

REPUBLIQUE OF CAMEROON  
Peace – Work – FatherLand  
\*\*\*\*\*  
MINISTRY OF NATIONAL EDUCATION  
\*\*\*\*\*

REPUBLIQUE DU CAMEROON  
Paix – Travail – Patrie  
\*\*\*\*\*  
MINISTRE DE L'ENSEIGNEMENT SUPERIEUR  
\*\*\*\*\*



**DESIGN AND IMPLEMENTATION OF A HOSPITAL  
MANAGEMENT WITH A SUPPORT DRONE  
CASE STUDY: BONASSAMA REGIONAL HOSPITAL**

**AN INTERNSHIP REPORT SUBMITTED IN PARTIAL FULFILMENT OF THE  
REQUIREMENT FOR THE AWARD OF THE HIGHER NATIONAL DIPLOMA (HND)  
IN SOFTWARE ENGINEERING**

**WRITTEN AND PRESENTED BY:**

**BAMA FAITH EKEI**

**MATRICULE: HND240DE5F052**

**PROFESSIONAL SUPERVISOR:**

**Mr TAFOWO CEDRIC**

**HEAD OF INTERN AT APPSTECH**

**ACADEMIC SUPERVISOR:**

**Eng ASONGAFACK PATRICK LYONGA**

**LECTURER AT PHIBMAT**

**ACADEMIC YEAR: 2024/2025**

## CERTIFICATION

This is to certify that the Software Engineering project report entitled "**Blood Donation App with a Support Drone**" Case Study **BONASSAMA REGIONAL HOSPITAL** is the work carried out by **BAMA FAITH EKEI, NKONGHO CLINTON EKINNEH** and **TEBEI NOEL FORKANG** students of **PHIBMAT UNIVERSITY** in the **Software Engineering Department** under the supervision of **Eng ASONGAFACK PATRICK** the head of the **Software Engineering Department**. The project has been undertaken as a partial fulfillment of the requirements for the HND. This report has not been submitted to any other institution for an award or any other degree/diploma.

**Mr.TAFOWO CEDRIC**  
**PROFESSIONAL SUPERVISOR**

Signature\_\_\_\_\_

Date\_\_\_\_\_

**Eng.ASONGAFACK PATRICK LYONGA**  
**ACADEMIC SUPERVISOR**

Signature\_\_\_\_\_

Date\_\_\_\_\_

## **DEDICATION**

This piece of work is dedicated to the BAMA's family

## ACKNOWLEDGEMENT

Apart from the efforts of my team members and I, the success of any project depends on the encouragement and guide lines of many others. First and foremost, I would like to extend my sincere gratitude to the **Director of PHIBMAT University Institute, Mr. NCHENDE CHRISTIAN**, for his leadership and dedication in fostering an environment that nurtures academic excellence.

My appreciation goes to the **Dean of Studies**, whose commitment to academic growth has played a significant role in shaping my journey.

A special thanks to my **Head of Department, Mr. ASONGAFACK PATRICK** for providing guidance and support throughout this project.

I am deeply grateful to my **academic supervisor, Mr. ASONGAFACK PATRICK LYONGA**, for his unwavering guidance, encouragement, and valuable feedback. Your patience and expertise have been instrumental in shaping the direction and outcome of this project.

My heartfelt appreciation also goes to my **professional supervisors, Mr. TFAWO CEDRIC, head of interns at APPSTECHLABS and Miss NGALEU XAVIERA**, for their mentorship and technical guidance which greatly contributed to the success of this project.

I am also thankful to my friends and classmates for their encouragement, understanding and companionship during this process. Your motivation helped me navigate challenges and stayed focused.

Lastly, I am profoundly grateful to my family, especially my parents, **Mrs. BUO MIRANDA NGEI and Mr. PWE HILLARY BAMA**, for their unwavering love, sacrifice, and belief in me. Your belief in me has been my greatest source of strength.

Above all, I give glory and honor to **GOD ALMIGHTY** for granting me wisdom, strength and perseverance to complete this work. His unwavering guidance and blessings have been my foundation throughout this journey.

## **ABSTRACT**

The Blood Donation Application is a web-based platform designed to facilitate and enhance the blood donation process. The main objective of this application is to provide a user-friendly system that connects blood donors, recipient, and healthcare organisations to ensure a seamless exchange of information and resources. It features an advanced search engine that enables users to search for available blood donors or blood banks based on location, blood type, and urgency, providing an easy and efficient way to match donors with recipients

Users can register as donors, where they can view and manage their donation history, receive notifications for hospitals urgently in need of blood, view hospital location and information and participate in blood donation drives. Administrators can post request for specific blood types, track the location of the donor and contact nearby donors. the administrator has tools to verify donor profiles, manage request and organise donation events ensuring proper coordination between all parties.

The application also includes features for reviewing donation events and providing feedback to enhance user engagement. The system's primary emphasis lies in providing a reliable and interactive platform to effectively manage blood donation operations, reduce response time during emergencies, and ensure equitable distribution of blood resources across different locations

## **RESUME**

L'application de don de sang est une plateforme web conçue pour faciliter et améliorer le processus de don de sang. L'objectif principal de cette application est de fournir un système convivial qui connecte les donneurs de sang, les receveurs et les organisations de santé afin d'assurer un échange fluide d'informations et de ressources. Elle dispose d'un moteur de recherche avancé qui permet aux utilisateurs de rechercher des donneurs de sang ou des banques de sang disponibles en fonction de la localisation, du groupe sanguin et de l'urgence, offrant ainsi un moyen facile et efficace de mettre en relation les donneurs avec les receveurs.

Les utilisateurs peuvent s'inscrire en tant que donneurs, où ils peuvent consulter et gérer leur historique de dons, recevoir des notifications pour les hôpitaux ayant un besoin urgent de sang, consulter les informations et la localisation des hôpitaux et participer à des campagnes de don de sang. Les administrateurs peuvent publier des demandes pour des groupes sanguins spécifiques, suivre la localisation des donneurs et contacter les donneurs à proximité. L'administrateur dispose d'outils pour vérifier les profils des donneurs, gérer les demandes et organiser des événements de don, garantissant ainsi une coordination adéquate entre toutes les parties.

L'application comprend également des fonctionnalités pour examiner les événements de donation et fournir des retours d'expérience afin d'améliorer l'engagement des utilisateurs. L'accent principal du système réside dans la fourniture d'une plateforme fiable et interactive pour gérer efficacement les opérations de don de sang, réduire le temps de réponse en cas d'urgence et assurer une distribution équitable des ressources sanguines à travers différentes localisations.

## **PREFACE**

This project is submitted in partial fulfillment of the requirements for the **Higher National Diploma** at **PHIBMAT UNIVERSITY INSTITUTE**. The institution renowned for its commitment to academic excellence and practical skill development, aims to produce graduates who are equipped with both theoretical knowledge and practical expertise to contribute meaningfully to their respective fields. PHIBMAT was created on the **6<sup>th</sup> of June 2022** With authorisation **No. 2203315/L/MINESUP/SG/DDES/ESUP/SDA/MF** to run specialties of **BUSINESS MANAGEMENT, ENGINEERING, ART and CULTURE, MEDICAL STUDIES**.

This work aligns with the schools objective of fostering critical thinking, innovation and professionalism. The program emphasizes a hands-on approach, encouraging students to apply their learning to real-world challenges, and this project reflects the culmination of these principles. It also serves as a testament to the institution's commitment to academic integrity and intellectual growth.

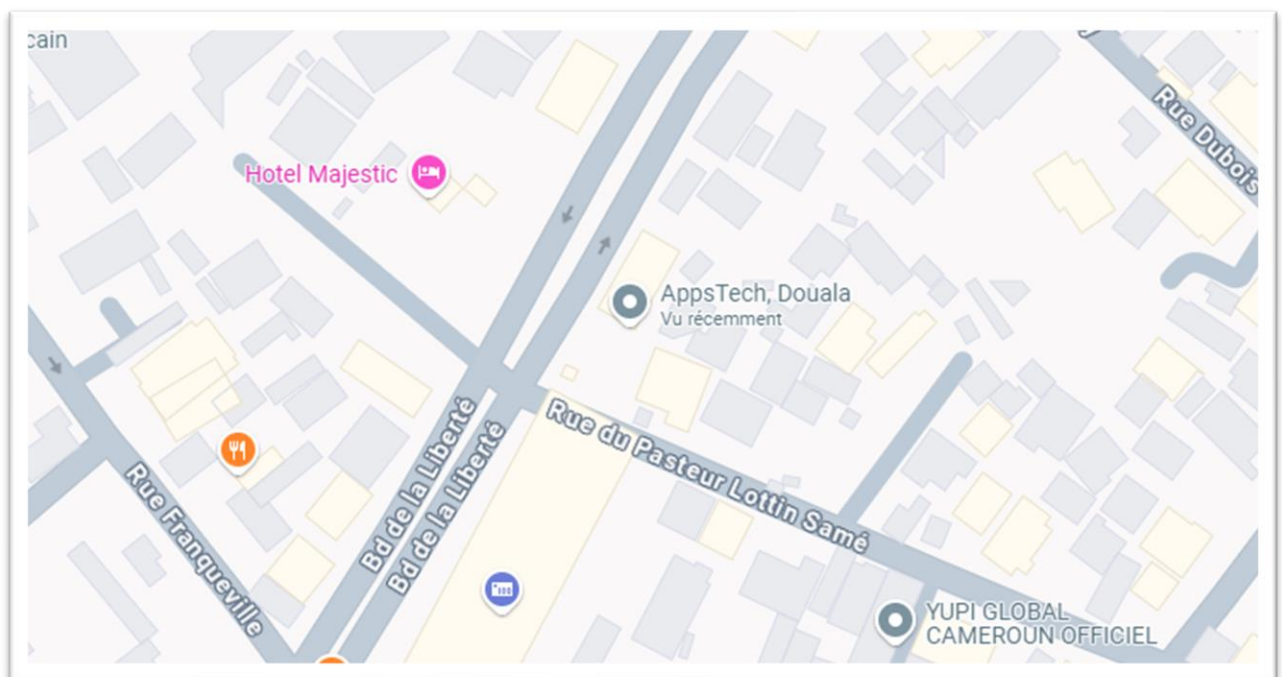
## IDENTIFICATION FORM

**APPSTECH** is a leading global provider of enterprise software solutions that was created in **2010** by **Madame REBECA ENONCHONG**. It provides implementation, training and application management services for companies around the globe by using advanced technologies to create innovative solutions. Appstech is committed to positive change and in helping their customers grow in this digital age.

Main activities;

- ❖ Web development with advanced frontend libraries like **React JS** and backend with **Python**.
- ❖ Offer AI services using programming languages like **Python** and **Java**.
- ❖ Offer Machine Learning services with advanced tools such as **Python, MATLAB, Ruby, Rust**.
- ❖ Offer Certifications.

