Software Requirements Specification

for

BLOOD DONATION WEBSITE

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22 September 2024

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1. Introduction

1.1 Purpose:

This document outlines the software requirements for the Blood Donation Management System, Version 1.0. The primary goal of the system is to facilitate efficient management of blood donations by connecting donors with hospitals and recipients in need.

It covers the functionalities related to donor registration, recipient blood requests, blood inventory management, and notifications to keep users informed.

The scope of this document encompasses the entire system, detailing features like the user authentication module, search and match algorithms for donors and recipients, and inventory tracking, with a focus on making sure blood supplies are properly managed and utilized.

1.2 Document Conventions:

The document follows standardized conventions to ensure clarity and consistency. Critical elements, such as system requirements and high-priority features, are highlighted using **bold** text. Requirements are described in a hierarchical manner, where higher-level requirements inherit priorities from more detailed requirements unless explicitly stated otherwise. Fonts and formatting have been used consistently to differentiate between sections and ensure easy navigation through the document. Each requirement is labeled with a unique identifier to facilitate traceability throughout the development process.

1.3 Intended Audience and Reading Suggestions:

The intended audience for this Software Requirements Specification (SRS) includes various stakeholders such as developers, project managers, testers, marketing teams, and documentation writers. Developers should focus on the detailed functional requirements and system architecture to ensure proper implementation. It is recommended that all readers start with the overview sections, which provide a general understanding of the system’s purpose, and then proceed to more specific sections relevant to their roles.

1.4 Product Scope:

The Blood Donation Management System aims to enhance the efficiency of the blood donation process by offering an easy-to-use platform that connects donors, recipients, and hospitals.

The system’s key benefits include reducing the time required to find suitable blood donors, improving inventory management to prevent shortages, and ensuring that both donors and recipients are kept informed throughout the process via notifications.

The platform will support hospitals in tracking blood stocks, managing requests, and coordinating donations efficiently. By aligning with healthcare sector goals, the system seeks to ensure a consistent and timely supply of blood, which is critical to saving lives.

Future versions may expand on this scope by introducing mobile apps, advanced data analytics, and real-time donor tracking.

1.5 References:

This document refers to several key references necessary for understanding and implementing the Blood Donation Management System. These include user interface design guidelines, system architecture documents, blood donation regulatory standards, and use case specifications.

References –

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2. Overall Description

2.1 Product Perspective -

2.1.1 The Blood Donation Management System is a new, self-contained product aimed at improving the efficiency of blood donation and distribution processes. It is not part of a larger family of systems but integrates with hospital databases and communication platforms.

2.1.2 The system interfaces with external hospital management systems to provide seamless donation tracking and inventory updates, and it includes a web portal for donors and recipients to interact with the platform.

2.1.3 A high-level diagram could illustrate the relationship between donors, recipients, hospital systems, and the central inventory database to show the system's flow and component interaction.

2.2 Product Functions -

2.2.1 Donor registration and profile management.
2.2.2 Recipient request submissions and status tracking.
2.2.3 Blood inventory management including donation tracking, expiration alerts, and matching algorithms.
2.2.4 Notifications to users (donors, recipients) regarding blood requests, donations, and inventory alerts.
2.2.5 Administrative dashboard for user and system management, and reporting.

2.3 User Classes and Characteristics

2.3.1 Donors: Individuals who register to donate blood. May have limited technical expertise but need access to key functions like registration and availability updates.
2.3.2 Recipients: Patients or representatives requesting blood. Typically interact with the system for submitting requests and tracking fulfillment.
2.3.3 Hospital Administrators: Manage blood stocks and fulfill blood requests; require high-level access to system reports and inventory management.
2.3.4 System Administrators: Handle overall system maintenance, user management, and security concerns.

2.4 Operating Environment

2.4.1 The system will operate on standard web servers and be accessible through modern web browsers.
2.4.2 It will be compatible with both desktop and mobile operating systems, including Windows, macOS, Linux, iOS, and Android.
2.4.3 The backend will be hosted on a MySQL database and use PHP for server-side logic.

2.5 Design and Implementation Constraints

2.5.1 The system must comply with data privacy regulations, such as GDPR, for storing donor and recipient personal information.
2.5.2 Blood inventory management must adhere to strict medical standards regarding storage, expiration, and transportation protocols.
2.5.3 Hardware constraints include the use of existing hospital infrastructure, meaning the system must be lightweight and easily integrated into current IT environments.

2.6 User Documentation

2.6.1 User manuals detailing donor and recipient workflows will be provided.
2.6.2 Administrator guides and training materials will be delivered for managing users, inventory, and system settings.
2.6.3 Online help and tooltips will be integrated within the user interface for quick assistance.

