Unity Donors

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DECLARATION

We hereby confirm that this project is based on our own efforts and development. Any external materials or references used have been properly cited. This project and documentation, in whole or in part, have not been previously submitted for any degree, diploma, or publication. It is solely a software creation for a course requirement.

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ABSTRACT

Unity Donors is a comprehensive web-based blood donation management system designed to bridge the gap between blood donors and recipients in an efficient and organized manner. The platform offers a user-friendly interface where individuals can register as donors or seekers, request blood when needed, and quickly locate suitable donors based on specific criteria such as location and blood group. The system is built with role-based access control, ensuring that different types of users—including donors, blood seekers, administrators, hospitals, and blood banks—can interact seamlessly and effectively. Communication between users is facilitated through email and mobile SMS, enabling timely and reliable coordination.

This project emphasizes streamlining complex processes, improving accessibility, and ensuring systematic management of critical tasks. Its goal is to leverage technology to simplify operations, enhance user experience, and provide real-time solutions to meet the needs of their respective users. By automating and centralizing essential functions, Unity Donors aims to create a more efficient and responsive ecosystem for blood donation, ultimately contributing to saving lives and fostering community engagement. To build this project we have used HTML, CSS, JavaScript, Bootstrap, C# (.NET Framework), Microsoft SQL Server.

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Chapter 1

Introduction

1.1 Introduction to Unity Donors

Unity Donors is a web-based blood donation management system designed to efficiently connect blood donors with recipients. The platform allows users to register, request blood, and locate suitable donors based on blood type and location. It implements role-based access control, enabling different user types—donors, seekers, admins, hospitals, and blood banks—to interact seamlessly. The system also integrates email and SMS notifications to enhance communication, ensuring that blood requests are quickly acknowledged and processed.

The platform features an intelligent donor-matching algorithm, allowing recipients to find compatible donors according to their desired blood group and the location where they need it. Users can request blood donations, and the system identifies and notifies potential donors based on availability and compatibility. Admins oversee user management, monitor donation activities, and generate reports, while volunteers can contribute by organizing blood donation drives and sharing informative blogs. Additionally, Stripe API integration enables optional donations to support operational costs for blood banks and organizations. With a secure database architecture, user data is protected, ensuring privacy and trust within the system.

Developed using C# (.NET Framework) with ASP.NET MVC5, Microsoft SQL Server, and Bootstrap, Unity Donors aims to revolutionize blood donation by improving accessibility and response times. By creating a structured and interactive digital platform, the system fosters voluntary blood donation and ensures timely assistance for those in need.

1.2 Motivation

Blood shortages remain a critical issue worldwide, often leading to delays in medical treatments and emergency responses. Many patients struggle to find suitable donors in urgent situations due to a lack of efficient communication and donor coordination. Traditional blood donation systems often rely on manual processes, which can be time-consuming and unreliable. Recognizing this gap, we developed Unity Donors to create a digital platform that streamlines the blood donation process. Our goal is to ensure that those in need can quickly connect with compatible donors, hospitals, and blood banks, reducing delays and potentially saving lives. By integrating automated donor matching,

real-time notifications, and a secure database, the system encourages voluntary blood donations while making the process more transparent, accessible, and efficient for everyone involved.

1.3   Benefit from the system

Unity Donors provides a centralized and efficient solution for blood donation management, ensuring that donors and recipients can connect quickly and seamlessly. By implementing automated donor matching, the platform significantly reduces the time needed to find compatible donors, making it especially useful in emergencies. The role-based access system allows donors, seekers, hospitals, and blood banks to interact securely, while real-time notifications via email and SMS keep users informed about urgent requests. Additionally, the system enhances data security and privacy, ensuring that personal information remains protected. Hospitals and blood banks benefit from better inventory management, while volunteers can contribute by organizing donation drives and spreading awareness. By streamlining the donation process and encouraging voluntary participation, Unity Donors helps save lives, foster community engagement, and improve healthcare accessibility.

1.4   Mission & Vision

Our mission is to provide an efficient and reliable platform that connects blood donors with recipients, ensuring the highest level of accuracy in matching compatible blood types. By leveraging advanced algorithms, we aim to optimize the matching process, reducing errors and enhancing the chances of successful donations. We are committed to ensuring top-notch performance, enabling quick response times and real-time updates that help users stay informed about blood requests and availability. Our system is designed for high performance to handle large volumes of users and data with minimal delays. Additionally, we place a strong emphasis on insurance, ensuring that user data is securely stored and protected with robust security measures, giving users peace of mind when using the platform. With these core values, our mission is to streamline the blood donation process, providing an efficient, trustworthy, and secure platform for all users involved.

1.5   Objective of the Project

The objective of the Unity Donors project is to create a comprehensive and user-friendly platform that connects blood donors with recipients, ensuring timely and efficient donations. The system aims to simplify the process of finding compatible donors based on blood type and location, reducing the time spent on manual searches. By automating donor matching, sending real-time notifications, and facilitating seamless communication between donors, recipients, hospitals, and blood banks, the platform seeks to improve the speed and effectiveness of blood donation. Another key objective is to ensure data privacy and security, safeguarding user information through

robust measures. Ultimately, the project strives to encourage voluntary blood donation, support healthcare providers, and enhance community engagement in the effort to address blood shortages and save lives.