**APPSTECH location;**



*Figure 1: Appstech's location*



## **LIST OF FIGURES**

Figure 1:Appstech's location .....	vii
Figure 2:Organigram of Appstech.....	3
Figure 3:System Development Life Cycle .....	15
Figure 4:Iterative Model.....	17
Figure 5:Gantt Chart.....	20
Figure 6:Class Diagram.....	21
Figure 7:Use Case Diagram .....	22
Figure 8:Sequence Diagram .....	23
Figure 9:Activity Diagram .....	25
Figure 10:Entity Relationship Diagram .....	26
Figure 11:Landing Page .....	27
Figure 12:Home Page.....	29
Figure 13:Sign up and Log in form for donors mobile view.....	30
Figure 14:Admin Sign up .....	30
Figure 15:Admin Login.....	31
Figure 16:Donors Dashboard .....	32
Figure 17:Admin Dashboard .....	33
Figure 18:questionnaire for requirement gathering .....	37

## **TABLE OF CONTENT**

### **Contents**

CERTIFICATION .....	i
DEDICATION .....	ii
ACKNOWLEDGEMENT .....	iii
ABSTARCT .....	iv
RESUME .....	v
PREFACE .....	vi
IDENTIFICATION FORM.....	vii
LIST OF FIGURES .....	viii
TABLE OF CONTENT .....	ix
PART ONE: THE INTERNSHIP FRAMEWORK .....	1
CHAPTER ONE.....	2
GENERAL PRESENTATION OF APPSTECH.....	2
1.1    CREATION AND HISTORICAL EVOLUTION OF APPSTECH .....	2
1.2    ORGANISATION OF APPSTECH.....	3
CHAPTER TWO.....	4
EVOLUTION OF THE INTERNSHIP ACTIVITIES .....	4
2.1 PRESENTATION OF THE SERVICE HOSTING AT THE COMPANY.....	4
2.1.1 THE CHIEF OF INTERN.....	4
2.1.2 TASK CARRIEDOUT.....	4
2.2 JUSTIFICATION OF TOPIC.....	8
INTRODUCTION OF PART TWO .....	9
CHAPTER THREE .....	10
3    .LITERATURE REVIEW, MATERIALS AND METHODS .....	10
3.1 LITERATURE REVIEW .....	10
3.1.1    Conceptul Framework .....	11
3.2 MATERIALS AND METHODS.....	13
3.2.1 FUNCTIONAL REQUIREMENTS.....	14
3.2.2 Non-Functional Requirements .....	14
3.2.3 System Development Life Cycle(SDLC).....	15
3.2.3 ITERATIVE MODEL .....	16
3.2.4 Stages of the Iterative Design Process .....	17

**DESIGN AND IMPLEMENTATION OF A HOSPITAL MANAGEMENT SYSTEM  
WITH A SUPPORT DRONE**

---

3.2.5 Reasons for using the iterative design .....	19
3.3 DESIGNING UML DIAGRAMS .....	19
3.3.1 Gantt Chart .....	19
3.3.2 Designing a class diagram.....	20
3.3.3 Designing a use case diagram.....	22
3.3.4 Designing a sequence diagram.....	23
3.3.5 Activity Diagram .....	24
3.3.6 Entity Relationship Diagram .....	26
CHAPTER FOUR.....	27
4 .RESULTS AND DISCUSSION .....	27
4.1 Presentation of result from practical case.....	27
4.2 Explanation/discussion of Results.....	33
4.3 Recommendations and Perspectives.....	34
GENERAL CONCLUSION .....	35
4.4 DIFFICULTIES ENCOUNTERED DURING THE INTERNSHIP .....	35
BIBLIOGRAPHY .....	36
APPENDICES.....	37

## GENERAL INTRODUCTION

### I. Introduction

The integration of technology in healthcare management has significantly transformed how hospitals operate and deliver services. This internship report focuses on the development and implementation of a **Blood Donation App with a Support Drone.**, aiming to improve operational efficiency and patient care. The following sections provide a comprehensive overview of the background, objectives, methodology and structure of this study.

### II. Background to the Study

Health care systems worldwide face increasing challenges due to growing patient populations, limited resources and the demand for efficient service delivery. Hospitals in particular struggle to streamline operations such as patient care, medical supply chain management and emergency response. The situation is worse in densely populated urban centers and remote or underserved areas, where logistical inefficiencies can lead to delayed treatments and compromised healthcare outcomes. Traditional Hospital Management Systems focus on digital record-keeping, resource allocation and communication within hospital facilities. However, these systems often lack integration with advanced logistical support mechanisms, especially for urgent or external task such as delivering critical supplies, transporting medical samples or facilitating rapid emergency response. The reliance on conventional methods of transportation (e.g ambulances or ground based couriers) introduces delays due to traffic congestion, limited accessibility, mutual intervention, ultimately impacting the quality of care. Recent technological advancements particularly in unmanned aerial systems like drones, offer a transformative solution. Drones are increasingly recognized for their potential in healthcare logistics, including rapid delivery of medical supplies (e.g blood, vaccines, medications), assistance in search and rescue mission and emergency communication during crises. Their ability to bypass ground traffic, cover challenging terrains and operate autonomously makes them an innovative addition to hospital management. The integration of support drones into hospital management systems addresses critical variables, including;

1. **Efficiency:** Reducing delays in the delivery of time-sensitive medical supplies
2. **Accessibility:** Overcoming geographical and infrastructural barriers to healthcare delivery
3. **Scalability:** Enhancing hospital capacity to handle emergencies and routine operations simultaneously

4. **Reliability:** Ensuring accurate and consistent delivery of service through automated system

Despite the potential, the adoption of drones in healthcare faces challenges such as regulatory compliance, technical limitations, cost implications and user acceptance. These factors necessitate the development of a comprehensive hospital management system that seamlessly integrates support drones while addressing logistical, technical and operational considerations. This study explores the design and implementation of a hospital management system that leverages drone technology to optimise healthcare delivery.

### **III. Problem Statement**

Healthcare facilities face increasing pressure to deliver timely, efficient and reliable services amidst challenges such as rising patient volumes, resource constraints and logistical inefficiencies. One critical area of concern is the timely transportation of medical supplies, laboratory equipment particularly in densely populated urban areas where traffic congestion causes significant delays and in remote or rural areas with limited infrastructure. These delays can jeopardize patient outcomes especially in emergencies where time is critical. Traditional hospital management systems often lack the capacity to address these logistical challenges effectively. Current methods of transportation including ambulances and courier services, are heavily reliant on ground-based systems which are subject to environmental and infrastructural barriers. Emerging technologies such as drones offer a unique opportunity to address these challenges. Drones can bypass traffic, access hard-to-reach locations and ensure rapid delivery of medical supplies thus complementing the functionality of existing hospital management systems. However, the integration of drone technology into hospital management systems remains underdeveloped due to technical operational and regulatory challenges. Additionally, there is limited research on how drones can be effectively incorporated into hospital management systems to enhance efficiency, scalability and reliability. This study seeks to address the gap by investigating the development and implementation of hospital management system that integrates support drones. By focussing on logistical challenges faced by hospitals and the potential role of drones in resolving these issues, the research aims to contribute to improving healthcare and operational efficiency in diverse settings.

### **IV. Research Questions**

1. How can a hospital management system improve patient engagement through features like online booking, reminders and access to electronic medical records ?.

2. What are the most effective strategies for securing patient data within a hospital management system ?.
3. How can a hospital management system assist in managing staff schedules and workloads ?.
4. What role does a hospital management system play in optimizing revenue cycle management in hospitals ?.
5. How can hospital management systems be seamlessly integrated into existing hospital management systems ?.
6. How can data collected and transmitted by drones be secured to ensure patient confidentiality and system integrity ?.
7. How can drones improve the delivery of medical supply delivery within the hospital ?
8. What type of medical supplies are most suitable for delivery through drones ?.
9. How can drones be designed to minimise disruption and ensure ease of use for hospital staff ?.
10. How can drones be used to reduce healthcare disparities in resource-limited settings ?

## **V. Objectives of the Study**

The primary objective of this study is to design and implement a **Blood Donation App** integrated with a **Support Drone** to enhance hospital efficiency. Specific objectives include.

- Automating administrative tasks such as patient record management and scheduling.
- Utilizing drones to provide timely delivery of medical supplies within and outside hospital premises

## **VI. Methodology**

The study adopted a design-and-implementation approach, incorporating interviews and observations from healthcare professionals to identify system requirements. The hospital management system was developed using modular architecture for scalability while drones were programmed for autonomous navigation and delivery. Testing and evaluation of the integrated system were conducted to validate its efficiency and usability.

## **VII. Structure of Work**

This report is structured into two parts, the part one is based on the internship framework and contains the first two chapters while the part two is based on the project framework containing the last two chapters.

- ❖ **Chapter one:** Introduces the internship framework and provides an overview of the company
- ❖ **Chapter two:** emphasizes on the evolution of the internship activities from day one to the last day
- ❖ **Chapter three:** Literature review, materials and methods
- ❖ **Chapter four:** Results and discussions