2.7 Assumptions and Dependencies

2.7.1 The system assumes reliable internet connectivity for real-time updates between the donors, recipients, and hospitals.
2.7.2 External hospital management systems must provide APIs or data access for integration with the blood donation management system.
2.7.3 The project depends on the availability of secure cloud hosting services to store and manage sensitive medical data.

3. External Interface Requirements

3.1 User Interfaces

3.1.1 The user interface will consist of a web-based graphical interface accessible from any modern browser. It will follow responsive design principles to ensure usability on both desktop and mobile devices.
3.1.2 Standard elements include navigation menus, form fields for input (text boxes, dropdowns, checkboxes), and buttons (submit, reset, cancel) present on all major screens. Help, error messages, and confirmation prompts will appear in a standardized format to maintain consistency.

3.1.3 GUI design will adhere to corporate style guidelines, ensuring alignment with branding. The layout will emphasize clarity and ease of navigation, with keyboard shortcuts available for critical actions.

3.2 Hardware Interfaces

3.2.1 The system will interact with hospital hardware, including barcode scanners for tracking blood donations and medical refrigerators for inventory control.

3.2.2 Data transmission between the software and hardware will use industry-standard protocols like USB or Ethernet, depending on the hospital's infrastructure.

3.2.3 Communication with hardware will follow medical device standards, ensuring secure and accurate data transfer for blood samples and inventory management.

3.3 Software Interfaces

3.3.1 The system will integrate with external hospital management software such as Epic Systems and Cerner for data exchange related to blood requests and inventory.

3.3.2 The database used for storing donor and recipient information will be MySQL, with backend support for PHP. The system will rely on RESTful APIs for communication between modules and external systems.

3.3.3 Data will be exchanged in JSON format to ensure lightweight communication. Encryption will be used for sensitive data, ensuring secure interaction between different software components.

3.4 Communications Interfaces

3.4.1 The system will support communications via HTTPS for secure data transmission over the web, particularly for donation tracking and requests.

3.4.2 Email notifications will be handled using SMTP for user communication regarding donation schedules, inventory status, and matching notifications.

3.4.3 All communication will be encrypted using SSL/TLS to protect sensitive donor and recipient information. Additionally, data synchronization between the hospital database and the central system will be handled in real-time with error-handling mechanisms to ensure reliability.

4. System Features

4.1 Blood Donation Scheduling

4.1.1 Description and Priority

This feature allows users (donors and administrators) to schedule blood donation appointments. Users can view available slots, select a convenient time, and receive confirmation. The priority of this feature is **High**, as it is a core function for ensuring timely donations.

Priority ratings:

- Benefit: 9
- Penalty: 8
- Cost: 4
- Risk: 3

4.1.2 Stimulus/Response Sequences

- **Stimulus:** The user selects the 'Schedule Donation' option from the main menu.
- **Response:** The system displays available time slots and allows the user to choose one. After selection, the system confirms the appointment and sends a notification email or SMS to the donor.
- **Error Handling:** If no slots are available, the system notifies the user and suggests alternate dates.

4.1.3 Functional Requirements

REQ-1: The system must display available donation time slots in real-time for the selected location.

REQ-2: The system must allow users to book, modify, or cancel appointments.

REQ-3: The system must send a confirmation message via email or SMS after a booking is completed.
REQ-4: The system must prevent users from booking more than one appointment within a 48-hour window.
REQ-5: The system must handle appointment overlap errors and notify users of scheduling conflicts.

4.2 Inventory Management

4.2.1 Description and Priority

This feature tracks blood inventory levels in the hospital and across various storage locations. It helps administrators monitor stock and triggers alerts when supplies run low. The priority is **Medium** due to its operational importance but less critical than scheduling donations.

Priority ratings:

- Benefit: 8
- Penalty: 7
- Cost: 5
- Risk: 4

4.2.2 Stimulus/Response Sequences

- **Stimulus:** The administrator accesses the 'Inventory Management' option to view current blood levels.
- **Response:** The system displays a detailed report of blood stock, including types, quantities, and expiration dates. If levels are below the threshold, an automatic alert is sent to designated personnel.
- **Error Handling:** If data synchronization fails, the system displays the last known inventory status and prompts the user to retry.

4.2.3 Functional Requirements

REQ-1: The system must track and display real-time blood inventory levels, categorized by blood type and expiration date.
REQ-2: The system must trigger alerts when blood stock for any type falls below the specified threshold.
REQ-3: The system must allow administrators to update and adjust inventory manually if needed.
REQ-4: The system must generate periodic inventory reports for administrative review.
REQ-5: The system must log all inventory updates for auditing purposes.