1.6   Project Organization

The rest of the chapters are organized as follows: In Chapter 2 we describe the overview of the system like features and significance of the system, following Chapter 3 and 4 represent the system requirement analysis and design application such as system design and database design. In chapter 5, we provide the output of our system as implementation and testing. Then in chapter 6, we present the conclusion and future work.

Chapter 2
System Overview

2.1 Introduction

In this chapter, we narrate about the system overview which implies the idea of the whole system. The prominent characteristics of this project related to the features and noticeable attributes are described as the significance of the system.

2.2 Our System

Unity Donors is a web-based blood donation management system that seamlessly connects donors with recipients. By matching users based on blood type and location, the platform ensures quick and efficient donations. Real-time notifications via email and SMS keep users updated, while secure data management safeguards privacy. Hospitals and blood banks can efficiently track donations, and donors can monitor their history through a user-friendly interface. With streamlined operations and automated matching, Unity Donors makes life-saving blood donations faster, safer, and more accessible anytime, anywhere.

2.3 Features

5. Automated Donor Matching

The system intelligently connects donors with recipients based on:

- **Blood type compatibility** (e.g., O-negative is a universal donor, while AB-positive is a universal recipient).
- **Location-based proximity** to ensure fast response time.
- **Availability of donors** (based on their donation history and eligibility period).
- **Emergency cases priority**, where urgent requests are matched with nearby donors.

2. Real-time Notifications

- **Email and SMS Alerts:** Donors, recipients, and hospitals receive instant notifications regarding blood requests, approvals, and donation schedules.

- **Automated Follow-ups:** The system reminds registered donors when they are eligible for their next donation.
- **Urgent Requests Alerts:** Nearby donors receive priority messages in case of emergency blood shortages.

3. Role-based Access Control

Different users have specific permissions to ensure data security and proper system access:

- **Donors:** Can view their donation history, manage availability, and respond to requests.
- **Recipients:** Can request blood, track request status, and contact donors.
- **Hospitals & Blood Banks:** Can manage inventory, approve donation requests, and coordinate with donors.
- **Administrators:** Oversee the system, approve registrations, and manage users.

4. Data Privacy and Security

- **Encryption & Authentication:** Protects user data with secure encryption and two-factor authentication.
- **Consent-based Data Sharing:** Users can control how their data is shared with hospitals and blood banks.

5. Blood Management System

- **Stock Monitoring:** Hospitals and blood banks can track blood availability in real time.
- **Blood Expiry Tracking:** The system tracks the expiration dates of blood units to prevent wastage.

6. Volunteer Engagement

- **Donation Drive Organizing:** Volunteers can set up and promote donation events.
- **Awareness Campaigns:** Informative blogs, posters, and videos can be shared to educate the public about the importance of blood donation.

7. User-friendly Interface

- **Simple Dashboard:** Displays essential information like available donors, pending requests, and donation history.

8. Hospital Collaboration

- **Integrated Blood Bank Coordination:** Hospitals and blood banks can update real-time stock levels, helping donors and seekers find availability quickly.
- **Hospital Portal:** Hospitals can request specific blood types, view donor details, and manage inventory through a dedicated portal.

9. Blood Donation Campaigns

- **Campaign Scheduling:** Organizers can plan and schedule donation events at hospitals, colleges, and corporate offices.
- **Social Media Integration:** Campaigns can be promoted via social media platforms, increasing participation.

10. Donor Recognition System

- **Badges & Certificates:** Frequent donors receive badges, digital certificates, or even rewards for their contributions.

Chapter 3

System Requirement Analysis

3.1 Introduction

System Requirement Analysis chapter elucidates the system and requirement solution, system module where requirement analysis explains the functional, non-functional requirements and constraints of the system and system module is the conceptual reflection of the system.

3.2 System Analysis

System analysis involves examining a system to develop solutions or improvements. Before development begins, a project proposal is created and reviewed by the organization. Analysts study the system's components, operations, and interactions to form a comprehensive understanding. This process applies to various fields, including system engineering. If a new system is required, a detailed analysis of the existing one is conducted to define specifications. Data is gathered through interviews, observations, and questionnaires, helping to identify decision points and transactions within the system.

3.3 Requirement Analysis

Requirements analysis and gathering are crucial for successful software development. This process identifies user needs to design new systems or improve existing ones while ensuring clarity and consistency. It involves three key steps:

- **Requirements Elicitation:** Collecting user needs through discussions, documentation, or direct input.
- **Requirements Analysis:** Ensuring requirements are clear, complete, and free from ambiguities to prevent resource loss.
- **Requirements Documentation:** Recording requirements in structured formats like summaries, use cases, or process specifications.

Properly categorized requirements help create a clear agreement between development teams and stakeholders, ensuring a well-defined and efficient software development process.

3.3.1 Functional Requirements

The functional requirement is a capability that a system has to comply with to fulfill the liability. It describes the function of a software. The requirement has two-part, front-end and back-end.