## **PART ONE: THE INTERNSHIP FRAMEWORK**

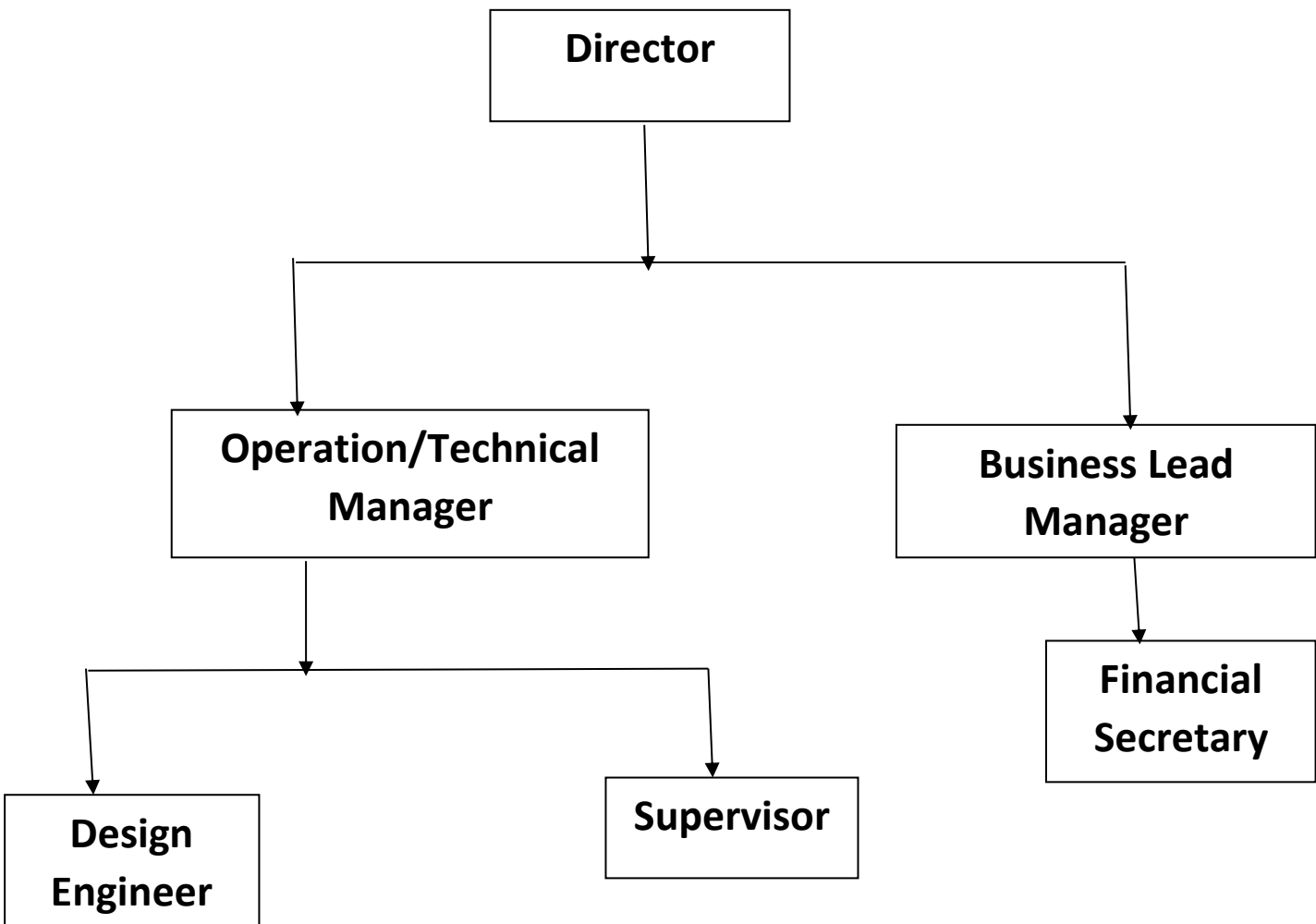
## CHAPTER ONE

# GENERAL PRESENTATION OF APPSTECH

## 1.1 CREATION AND HISTORICAL EVOLUTION OF APPSTECH

Appstech was created in the year **2010** by **Madame REBECCA ENONCHONG**. Her vision for Appstech was rooted in her passion for technology and entrepreneurship, which she developed early in her career while working in the United States. The company has grown into a prominent global provider of enterprise application solutions, including its specialisation focused on Oracle technology. The company established its presence in Cameroon as part of its strategic expansion into Africa which has become part of the broader movement to support the local tech ecosystem by providing advanced IT solutions and creating opportunities for young professionals. Later in 2010 Appstechlabs and Appstech Guest were created still under Appstech. Appstechlabs is a hub for innovation and collaboration, particularly aimed at promoting training, mentorship and collaboration opportunities for African tech startups serving as an incubator to help nurture and scale their operations. Appstech Guest while less documented is likely connected to providing tailored enterprise solutions or supporting partnership and events under the Appstech brand. Both initiatives reflects the mission of the founder to advance technology adoption and business innovation across Africa.

## 1.2 ORGANISATION OF APPSTECH



*Figure 2: Organigram of Appstech*



## CHAPTER TWO

# EVOLUTION OF THE INTERNSHIP ACTIVITIES

## 2.1 PRESENTATION OF THE SERVICE HOSTING AT THE COMPANY

### 2.1.1 THE CHIEF OF INTERN

Upon my arrival at APPSTECH, I was warmly welcomed by **Mr Tafowo Cedric**, the Chief of Interns. During our inductory meeting, he provided an overview of the company's culture, values and expectations for interns, one of them was the fact that work begins at 8am and closes at 5pm everyday from Monday to Friday. He emphasized on the importance of teamwork, innovation and professional growth during the internship. He also outlined the key responsibilities we would have for the period of three months which was the duration of the internship, the first two months were meant for studying and the third month was dedicated to building the project given by the company. He went further to emphasize on the fact that we would have a power point presentation every Friday. Mr Tafawo encouraged open communication and reassured us of the support available from the team. This warm and structured welcome set a positive tone for my internship journey and made me feel valued and motivated to contribute to the organisation.

### 2.1.2 TASK CARRIED OUT

**Week 1:** During this week, the company initiated a transition from the Windows operating system to Ubuntu. This significant change not only demonstrated the company's commitment to staying current with technology but also provided interns like me with a unique learning opportunity. Still in the same week the company organised sessions to equip us with the necessary knowledge and skills for Ubuntu. This covered various aspects including installation, configuration and usage. I found some difficulties in adapting to this operating system due to its complex nature and its non user-friendly interface. Never

the less, the availability of the unlimited internet enabled us to get online tutorials on how to work with Ubuntu.

**Week 2 – 5:** We were assembled as a collective group to study Python fundamentals and FastAPI, covering data types, control structures, functions and libraries relevant to web development. We also engaged in daily coding exercises to reinforce Python knowledge across all interns. During this period we were given individual projects to create a simple TO-DO app using FastAPI. At the end of the fifth week, the Chief of interns restructured the internship, dividing interns into three specialised teams: **Web Development**, **Data Engineering** and **Machine Learning**. I was assigned to the web development team and voted as team lead for that week. Despite the fact that most programming languages have the same syntax, Python and FastAPI was a little different this got me struggling at the beginning hence I engaged myself into numerous python exercises which later made me have some stands in Python.

**Week 6 -7:** Initiated training on ReactJS and FastAPI, focusing on their role in building dynamic, full-stack web applications. In ReactJS, learned key concepts such as components, states and props. At the end of this week we had a power point presentation based on what we had studied for that week. Due to the transition from Python to ReactJS, I faced difficulties trying to study and understand ReactJS tho it was more familiar to me than Python, but the tutorials provided to us by our professional supervisor went a long way to widen my knowledge in ReactJS.

**Week 8 :** During this week we progressed to advanced ReactJS topics, including hooks and context API, to improve data handling across components. We also focused on backend development with FastAPI, working on API endpoints to serve data and integrate it with the frontend. At the end of this week we presented a small project that was based on what we had studied so far in react which was a form with a stock filter. During such presentations, the Chief of intern would always be around with his colleagues to criticise and appreciate our work such that we can ameliorate the performance before the final presentation on the last week

**Week 9:** During the mid of this week, our chief of intern forwarded our final projects to us with the requirements of what each team was expected to do. The project was a web app that was based on showcasing stock-listing, stock behaviour and stock prediction of a variety of stock from different companies. The Data engineering team was incharge of collecting the data from a website

called EODHD short for End of Days Historical Data using API calls, after which they forwarded this data to the Machine Learning Team. The machine learning team on their part used this data to study the market for each stock and then train their models to be able to predict stock and stock behaviour. As for the web development team we were given the responsibility to create a dashboard so it could serve as a means to visualise the different components of our app such as the stock listing, stock behaviour and stock prediction based on the data from the machine learning team.

**Week 10:** In the course of this week, my team mates and I came up with a design for the dashboard and also for the landing page, login and sign up forms since we were asked to implement authentication. As the team lead for that week, I splitted the work by giving the authentication forms to two of my team mates, the backend to one of my other team mate and I focused solely on building the dashboard and the landing page. Inorder for the dashboard to give an appealing visual experience, I intergrated charting libraries like recharts using line charts and bolinger bands. Data from this library was later replaced by an API call from the backend to give the actual data.

**Week 11:** During this week, the entire front-end was combined using a library in reactJS known as react routers which could enable us navigate from one section of the application to another. We further went ahead to link our ReactJS components with FastAPI end points enabling real time data fetching and display on the dashboard. Also we conducted rigorous testing of API response to confirm data accuracy and stability. In the course of building the app we did not implement a functionality which was to integrate a microphone this was because the front end was not properly designed to fit the backend

**Week 12:** During this week, we organised an inter-team meeting to address integration challenges and finalise design adjustments making sure the app was responsive across a variety of devices, after which we made sure everyone had the project running smoothly on thier PCs. Further more, we prepared a comprehensive group power point presentation showcasing the dashboard's features with each team explaining their contributions, after which we had numerous practice sessions and prepared for technical Q&A on our project's technology stack, development process and design choices. At the end of this week, we had our final presentation of the project infront of our parents/guardians and supervisors.

For someone who had little or no knowledge about the tech world, this internship enabled me to gain skills in reactJS and other modern and easy-to-use libraries for web development, and also creating very beautiful and professional powerpoints. I must admit I am grateful to APPSTECH for giving me the opportunity to be part of such a golden opportunity and also for the patience and kindness and services they have put together to better the future of the IT society.

## **2.2 JUSTIFICATION OF TOPIC**

The Blood Donation App will provide critical services such as real-time blood donor matching, tracking blood availability and facilitating communication between hospitals and donors.

I chose to work on this topic because it came to my attention through research that many hospitals face challenges with managing blood supplies, especially in emergencies. Despite advancements in healthcare, many healthcare facilities still rely on manual process for blood management, which are time-consuming and prone to errors.

With the integration of this system, hospitals can quickly access blood supplies, donors can receive timely notifications, and the process becomes faster and more reliable. This system utilises modern technology, which is necessary in today's fast-paced world to ensure efficiency and save lives

Through this platform, patients will receive blood transfusion without unnecessary delays, and donors will find it inconvenient to contribute, enhancing the overall healthcare experience while reducing the risk of inefficiencies and delays in life-saving procedures.



## INTRODUCTION OF PART TWO

Part two of the project, consist of two chapters, I will focus on explaining more about literature review, materials and methods I use in carrying out my project which is chapter three. Also I will be discussing about the results, discussion and general conclusion which is the last chapter



## PART TWO: PROJECT FRAMEWORK

## CHAPTER THREE

### 3 .LITERATURE REVIEW, MATERIALS AND METHODS

This chapter has a total of two sections. Sections one is made up of the literature review while section two is made up of materials and methods, analytical tools and the presentation of results

#### 3.1 LITERATURE REVIEW

Blood donation web apps have ben developed to address inefficiencies in traditional donation systems. Conventional methods such as paper-based reds and phone-call-based donor request, suffer from **slow respond times, difficulty in reaching donors during emergencies, and lack of well organised donor data base.**

While existing digital blood donation platfoms offer **donor registration, blood availabilty tracking, emergency request** and **automated reminders**, they also face several challenges including

- **Limited donor privacy control:** Many systems do not allow donors whether their contact information is private or public
- **Inability to Store Multiple Contact:** Some platforms only allow a single contact number limiting accessibility during emergencies
- **Lack of Interactive Dashboards:**Many applications lack user-friendly dashboards where hospitals and donors can easily manage their activities in one place

Your blood Donation web app addresses these challenges by **allowing donors to choose whether their contact details are public or private, enabling them to add multiple contact numbers, and providing interactive dashboards** for better usability. Thes enhancements aim to create a more efficient user-friendly and accessible blood donation system.