4.3 Donor and Recipient Matching

4.3.1 Description and Priority

This feature matches blood donors with recipients based on blood type, urgency, and geographic proximity. It is a **High** priority, as it directly impacts the effectiveness of the blood donation system.

Priority ratings:

- Benefit: 9
- Penalty: 9
- Cost: 6
- Risk: 5

4.3.2 Stimulus/Response Sequences

- **Stimulus:** The system receives a new blood request from a hospital or healthcare provider.
- **Response:** The system scans the donor database to identify suitable matches and sends notifications to potential donors.
- **Error Handling:** If no match is found, the system will initiate a wider search and inform healthcare providers of the status.

4.3.3 Functional Requirements

REQ-1: The system must match donors and recipients based on blood type compatibility and geographic proximity.
REQ-2: The system must allow healthcare providers to prioritize matches based on the urgency of the recipient's condition.

REQ-3: The system must send match notifications to both the donor and the healthcare provider once a match is identified.
REQ-4: The system must handle multiple matching scenarios, ensuring that priority is given to the most urgent cases.
REQ-5: The system must generate reports of all matches and their outcomes for auditing and statistical analysis.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

- The system must handle a minimum of 100 concurrent users without performance degradation to ensure usability during peak hours.
- Response time for scheduling appointments should not exceed 2 seconds under normal operating conditions, ensuring a smooth user experience.
- Data synchronization between inventory and scheduling modules must occur in real-time, with updates reflected within 1 second to maintain accuracy and reliability.

5.2 Safety Requirements

- The system must implement measures to prevent scheduling conflicts that could lead to donor or recipient misinformation, which can cause harm.
- All blood storage areas must be monitored with alerts triggered if temperature or storage conditions fall outside specified safe limits.
- Compliance with local and international health regulations (e.g., FDA guidelines) must be ensured, with certifications verified before deployment.

5.3 Security Requirements

- User authentication must employ multi-factor authentication (MFA) to ensure secure access to sensitive data, such as donor and recipient information.
- All data transmissions must be encrypted using industry-standard protocols (e.g., TLS) to protect against interception.
- Compliance with regulations like HIPAA for healthcare data protection must be ensured, and regular audits should be conducted to verify adherence.

5.4 Software Quality Attributes

- Usability: The system must achieve a usability score of at least 85% in user testing, ensuring that users can easily navigate and utilize features.
- Reliability: The system should maintain 99.9% uptime, ensuring availability during critical operational periods.
- Maintainability: The software should allow updates and bug fixes to be deployed within 24 hours of identification to ensure continuous improvement.

5.5 Business Rules

- Only authorized personnel (e.g., administrators) can modify donor records, while donors can only view their own information.
- Appointments can only be scheduled during operational hours as defined by the organization (e.g., 8 AM to 8 PM).
- Blood donation eligibility criteria (e.g., minimum age, health status) must be validated by the system before allowing scheduling, ensuring compliance with health regulations.

These requirements help guide the development process by outlining critical performance, safety, security, quality, and operational guidelines that the system must adhere to for effective functioning.

6. Other Requirements

- Database Requirements: The system must utilize a MySQL database to store donor, recipient, and inventory data, ensuring ACID compliance for transaction reliability. Backup procedures should be established to prevent data loss, with backups occurring daily.
- Internationalization Requirements: The application must support multiple languages, with a flexible architecture to accommodate language packs for future expansions, allowing users to select their preferred language during registration.
- Legal Requirements: The system must comply with local regulations regarding blood donation and medical data management, including obtaining necessary consents from users and adhering to data protection laws (e.g., GDPR).

Appendix A: Glossary

- ACID: A set of properties (Atomicity, Consistency, Isolation, Durability) that guarantee database transactions are processed reliably.
- MFA: Multi-Factor Authentication, a security process that requires multiple forms of verification before granting access.
- TBD: To Be Determined, a placeholder indicating that certain information is not yet finalized.

Appendix B: Analysis Models

- Data Flow Diagram (DFD): Illustrates the flow of data within the system, highlighting the processes involved in donor and recipient interactions.
- Entity-Relationship Diagram (ERD): Depicts the relationships between entities such as donors, recipients, and blood inventory, aiding in database design.
- Class Diagram: Represents the classes and their relationships within the system, providing a blueprint for object-oriented design.

Appendix C: To Be Determined List

1. REQ-1: Final specifications for the user interface design.
2. REQ-2: Detailed algorithms for the matching process in the Search and Match Module.
3. REQ-3: Regulatory compliance details specific to each region where the system will be implemented.
4. REQ-4: Final selection of languages for internationalization support.