1. System Overview

Unity Donors is a web-based blood donation management system that connects donors, recipients, hospitals, and blood banks for efficient blood donation and request handling. It features automated donor matching, real-time notifications, and hospital collaboration to streamline the process

2. User Roles

- **Donor:** Register, update availability, respond to requests, and track donation history.
- **Recipient:** Request blood, track request status, and receive notifications.
- **Hospital/Blood Bank:** Manage blood inventory, approve requests, and schedule donation drives.
- **Administrator:** Manage users, system settings, and reports.

3. Core Functionalities

- **User Registration & Authentication:** Secure sign-up, role-based access, and two-factor authentication.
- **Donor Matching:** Automated pairing based on blood type, location, and urgency.
- **Blood Request Management:** Submit, track, and approve blood requests.
- **Real-time Notifications:** Email/SMS alerts for requests, approvals, and donation reminders.
- **Hospital & Blood Bank Collaboration:** Live inventory updates and donor coordination.
- **Donation Campaigns & Events:** Organize blood drives and promote awareness.

4. System Constraints

- Requires an internet connection and MailKit for real-time notifications.
- Complies with GDPR/HIPAA for data security.

5. Error Handling & Analytics

- Automated alerts for unfulfilled requests and low blood inventory.
- Reports on donations, stock levels, and campaign impact.

3.3.2 Non-Functional Requirements

5. **Performance & Scalability**

- The system should handle at least 1000 concurrent users without performance issues.
- Blood request processing and donor matching should take less than 2 seconds.
- The system should be scalable to support future growth in users and hospitals.

2. Security & Data Privacy

- All user data must be encrypted using AES-256 encryption.
- The system should comply with GDPR and HIPAA regulations for handling medical data.
- Role-based access control (RBAC) should restrict sensitive data access.

3. Availability & Reliability

- The system should maintain 99.9% uptime for uninterrupted service.
- Automated backup and recovery mechanisms should ensure no data loss.
- Blood request and donor matching services should remain available 24/7.

4. Maintainability & Extensibility

- The system should be modular, allowing easy updates and new feature integration.
- Code should follow industry best practices for maintainability.

5. Compatibility & Portability

- The system should be compatible with modern web browsers (Chrome, Edge, Firefox, Safari).
- The platform should be optimized for both desktop and mobile devices.

3.3.3 Software Requirements

This section lists the software requirements that are needed to run the system efficiently. The operating system needed for the system to run effectively, the interface to run the application, the driver for running web applications, the integrated development environment to develop the application, and the third-party tool used for editing purposes are as follows:

1. Operating System: Windows (Windows 7,8,8.1,10 or Windows Server 2008 and later. We are currently dockerizing .NET image so that it can be run on all types of computer systems.)

2. Tested On: IIS Express Server

3. Web Brower: Browsers containing JavaScript

4. Integrated Development Environment: Microsoft Visual Studios.

5. Third-Party Tool: Microsoft Word.
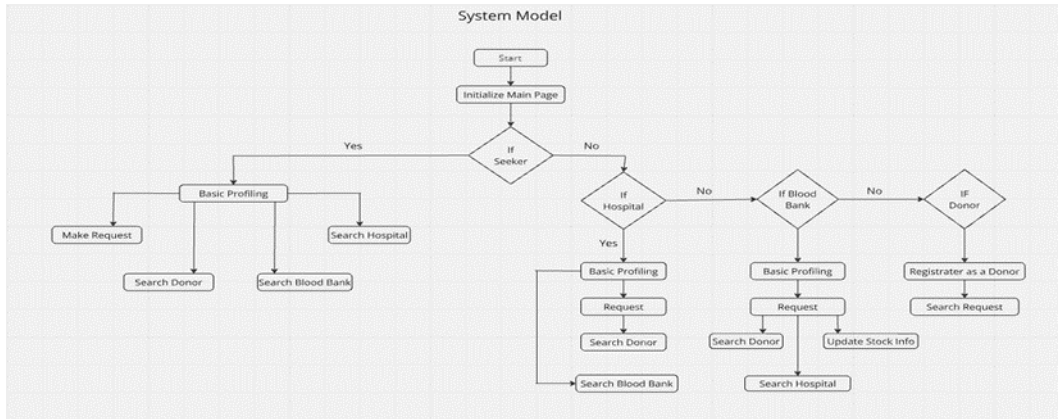
3.4 System Model

Figure 3.1:System Model

System has the following module:

1. Administrator model.

2. User Model.

1) Administrator Model:

Admin can access only the legitimate features which are authorized by the owner of the organization.

- Has full access to all the models of this system.

- Can add, remove or update user account.

- Responsible for the accounts of all users

- Modify requests and user accounts

2) User Model

- 1. Donor

- 2. Seeker

- Blood bank

- Hospital

3.5 Tech-Stack

Front end: Bootstrap, HTML, CSS, JavaScript

1. Bootstrap: Bootstrap is the most popular HTML, CSS, and JavaScript framework for developing responsive, mobile-first web sites.