### 3.1.1 Conceptual Framework

#### 3.1.1.1 Definition of Terms

**ReactJS:** ReactJS , a javascript library used to build dynamic user interfaces

**Node.js:** An open source, cross-platform runtime environment that allows developers to execute JavaScript code on the server side

**Web app:** a web application that runs on a web server and is accessed through a web browser using the internet

**Blood Donor:** An individual who donates blood

**Administrator:** The hospital that request for the blood

**API:** application programming interface, used for transmitting data resources between client and server

**Chatbot:** Software application designed to simulate conversations with human users especially over the internet

**Dashboard:** A visual representation of the various components of the application which will enable the users to interact with the system effectively

**Internet:** Global interconnection of computers to share information and resources

Principles of operation

- You must have signedup and loggedin as an administrator or a donor
- You must have registered as a donor
- You must have registered as a hospital

#### 3.1.1.2 SIMILAR STUDIES

DONORS	<ul style="list-style-type: none"><li>➤ Log in/Sign up</li><li>➤ Register</li><li>➤ Update profile</li><li>➤ Find nearby donation drives</li><li>➤ View dashboard</li><li>➤ View donation history</li><li>➤ Contact hospitals</li><li>➤ View hospital blood banks</li></ul>
--------	---

**DESIGN AND IMPLEMENTATION OF A HOSPITAL MANAGEMENT SYSTEM  
WITH A SUPPORT DRONE**

---

ADMINISTRATORS	<ul style="list-style-type: none"><li>➤ Log in/ Sign up</li><li>➤ Register</li><li>➤ Search for blood types</li><li>➤ Send notifications</li><li>➤ Verify donors profile</li><li>➤ Contact donor</li><li>➤ Search for blood donors</li><li>➤ View blood donors location</li><li>➤ Manage blood request</li><li>➤ View admin dashboard</li></ul>
----------------	---

### 3.1.1.3 Functionalities of the Old System

The old blood donation system relied on manual processes for donors records, eligibility screening, and scheduling. Communication with donors was limited to phone calls or letters, and blood collection used basic equipment with minimal tracking. Testing and storage were less advanced, resulting in slower processing and increased risk of errors

### 3.1.1.4 Technical and Financial Advantages of the New System

#### Technical Advantages

- **Centralised Databases:** Streamlines donor records and ensures efficient tracking and retrieval of information
- **Online Scheduling and Notifications:** Donors can book appointments online and receive reminders through messages
- **Real-Time inventory Management:** Tracks blood appointments across multiple centers, enabling faster allocation during emergencies.

#### Financial Advantages

- **Cost Efficiency:** Automated processes reduce labor costs and minimise paper work
- Digital tools for outreach and scheduling attracts more donors, boosting supply

## 3.2 MATERIALS AND METHODS

### HOSPITAL MANAGEMENT SYSTEM : BLOOD DONATION SYSTEM

System management is the process of overseeing all aspects of the blood donation app's operations. This includes creating and managing user profiles, tracking blood donations, connecting donors to recipients, and ensuring a smooth user experience.

The main function of the Blood Donation App can be divided into four categories: **Donor Profiles, Admin Donor, Blood Request, Notifications, Drone Integration**. Let's briefly discuss the main aspects of each category:

- ❖ **Donors Profile:** This includes ensuring accurate information, such as blood type, location and eligibility status (e.g health condition, age). The app makes it easy for donors to update their profiles and access relevant donation guidelines.

- ❖ **Admin Profile(Hospital):** Hospitals and blood banks have dedicate profiles in the app. These profiles include essential details such as **hospital name, location,** contact information, and authorisation credentials. Hospitals use their profiles to:
  - Make blood request for specific blood types
  - Track the fulfilment status of their request
- ❖ **Blood Request:** The app facilitates request from hospitals or blood banks. It matches these requests with available donors ensuring a timely response to emergencies
- ❖ **Notifications:** This includes alerts for donation opportunities, eligibilty reminders, and updates on urgent requests.
- ❖ **Drone Integration:** To improve efficiency and address emergencies, the app incorporates drone delivery for transporting blood. Drones are equipped with temperature-controlled storage compartments to ensure thes afety and quality of blood diuring transit. They:
  - Deliver blood directly from blood banks to hospitals or emergency sites
  - Reduce transportation time, especially in remote or traffic congested areas

### **3.2.1 FUNCTIONAL REQUIREMENTS**

#### **DONOR**

- ❖ Log in/Sign up
- ❖ Register
- ❖ Update Profile
- ❖ Donate blood
- ❖ View blood banks location
- ❖ View dashboard
- ❖ Contact hospital

#### **ADMIN**

- ❖ Log in/Sign up
- ❖ Register
- ❖ Filter by blood types
- ❖ View admin dashboard
- ❖ Send notifications

#### **DRONE**

- ❖ Carry blood sacs

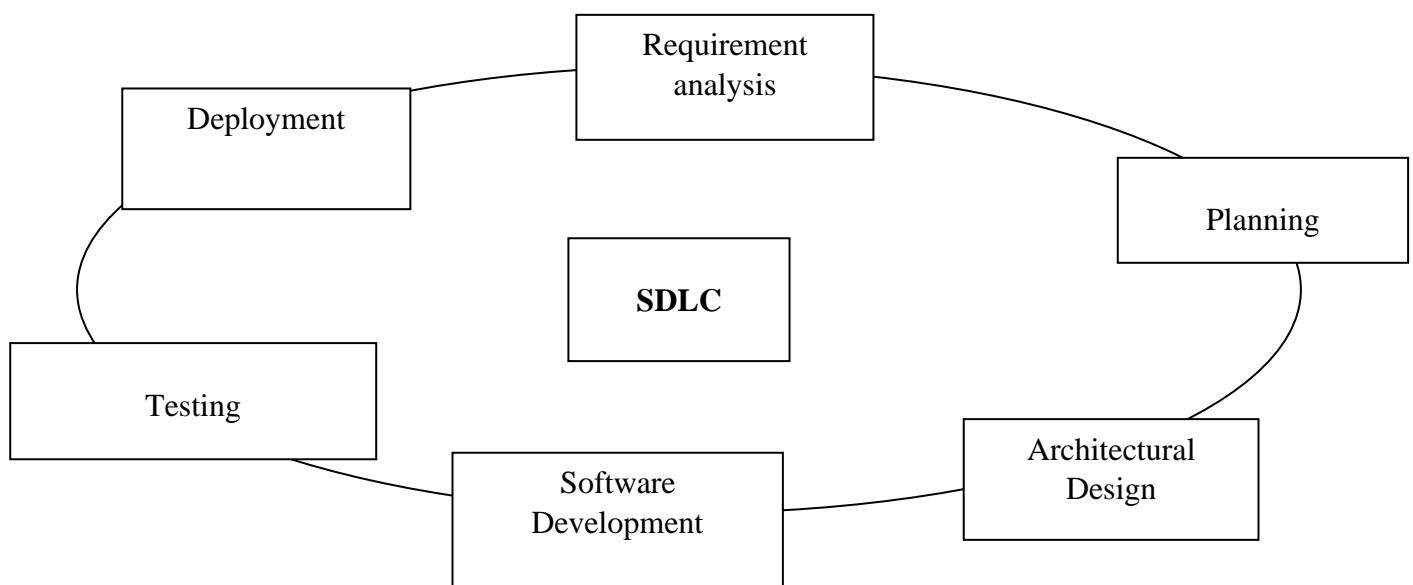
### **3.2.2 Non-Functional Requirements**

- **Performance:** Fast response time

- **Usability:** simple and intuitive interface
- **Security:** Data encryption , multi-factor authentication
- **Reliability:** Accurate and timely notifications, robust drone delivery systems.
- **Legal Compliance:** Follow medical, legal and ethical standards for handling donors and patient data

### 3.2.3 System Development Life Cycle(SDLC)

SDLC is a process that produces software with the highest quality and lowest cost in the shortest time possible. SDLC provides a well structured flow of phases that helps an organisation to quickly produce high quality software which is well tested and ready for production use.



*Figure 3: System Development Life Cycle*

The SDLC involves six phases and can be seen above. Below are the various models used for system development life

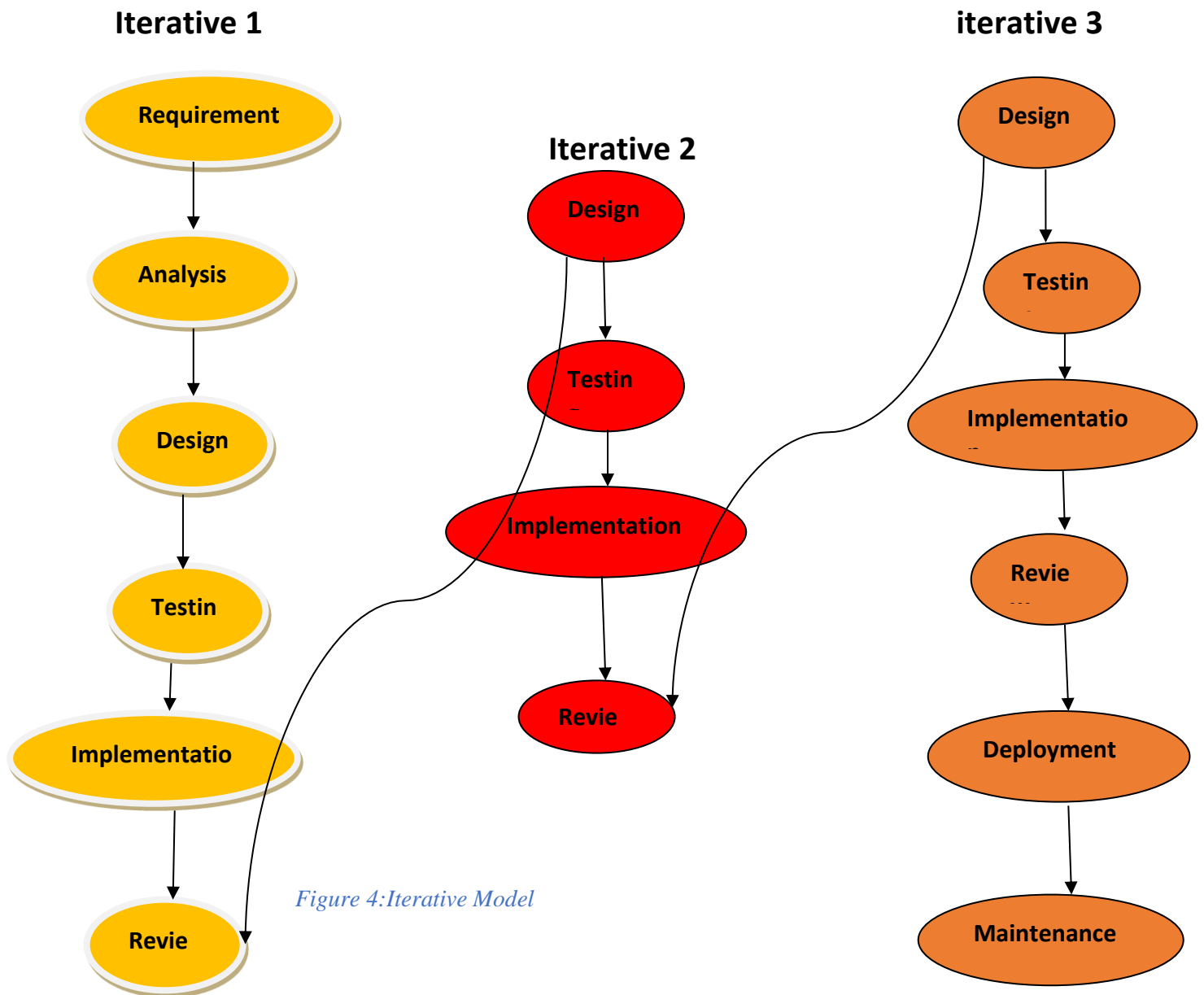
1. **Waterfall Model:** This SDLC model is the oldest model and most straightforward. Each phase has its own mini-plan and each phase “waterfalls” into the next. The biggest drawback of this model is that small details left incomplete can hold up the entire process

2. **Agile Model:** The agile model separates the products into cycles and delivers a working product very quickly. This methodology produces a succession of releases. Testing of each release provides feedback information that is incorporated into the next version. The drawback of this model is that heavy emphasis on customer interaction can lead the project in the wrong directions in some cases.
3. **Iterative Model:** This relies on repetition. Developers create a version very quickly and for relatively very little cost, they test and improve it through rapid and successive versions. One big disadvantage here is that it can eat up fast if left unchecked.
4. **V-shaped Model:** An extension of the waterfall model, this SDLC methodology tests at each stage of development. As with waterfall, this process can run into roadblocks.
5. **Big Bang Model:** This is a high risk model which throws most of its resources at development and works best for smaller projects. It lacks the true requirement definition stage of the other methods.
6. **Spiral Model:** This is the most flexible of the SDLC models, the spiral model is similar to the iterative model in its emphasis on repetition. The spiral model goes through the planning, design, build and test phases over and over, with gradual improvements at each stage.