2. HTML: HTML is used to create and save web document. E.g. Notepad/Notepad++

3. CSS: (Cascading Style Sheets) Create attractive Layout

4. JavaScript: it is a programming language, commonly use with web browsers.

Back end: C# (.NET Framework), Microsoft SQL Server.

1. C# (.NET Framework): C# is a modern, object-oriented programming language developed by Microsoft for building applications on the .NET Framework, enabling robust, type-safe, and scalable software development.

2. Microsoft SQL Server: Microsoft SQL Server is a relational database management system (RDBMS) developed by Microsoft, designed to store, retrieve, and manage data efficiently, supporting applications with robust data storage, analytics, and transaction processing capabilities.

Publish & Containerization:

1. IIS Express on Port 8080
2. Docker Image (yet to publish)
3. CI/CD Pipeline for further development using GitHub Action.

Chapter 4

Design Application

4.1 Introduction

To understand the acuity of a system, design applications are much more important in software engineering. This chapter clarifies the understandability of the 'Unity Donors' software by providing the clear concept of the system design including database design of the system. Use case, activity, class diagram and flowchart are illustrated in the system design.

4.2 Design Analysis

User Experience (UX) is essential for designing a user interface (UI) that aligns with business and product strategies while meeting all use case requirements. Several key UX factors influence software design:

- **Compatibility:** Ensures interoperability with other products, including older versions.
- **Maintainability:** Allows easy bug fixes and updates through modular and extensible design.
- **Fault-tolerance:** Enables recovery from component failures.
- **Security:** Protects against potential threats and hostile actions.
- **Re-usability:** Allows features to be reused in other projects with minimal changes.
- **Scalability:** Adapts to increasing data and users efficiently.
- **Reliability:** Ensures consistent performance under specified conditions.
- **Performance:** Executes tasks efficiently without excessive memory use.
- **Portability:** Operates across different environments.
- **Usability:** Provides an intuitive and user-friendly interface with practical default settings.

  These factors contribute to a well-rounded and effective software design, enhancing user satisfaction and system efficiency.

4.3   System Design

System design is the process of defining the elements of a system like the architecture, model, components and their interfaces and data for the system based on specific requirements. System design is concerned with the system function. It is a process which satisfies the desired needs and requirements of a business or organization. A systemic method is required for a coherent and well-running system.

4.3.1   Use Case Diagram

The system's use case shows the user a detailed view of the system and how the actors would interact with each other and with the system. The explanation for each use case is then provided below the system use case for the administrator and the employee.
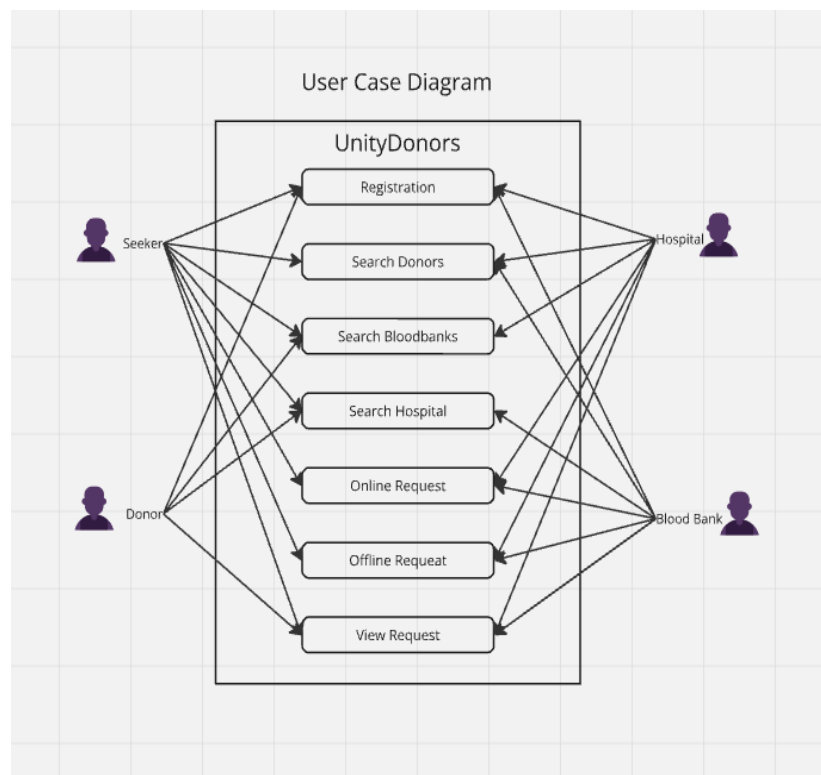
Figure 4.1 Use Case Diagram

The figure.4.1 demonstrates the use case for admin and users where they have access to the system. Here indicates how they connected to each other through the system. It signifies the system approaches clearly.

4.3.2 Flow Chart

The flowchart represents the workflow of the Unity Donors system, outlining how different user roles interact with the system.

The process begins with the initialization of the main page. The system then identifies the type of user by checking if the user is a Seeker, Hospital, Blood Bank, or Donor.

1. **Seeker:**
   o If the user is a seeker, they undergo basic profiling.
   o They can then choose to make a request, search for donors, search hospitals, or search blood banks.
2. **Hospital:**
   o If the user is a hospital, they also undergo basic profiling.
   o Hospitals can request blood, search for donors, and search blood banks.
3. **Blood Bank:**
   o Blood banks also go through basic profiling.
   o They can request blood, search for donors, and search hospitals.
   o Additionally, they have the functionality to update stock information.
4. **Donor:**
   o If the user is a donor, they can register as a donor in the system.
   o They can also search for blood requests to find donation opportunities.
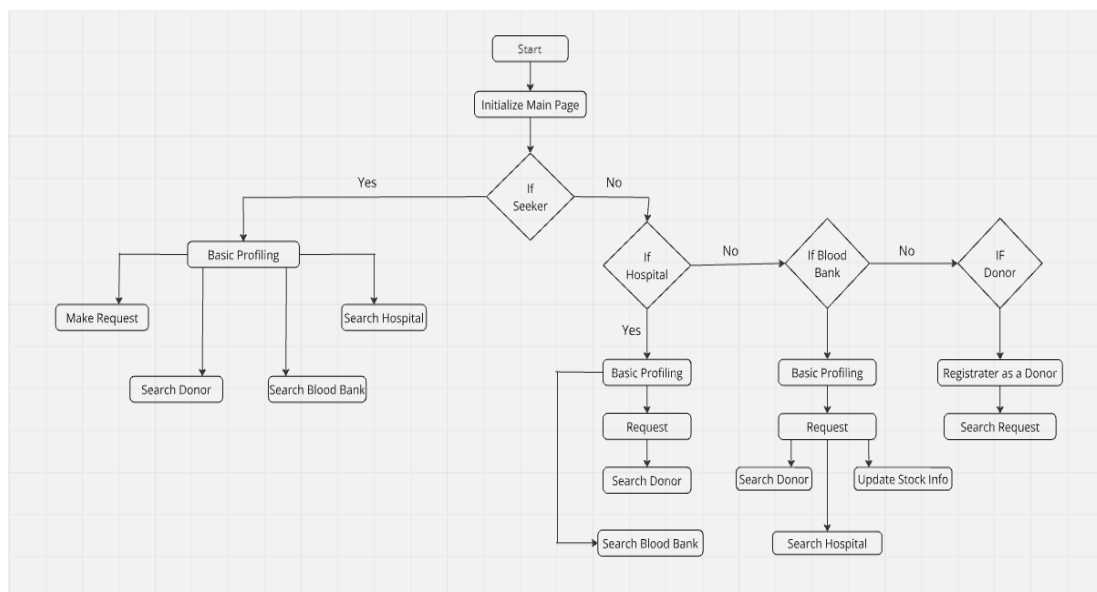

Figure 4.2:   Flow Chart of the Unity Donors

4.4 Database Design

The Unity Donors web application utilizes a robust database to manage all the necessary information effectively. The database, named 'Unity Donors', consists of several tables that store data related to donors, seekers, blood requests, blood donations, hospital information, user accounts, and other relevant details. The system uses these tables to handle requests, manage donations, and keep track of donor and seeker profiles.

The administrator, with authorized access granted by the company owner, can view, update, or delete records from the database. This access is tightly controlled to ensure the integrity and security of all sensitive data. The database structure is designed to support the efficient flow of information throughout the system, ensuring that all operations, from blood request management to donation tracking, are executed smoothly.
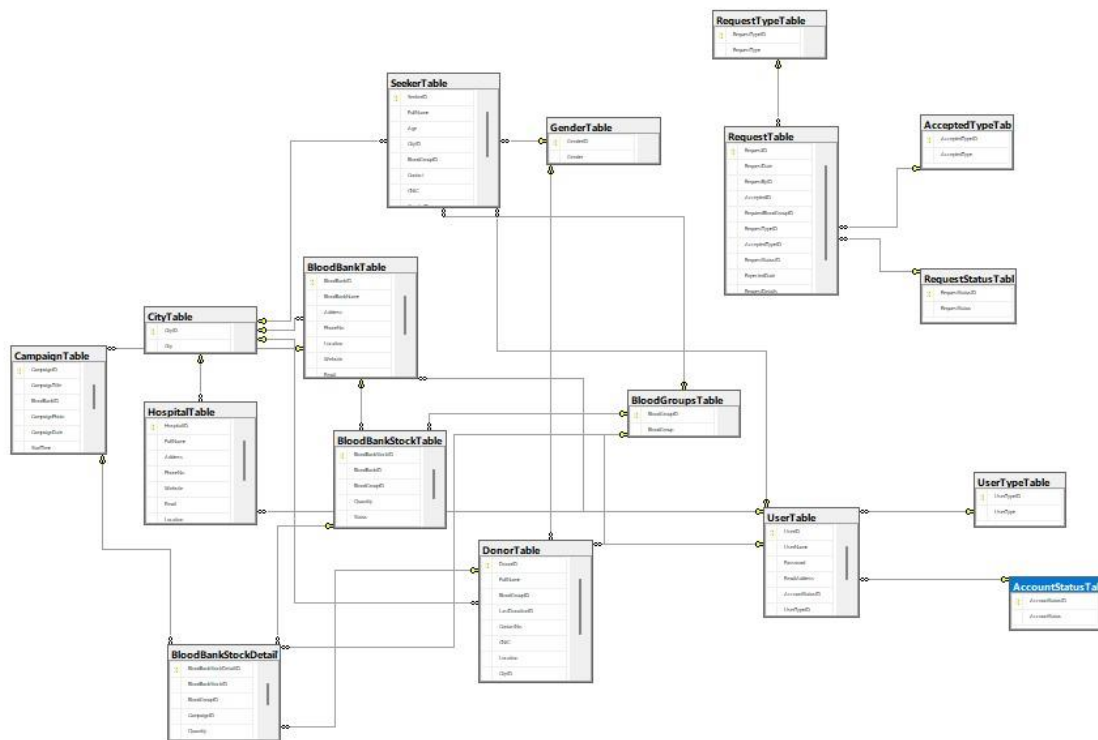