### **3.2.3 ITERATIVE MODEL**

In this project I will be using the Iterative model, it relies on repetition. Developers create a version very quickly and for relatively very little cost, they test and improve it through rapid and successive versions. The disadvantage here is that it consumes resources rapidly.





*Figure 4: Iterative Model*

### 3.2.4 Stages of the Iterative Design Process

#### Step1: Research your customers

What is the prblem your product will solve? Will it help customers achieve a goal or ease pain?. You need to understand users and analyse their habits to know what exactly you are going to design and develop. User research in the form of focus groups or interview offers insight into

customers requirements, habits, and needs. It provides you with the user context you need to start brainstorming solutions.

### **Step 2: Ideation phase – developing your product idea**

The goal of the ideation phase is to generate many different solutions and be creative. In this step, you can start generating ideas that address the problem you identified in your research. You can use information about users, their emotional approaches to your product and context in which they would use the product to generate ideas

Try brainstorming to come up with new solutions that will delight your user. When developing ideas make sure you are thinking about the “why” behind your product. What will resonate with users?, what will make them happy and solve their problems?. You want to articulate the core of your project using thoughtful, strategic designs.

### **Step 3: Build your product**

In the building phase, you create an early example of your products using concepts or systems that you have chosen for the final design. The prototype needs to outline how the product will be used, whether it is basic software functionalities, wireframes or even paper mockups of your visual design.

You can test these early materials with users to ensure that the product is usable. This is also a great opportunity for gathering feedback on how well it meets user needs. This step is time consuming and often costly, the goal is to have a working version of the product to show people so you can get their valuable feedback

### **Step 4: Analyse user feedback**

You can design and build a minimum viable product (MVP) that allows you to meet the project requirements and provide value early in iterative processes.

### **Step 5: Repeat the process**

An iterative design is based on repeating the cycle of “build, measure and learn” to constantly adjust the product. After analysing users feedback, the team implements it and then starts ideation and building again.

### 3.2.5 Reasons for using the iterative design

- ❖ **Accelerates your process:** The iterative process allows you to refine and revise a product quickly. It is efficient because you can build your product step-by-step, rather than having to rework an entire plan as changes occur. Moreover, the workload of the development team is spread out more effectively throughout the project’s development lifecycle.
- ❖ **Stay flexible:** The incremental development approach assumes that you don’t have all the answers or that the environment for your product and your customers needs may change during the development timeline
- ❖ **Collect feedback efficiently:** A phased approach to software development can be effective. The incremental, iterative development process enables you to continuously collect feedback and incorporate changes quickly. Empirical user testing lets you identify inconsistencies or flaws in requirement, design, code, and other implementations with each iteration. It also helps to avoid misunderstandings and identify what works by trial and error
- ❖ **Avoid over-engineering:** You can design and build a minimum viable product that allows you to meet the project requirements and provide value early in iterative processes.

## 3.3 DESIGNING UML DIAGRAMS

### 3.3.1 Gantt Chart

This is a graphical representation of activities against time. It is a project management tool assisting in planning and scheduling of projects or simplifying complex projects. The chart below talks about the length of time taken for the project to be realized

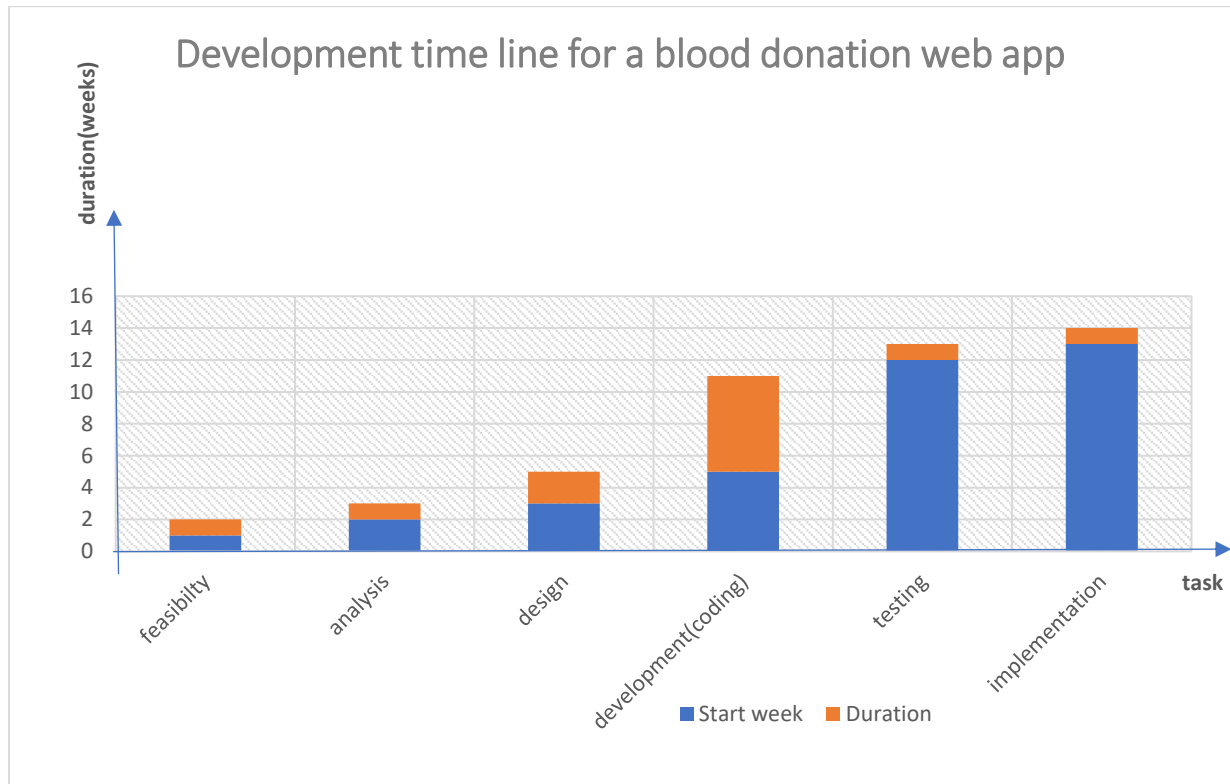


Figure 5:Gantt Chart

### 3.3.2 Designing a class diagram

A class diagram is a static diagram and it represents a static view of an application. Class diagrams are not only used for visualising, describing and documenting aspects of a system but also for constructing executable code of the software application.

Class diagrams describe the attributes and operations of a class and also the constraints on the system. The class diagrams are widely used in modeling of object-oriented languages

The class diagram is made up of three sections which are as follows:

- **Upper section:** It contains the name of the class and it is always required
- **Middle Section:** It contains the attributes which are always used to describe the qualities of the class. It is required when describing a specific instance of a class

## DESIGN AND IMPLEMENTATION OF A HOSPITAL MANAGEMENT SYSTEM WITH A SUPPORT DRONE

- **Bottom Section:** It includes the class operation in which specific name, type, parameters and constraints of its class

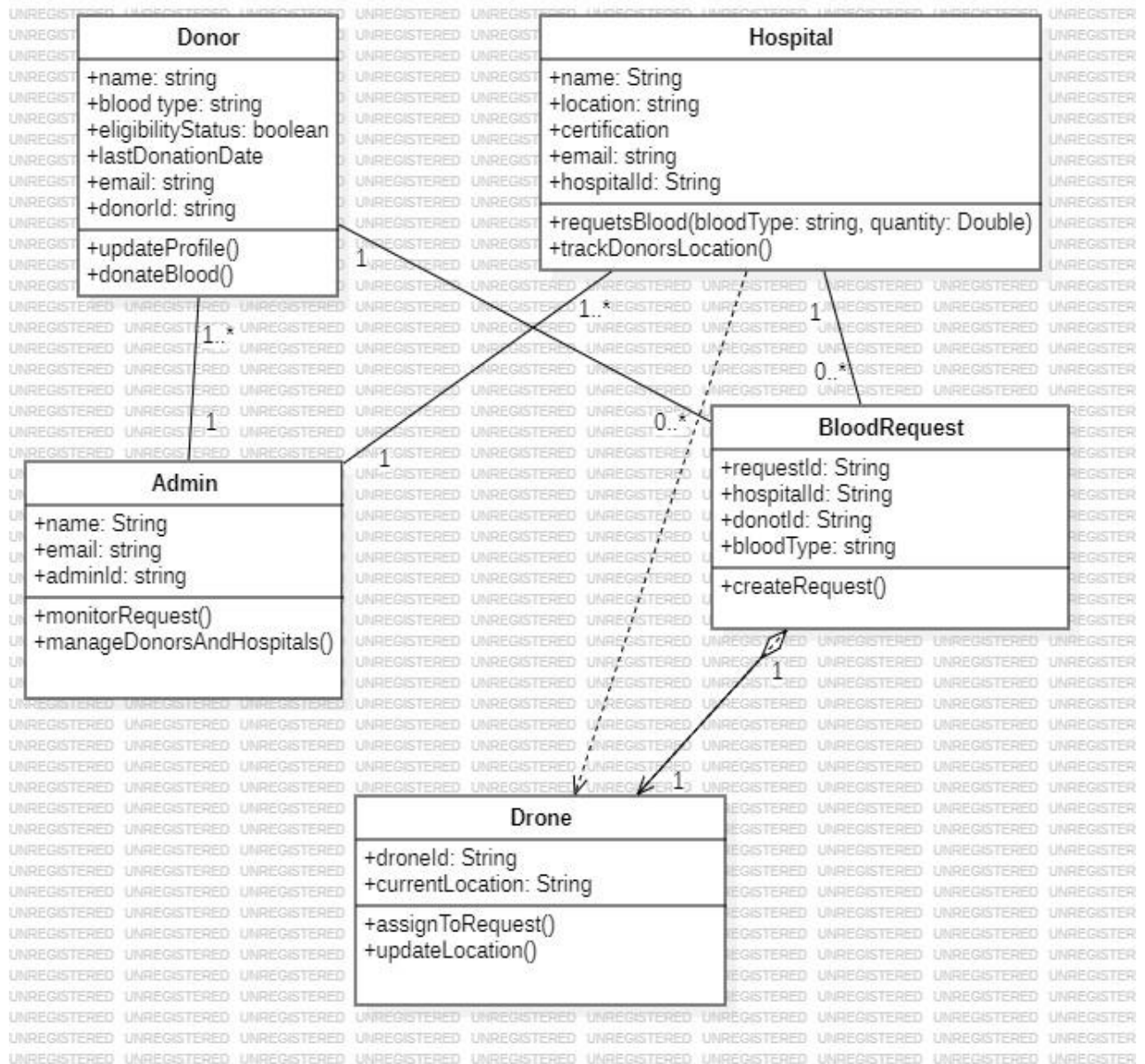


Figure 6: Class Diagram

### 3.3.3 Designing a use case diagram

A use case diagram is the representation of a user's interaction with the system that shows the relationship between the user and the different actions or methods in which the user is involved.