Figure 4.3: Database Design

Chapter 5

Implementation & Testing

5.1　introduction

This chapter presents the outcomes of the project's implementation and testing. Each output is accompanied by a detailed explanation to provide clarity on its functionality and significance. The results showcase how different system components operate, ensuring that the project meets its intended objectives.

5.2　Implementation

System implementation involves defining how the system is built, ensuring its functionality, and making it fully operational. It also focuses on quality assurance to confirm that the system meets performance and usability standards.

5.2.1　Application　Implementation

The Unity Donors system is designed to be implemented in multiple phases, each enhancing its functionality and usability. The core modules of the system include the Admin, Donor, Seeker, Hospital, and Blood Bank modules.

- The system must allow users to register as donors, seekers, hospitals, or blood banks and store their information securely in the database.
- Donors should be able to browse and respond to blood requests based on location and blood type.
- Seekers must be able to create blood requests and find matching donors efficiently.
- Hospitals and blood banks should manage and update their available blood supply information.
- The system should facilitate communication between donors and seekers through email and SMS notifications.
- Admins should have the ability to manage users, monitor donation activities, and generate reports.
- The platform must ensure data accuracy, security, and seamless integration for an efficient and reliable blood donation management system.

5.3　Application　Interface:

The user interface of Unity Donors is designed to provide a seamless experience for all users, including donors, seekers, hospitals, blood banks, and admins. It ensures efficient

interaction by allowing users to navigate the platform effortlessly. The system follows key principles of interface design, including clarity, consistency, responsiveness, and ease of use.

The platform offers an intuitive dashboard where users can register, request blood, and connect with matching donors or blood banks. The interface is designed to be visually appealing while maintaining high functionality. Notifications via email and SMS ensure timely updates, enhancing user engagement. With a responsive design, the system adapts well to different devices, making it accessible anytime and anywhere.

5.3.1   All Models of the System

5.3.1.1 Log in Page

Accessibility: Admin, User (Donor, Seeker, Hospital, Blood bank)
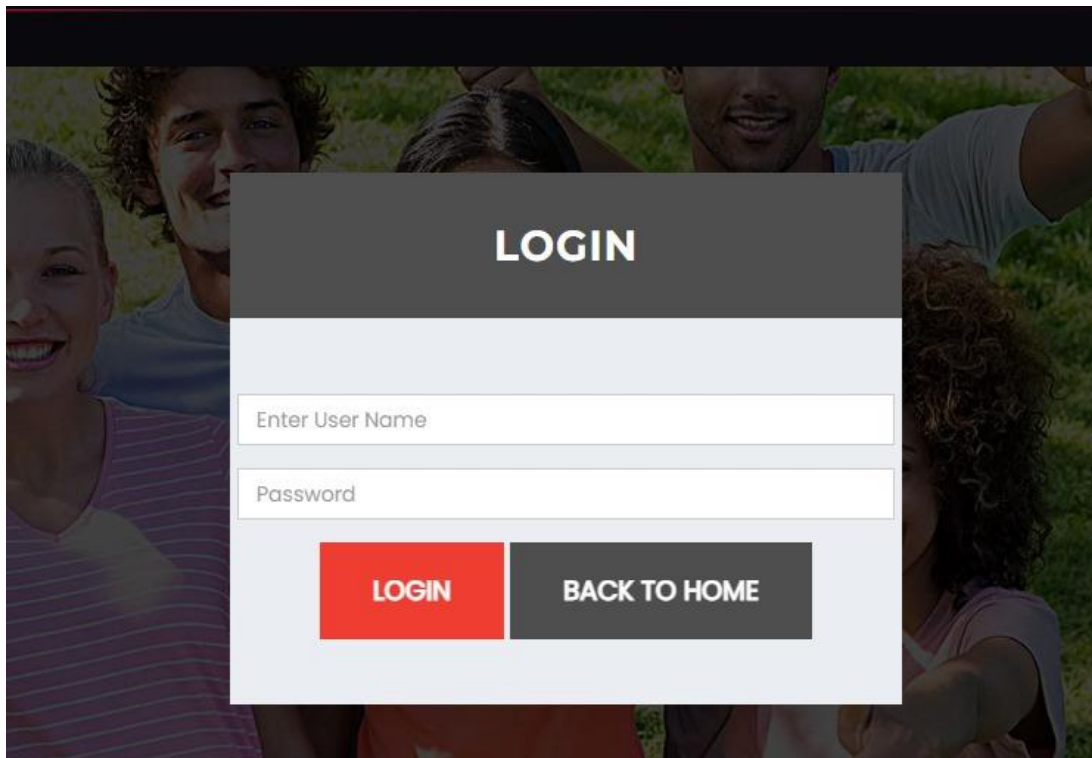
Figure 5.1: Login Page