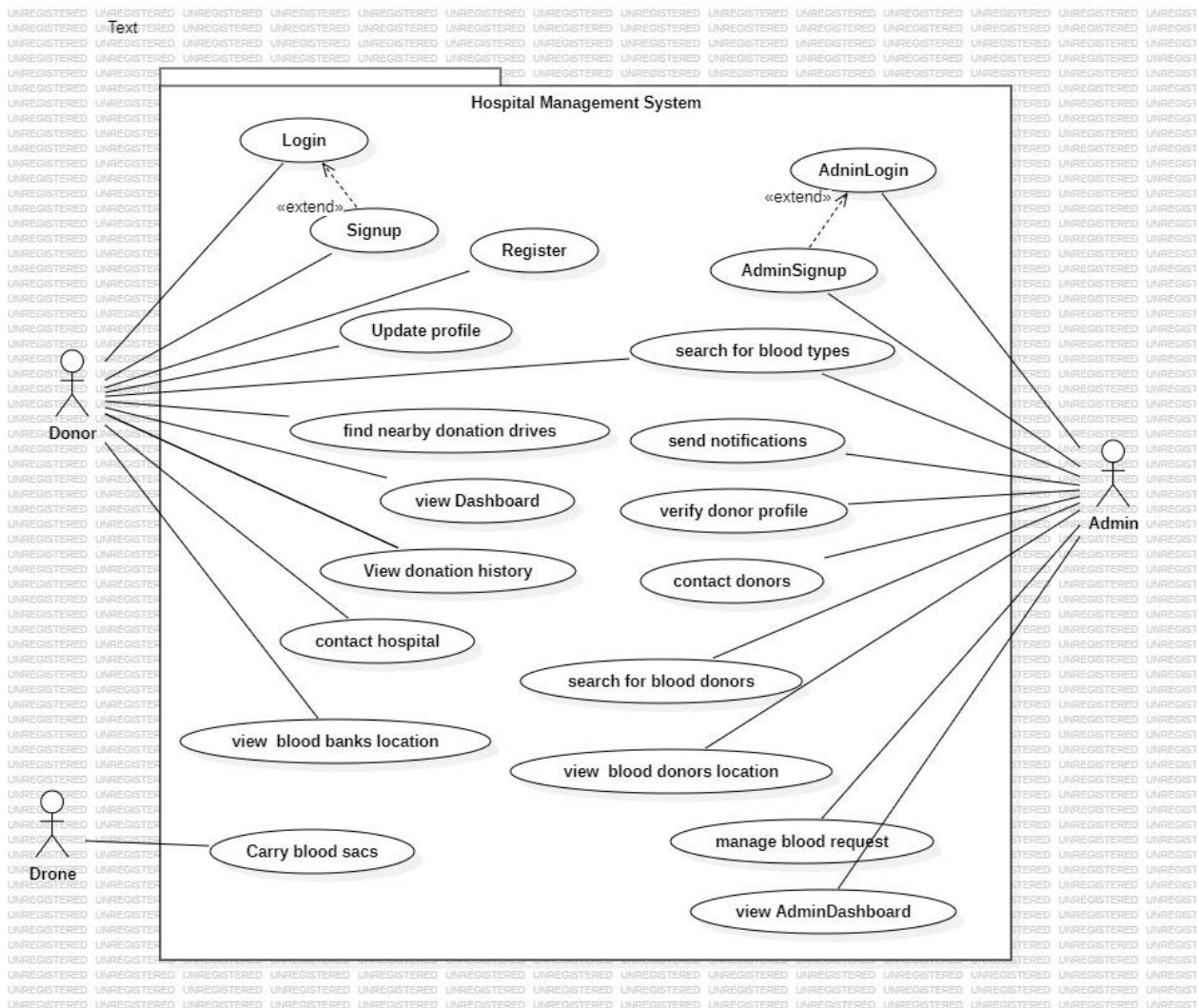
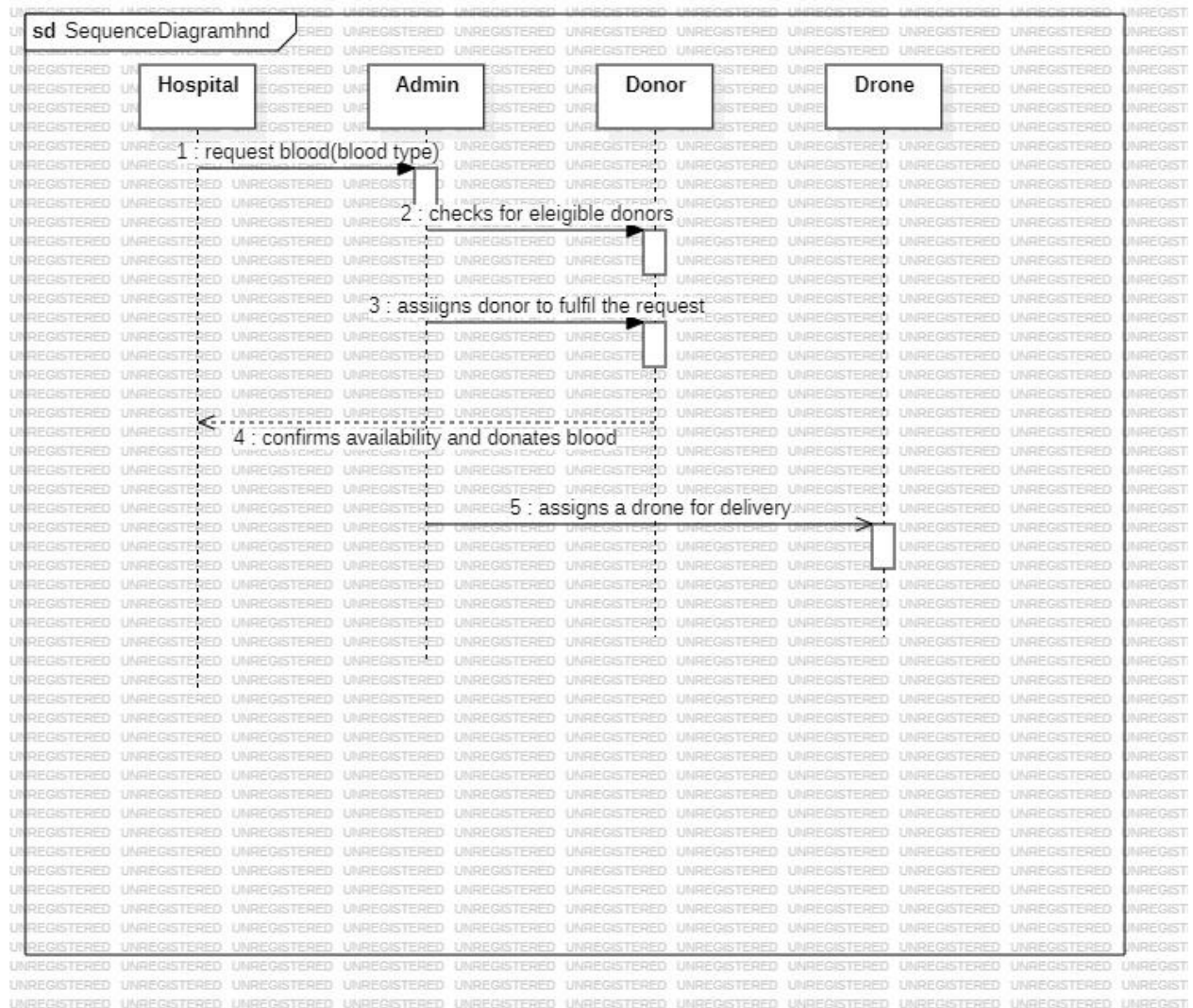


Figure 7: Use Case Diagram



### **3.3.4 Designing a sequence diagram**

A sequence diagram is an interaction diagram. From its name it is clear that the diagram deals with some sequences which are the sequence of messages flowing from one object to another. Interaction among the components of the system is very important from implementation and execution perspective. A sequence diagram is used to visualise a sequence of call in a system to perform a specific functionality.



*Figure 8:Sequence Diagram*

### **3.3.5 Activity Diagram**

An activity diagram represents the flow of activities or actions in a system. It visually describes the sequence of steps in a process or workflow, making it easier to understand complex behaviors