The figure 5.1 shows the login page of the Unity Donors system. Donors, seekers, hospitals, blood banks, and admins need to log in with their email and password to

access their respective profiles. Each user role has specific access permissions based on their functionalities within the system.

5.3.1.2 Main Dashboard

Accessibility: Admin, User

Figure 5.2: Main Dashboard

The figure 5.2 shows the admin panel of the Unity Donors system. When an admin logs in, the dashboard provides list of all newly registered account needs approve. From this page, the admin can manage user accounts, verify donor eligibility, and oversee blood request activities. Clicking on "Show More" provides detailed reports on donation history, request trends, and system usage. The page also includes a notification system for important updates, along with a calendar displaying scheduled donation events and holidays.

5.3.1.3 Admin Dashboard

Accessibility: Admin
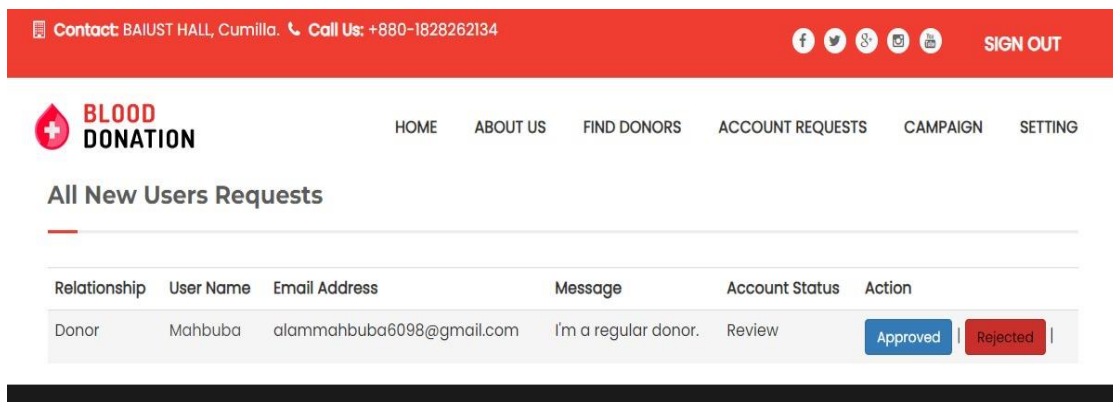
Figure 5.3: Admin Dashboard

5.3.1.4 Search Donor

Accessibility: User

Figure 5.4:   Search Donor

5.3.1.5 Request From

Accessibility: User

Figure 5.5:   Request From

5.3.1.6   Sending Email and SMS

Figure 5.6:   Sending Email and SMS

5.3.1.7 Hospital requesting to Blood Bank

Accessibility: Hospital

Figure 5.7:   Hospital Request to Blood Bank

5.3.1.8 Blood Bank Accepting the Requesting

Accessibility: Blood Bank

| 01 February, 2025 | (Hospital Request - +88 02 48115270-2) | B+ | 03 February, 2025 | asdfasdf | Pending | Accept Cancel |

Figure 5.8:   Blood Bank Accepting the Request

5.3.1.9 Update Bloodstock

Accessibility: Blood Bank
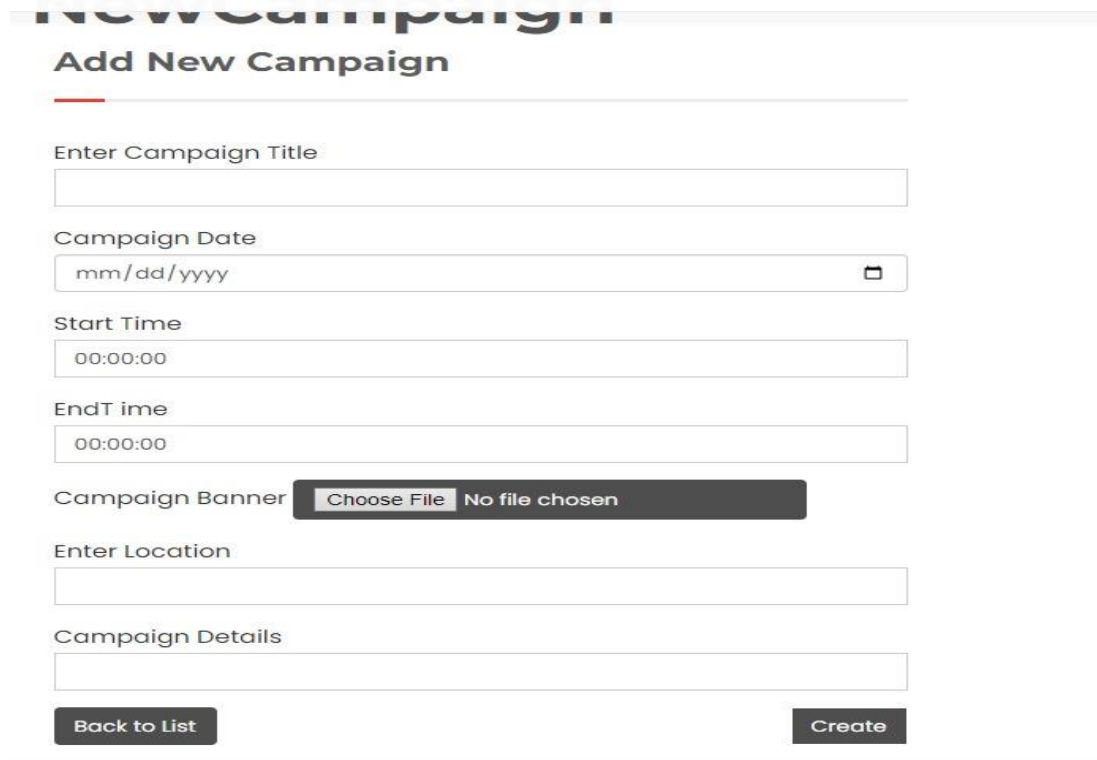
Figure 5.9:   Update Blood Bank

5.3.1.10   Add New Campaign

Accessibility: Admin

Figure 5.10: Add New Campaign

5.4   Manual Testing

In this project, manual testing was conducted to ensure the functionality, usability, and reliability of the Unity Donors system. Each module, including user authentication, blood request management, donor matching, and communication features, was tested step by step to verify that it met the expected requirements. Test cases were executed manually by simulating real-world scenarios to identify potential bugs or inconsistencies. The testing process involved verifying data input validation, role-based access control, and system responsiveness. Any issues encountered were documented and resolved to enhance the system's performance and ensure a seamless user experience.

Chapter 6

Conclusion & Further Development

6.1 Conclusion

The Unity Donors system is a web-based blood donation management platform designed to connect donors, seekers, hospitals, and blood banks seamlessly. It provides a streamlined process for managing blood requests, donor eligibility, and real-time availability, ensuring that life-saving donations reach those in need efficiently. The system allows donors to track their donation history, receive notifications for upcoming donation opportunities, and stay informed about eligibility criteria.

Seekers can request blood, view matching donors, and communicate with hospitals or blood banks directly. The platform enhances accessibility, transparency, and coordination among all stakeholders. With secure data management, automated notifications, and role-based access, Unity Donors ensures an organized and reliable system for blood donation management.

By providing a centralized solution, the system promotes faster response times, reduces the challenges in finding blood donors, and encourages more people to contribute to life-saving efforts. The accessibility of information from anywhere makes it a valuable tool for individuals and medical institutions, reinforcing the importance of an efficient and responsive blood donation network.

6.2 Further Development

To enhance the functionality of Unity Donors, we plan to introduce additional features in the future. Due to time constraints, some aspects of the system could not be fully implemented. Future improvements may include advanced donor eligibility tracking, AI-based donor-recipient matching, and real-time blood inventory updates for hospitals and blood banks.

We also aim to integrate emergency alerts for urgent blood requests, enhance security measures, and introduce a mobile application for easier access. By addressing these limitations, Unity Donors will become a more efficient, reliable, and user-friendly platform, ensuring a seamless experience for donors, seekers, and medical institutions

6.2.1 Limitations

Our project has certain limitations that we could not address within the given time frame. We aim to improve these aspects in the future. The current limitations of our system are:

- The system currently matches donors and seekers based on basic location and blood type criteria, but it does not yet include advanced filtering like urgency-based matching or AI-powered recommendations.
- Blood banks and hospitals must manually update their inventory; there is no automated tracking system for real-time stock updates.
- The system does not yet support a mobile application, limiting accessibility for users who prefer mobile platforms.
- Emergency notifications for urgent blood requests are not yet integrated, requiring users to manually check for available donors.

We plan to address these limitations in future updates to improve efficiency, accuracy, and user experience.

6.2.2   Future Aspects

To enhance the functionality and usability of our system, we plan to introduce several improvements in future updates. Some key future aspects include:

- **Advanced Donor Matching:** Implement AI-based matching to connect blood seekers with the most suitable donors based on location, availability, and urgency.
- **Automated Blood Inventory Management:** Enable real-time tracking and updates of blood stock in hospitals and blood banks to ensure better resource management.
- **Mobile Application Development:** Develop a mobile app for easier access, allowing users to request and donate blood on the go.
- **Emergency Notification System:** Introduce instant alerts for urgent blood requests to notify nearby eligible donors quickly.
- **Improved Verification Mechanism:** Enhance donor and seeker verification to prevent misuse and ensure reliability.

These enhancements will make the system more efficient, accessible, and impactful for users.

THE END

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