## DESIGN AND IMPLEMENTATION OF A HOSPITAL MANAGEMENT SYSTEM WITH A SUPPORT DRONE

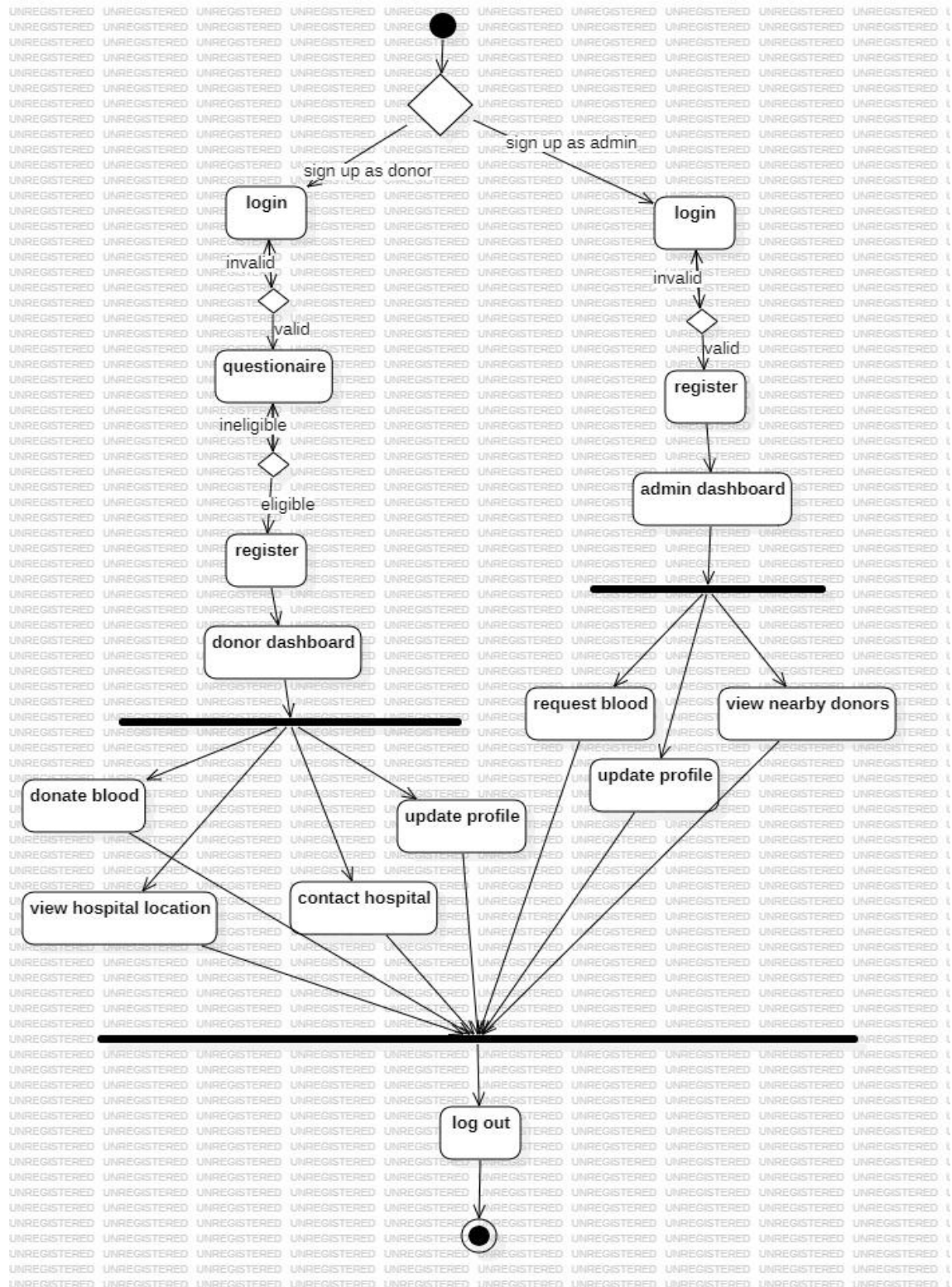


Figure 9:Activity Diagram

### 3.3.6 Entity Relationship Diagram

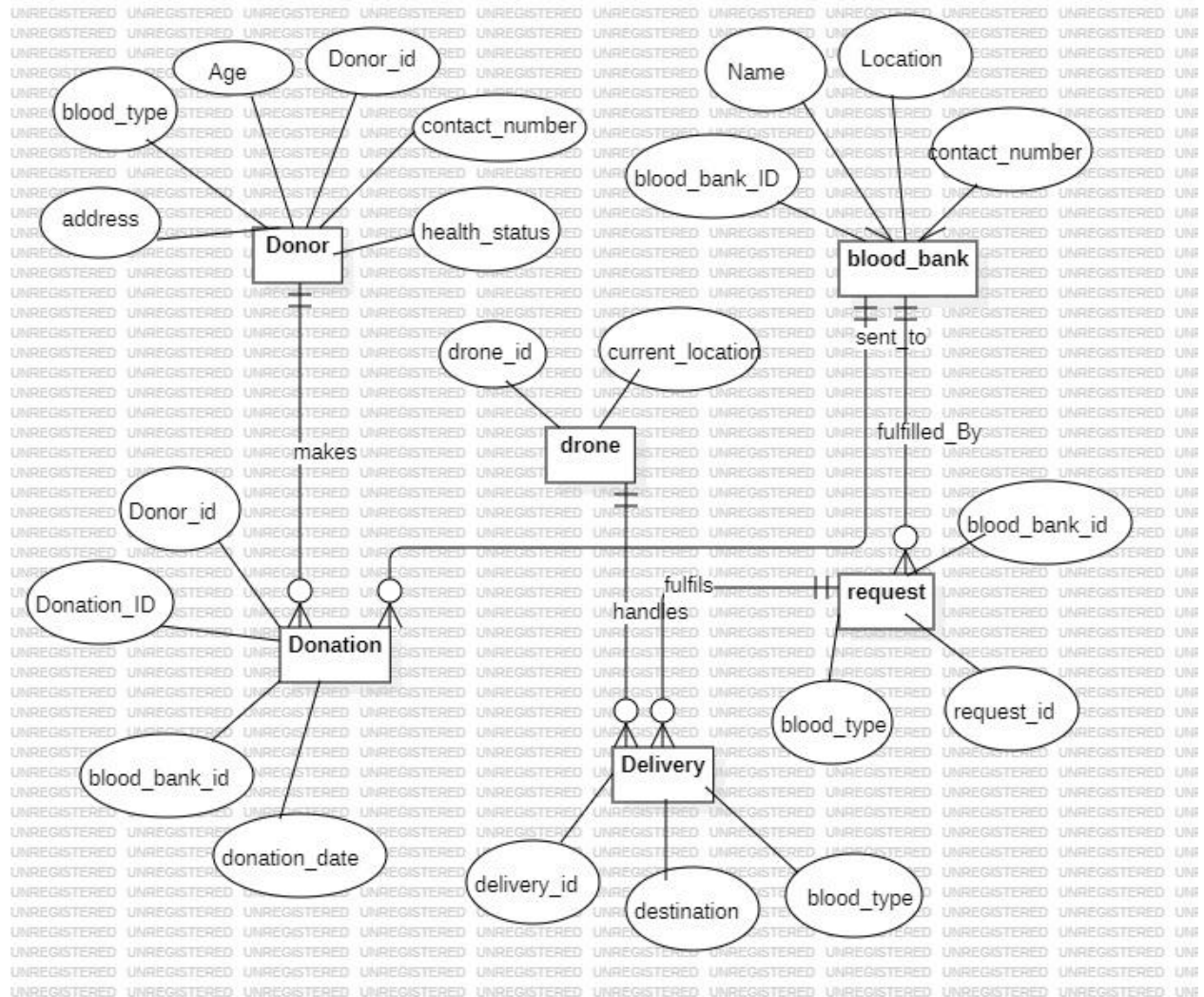


Figure 10: Entity Relationship Diagram

## CHAPTER FOUR

### 4 .RESULTS AND DISCUSSION

#### 4.1 Presentation of result from practical case

This chapter presents the results obtained from the development and implementation of the **Blood Donation Web App**. The results are demonstrated using screenshots of various system components, showcasing the functionality and features of the application. Each section highlights key aspects such as **home page, authentication forms, dashboard** for both admin and donor. The discussion further evaluates how well the system meets its objectives, challenges encountered during development and potential improvements for future enhancements

##### Landing Page

The landing page serves as an entry point into the application, featuring a clean and minimalist design. It includes a “Get Started” button, which directs users to the home page and a “learn more” button which provides details about the platform’s purpose and functionality

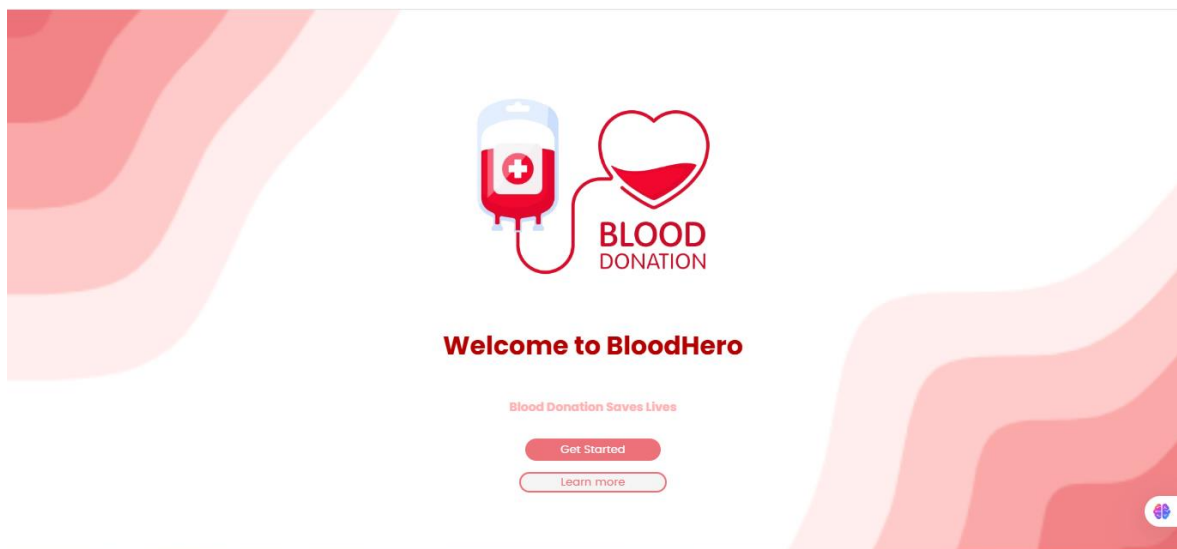


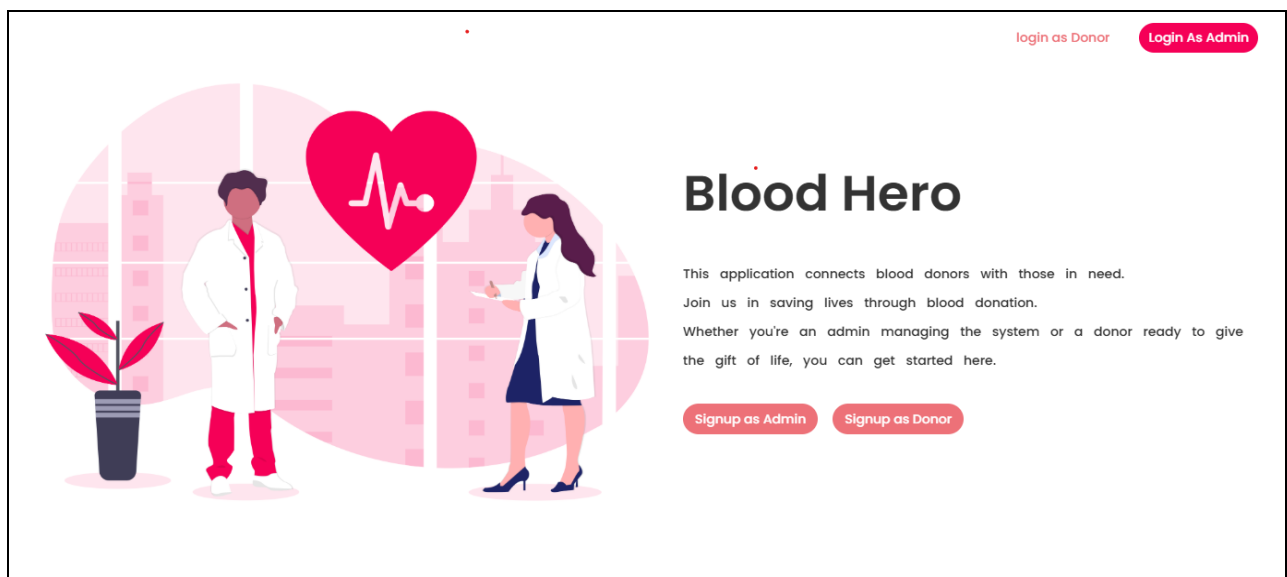
Figure 11:Landing Page

This page was designed to be **simple, intuitive and visually appealing** to encourage user engagement. The **navigation buttons** ensure easy access to key sections of the app. A major consideration during development was ensuring that the page loads quickly and responsively on both desktop and mobile devices

## Home Page

The home page provides users with two main options

1. **Sign Up as a Donor:** This allows users to create their account as **blood donors**, providing information such as name, email address and password
2. **Sign Up as an Admin:** This option is designed for hospitals with blood banks, enabling them to manage blood donation records and oversee blood request



*Figure 12:Home Page*

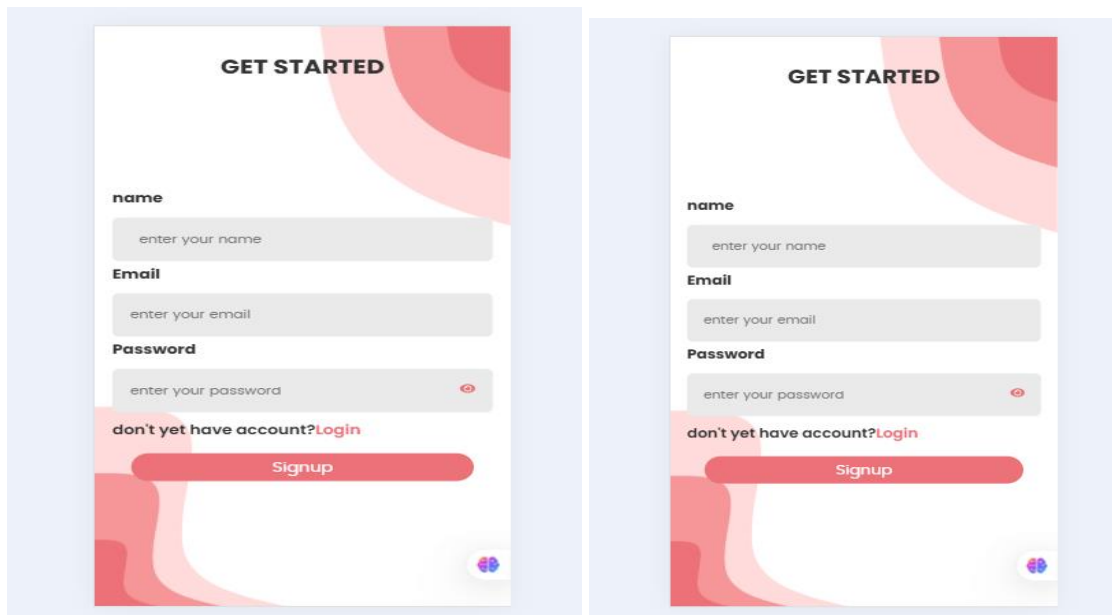
The role based signup system ensures secure and structured access to the platform. Donors can register and update their availability, while hospitals/blood banks can manage donation request efficiently. A key challenge was implementing a role-based access control, ensuring that only verified hospitals and blood banks can sign up as admins. This was resolved by integrating an approval system, where admin accounts require manual verification before gaining full access.

## Authentication Forms(Log In and Sign Up)

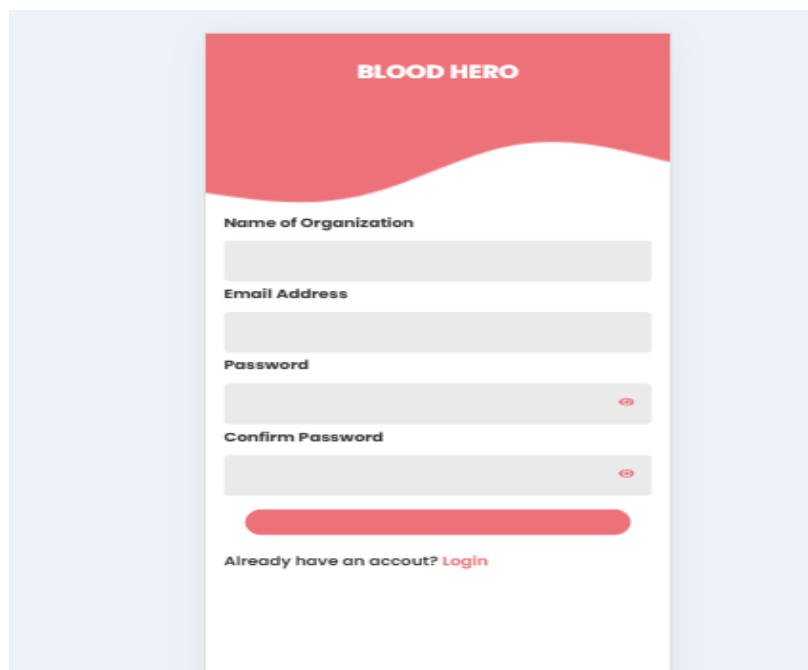
**Donor Login and Signup:** allows sers to create account or login using their required email and password



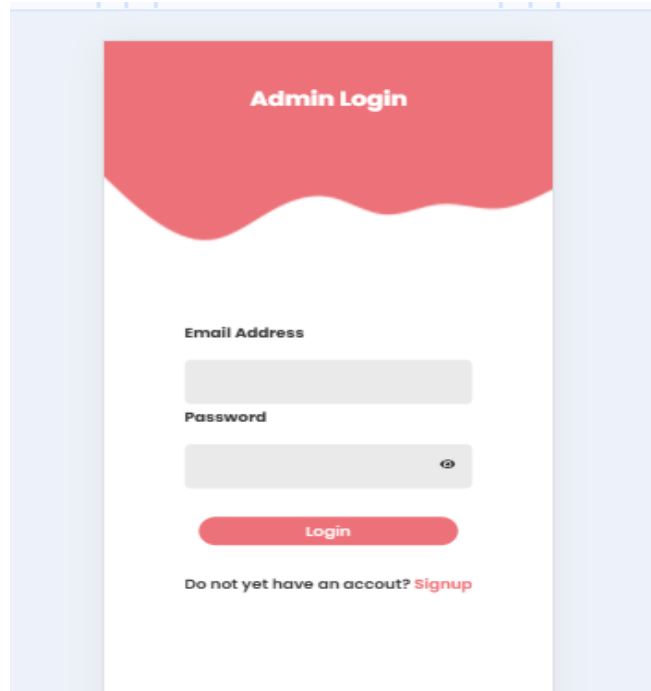
**Admin Login and Admin Signup:** Hospital/Blood banks register separately, and admin must be verified before gaining full system access.



*Figure 13: Sign up and Log in form for donors mobile view*



*Figure 14: Admin Sign up*

The image shows a web form titled "Admin Login" in white text on a red background. Below the title, there are two input fields: "Email Address" and "Password". The "Password" field has a small eye icon on the right side. Below the input fields is a red "Login" button. At the bottom, there is a link that says "Do not yet have an account? Signup" in red text.

*Figure 15:Admin Login*

The authentication system was built with **security best practices**, including **password hashing**, **form validation** and **role-based authentication**. If an admin signs up, they are still prompted to login with the same information, their access is **pending approval** by the system before they can manage donations

### **Donor's Dashboard**

Once logged in, donors can:

- Accept to **donate blood**
- Request to donate blood
- View **blood donation history**
- Have **one-on-one** chat with the hospital
- Update their profile





*Figure 17:Admin Dashboard*

### Results and Explanation

The admin interface was designed with a **clear layout** to streamline hospital operations. A challenge encountered was **optimising search filters** for donor matching and also **integrating a map** that could easily detect nearby donors. This was improved by implementing a **location-based filtering** system for quick donor identification

## 4.2 Explanation/discussion of Results

- ❖ The system successfully achieves its purpose by connecting blood donors and recipients efficiently

### Challenges faced:

- ❖ Implementing real-time updates for donors availability
- ❖ Optimising database base performance for faster search results
- ❖ Ensuring data security and user authentication

### Key achievements

- ❖ Mobile friendly design
- ❖ Secure authentication system using hashed password
- ❖ Integration of a map
- ❖ Integration of a chat bot
- ❖ Automated notification for donors

## 4.3 Recommendations and Perspectives



### Future Improvement

- ❖ Develop the app to a mobile app for both android and ios users
- ❖ Integrate google maps API for location-based donor search
- ❖ Partner with hospitals and blood banks to expand the network
- ❖ Implement AI-based matching to improve donor-recipient compatibility

## **GENERAL CONCLUSION**

In conclusion, the development of the blood donation app represents a significant step forward in enhancing the efficiency and accessibility of blood donation processes. Through rigorous user-centered design and testing, the application addresses key challenges faced by both donors and blood banks. The features, including user registration, donation scheduling and personalisation dashboards have demonstrated their effectiveness in encouraging user engagement and simplifying the donation process.

The feedback collected during the testing phase highlighted user satisfaction rates, confirming the app's usability and functionality. Moreover, the insights gained from analysing user interaction provide a roadmap for future enhancements, ensuring that the app continues to meet the evolving needs of its users.

Ultimately the project underscores the importance of leveraging technology in public health initiatives, aiming to increase blood donation rates and save lives. Future iterations of the app will focus on integrating additional features based on user feedback and expanding its reach to a broader audience.

## **4.4 DIFFICULTIES ENCOUNTERED DURING THE INTERNSHIP**

### **❖ Technical Issues**

- I had limited knowledge in programming languages like ReactJS and FastAPI a python framework
- I faced difficulties in adapting to the new operating system which was Ubuntu

### **❖ Social Issues**


- While at Appstech there was a problem of power failure which was later adjusted
- As the team head, I found difficulties in coordinating my team mates in preparing for the Friday weekly presentation
- The time period for the internship clashed with my academic time table hence I had to for-go my classes in order to complete the three months internship program.

## BIBLIOGRAPHY

- [1] **World Health Organisation**, “Blood safety and availability”, **WHO**, 2022.[online]. Available:<https://www.who.int/news-room/fact-sheets/details/blood-safety-and-availability>.
- [2]J. Smith and M. Brown, “Advancements in blood donation systems”, international journal of Medical Sciences, vol. 10, no. 3, pp. 45, Mar. 2023
- [3] StarUML, “Star UML 19.0”, [online]. Available: <https://www.staruml.com>
- [4]OpenAI, “ChatGPT”, [online]. Available: <https://chat.openai.com>
- [5] Github “Github”, [online]. Available: <https://www.github.com>

## APPENDICES

BLOOD  
DONATION  
QUESTIONNAIRE

  
THE UNIVERSITY OF ZIGALLAMA

How to facilitate blood donation process with a web based side that  
aims at linking donors to hospitals

What's Blood donation ?

What's the importance of blood donation ?

How do hospitals connect with Donors ?

what are the drawbacks of the current donation method?

How can a web donation app handle t drawbacks!?

Are hospitals, donors and blood-deficit patients really willing to  
embrace this technology!? Why!? YES ☐ NO ☐

How will this innovation help the society as a whole

what attributes are most relevant to be implemented in the system!?

Dev- Requirement Gathering

*Figure 18:questionnaire for requirement gathering*