International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 13 Issue: 02 | Feb 2026 www.irjet.net p-ISSN: 2395-0072

Bloodnet: A Real-Time Blood Emergency Response System

Mr. M. Dhasaratham [1] , P.Pranavya [2], S. Mallikarjun [3], S. Lakshmi Narasimha [4], M. Rohith Kumar[5]

[1]*Professor, Department of IT, TKR College of Engineering and Technology, Telangana, India*
[2,3,4,5]*B.Tech Students, Department of IT, TKR College of Engineering and Technology, Telangana, India*

Abstract - *Blood donation is a critical healthcare service that saves lives during emergencies, surgeries, and medical treatments. However, many blood donation and blood bank management processes still rely on manual paperwork, offline communication, and unstructured record keeping. These traditional methods often lead to delays, data loss, inaccurate stock updates, and poor coordination between donors, volunteers, blood banks, and administrators. To overcome these challenges, this paper presents BloodNet: A Real-Time Blood Emergency Response System, a web-based platform developed using the Django framework. The system provides a centralized and secure environment where all stakeholders can interact through role-based modules such as Admin, Blood Bank, Volunteer, and Donor. Blood banks can update blood stock in real time and manage donation camps, volunteers can request participation and track approval status, and donors can upload donation receipts, check verification updates, and communicate with administrators. A transparent digital receipt verification mechanism ensures authenticity and reduces fake submissions. The system is implemented using Django, SQLite, and web technologies such as HTML, CSS, and JavaScript. Overall, BloodNet improves efficiency, enhances transparency, reduces manual errors, and enables faster communication and better emergency response in blood donation services.*

Key Words: Blood Donation, Blood Bank Management, Real-Time Stock Updates, Django Web Application, Receipt Verification, Volunteer Management, Emergency Response System, Web-Based Healthcare System.

1. INTRODUCTION

Blood donation is one of the most essential healthcare services, as it supports emergency medical treatments, accident cases, surgeries, cancer therapies, and chronic disease management. The availability of blood at the right time can directly impact patient survival. However, blood donation management in many hospitals and blood banks still depends on manual paperwork, offline coordination, and unstructured record keeping. These traditional approaches create serious challenges such as delays in communication, inaccurate stock monitoring, and difficulty in verifying donor donation records.

In recent years, several digital solutions and mobile applications have been proposed to improve blood donation awareness and donor participation [1], [2]. Yet, many systems still lack real-time stock monitoring, structured volunteer coordination, and transparent receipt verification, which are crucial for emergency response. Hence, there is a strong need for a centralized platform that connects all stakeholders such as donors, volunteers, blood banks, and administrators in a secure and efficient way.

The proposed system, BloodNet: A Real-Time Blood Emergency Response System, is designed to digitalize and automate the entire workflow of blood donation and blood bank management. The system is implemented using Django for secure backend operations, SQLite for database management, and HTML/CSS/JavaScript for a user-friendly interface.

1.1 Motivation

The major motivation behind developing BloodNet is to reduce the delays and inefficiencies caused by manual blood donation processes. During emergencies, even a small delay in locating blood availability can become life-threatening. Manual systems often fail to provide real-time updates, and donors are unable to track their donation status or receipt verification. Studies show that mobile and web-based systems can significantly improve donor engagement and improve access to blood-related services [2]. Therefore, a digital platform like BloodNet becomes necessary to support fast, reliable, and transparent blood donation management.

1.2 Problem Overview

The existing blood donation ecosystem suffers from multiple operational issues such as manual record keeping, poor stock tracking, and communication gaps. Blood banks maintain blood unit availability using registers, which can lead to outdated or incorrect information. Receipt verification is also performed manually, increasing the chances of duplicate or fake receipt submissions. Volunteer participation is not well structured, causing confusion and lack of coordination during blood donation camps. Similar issues have been reported in earlier blood bank management systems and inventory control studies [1], [5]. These limitations highlight the need for a secure and automated system.

2. PROPOSED SYSTEM

The proposed system, BloodNet: A Real-Time Blood Emergency Response System, is a web-based platform designed to digitalize and automate the complete blood

donation and blood bank workflow. The system eliminates the limitations of manual processes by providing a centralized environment where all stakeholders can interact through structured role-based access. BloodNet integrates Admins, Blood Banks, Volunteers, and Donors into a single secure platform that supports real-time stock monitoring, digital receipt verification, camp management, volunteer approval, and direct communication.

The system is developed using the Django web framework due to its strong authentication support, secure session management, and rapid development capability. The frontend interface is designed using HTML, CSS, and JavaScript to provide a simple and user-friendly experience. SQLite is used as the database for efficient and lightweight storage of user records, donation details, camp information, and stock data.

2.1 System Overview

BloodNet is designed to improve coordination between donors, blood banks, volunteers, and administrators by providing a single digital platform. The system ensures that donors can register, upload donation receipts, view donation camp information, and track the verification status of their submissions. Blood banks can register and update blood stock availability in real time, which helps improve emergency response. Volunteers can register and request participation approval for camps and donation events, and they can track their approval status within the system. Admins act as the central authority to verify receipts, approve volunteers, manage blood banks, manage donation camps, and respond to user queries.This structured workflow reduces confusion, improves transparency, and ensures smooth management of all blood donation activities.

2.2 Role-Based Modules and Workflow

The proposed system is divided into four major modules based on user roles. Each module is designed with specific responsibilities and access control. The Admin module controls overall system operations such as verifying donor receipts, approving volunteer requests, monitoring blood bank activities, managing camps, and handling user messages. The Blood Bank module focuses on real-time blood stock management and camp creation. The Volunteer module supports volunteer registration, participation request submission, and approval tracking. The Donor module allows donors to register, upload receipts, check verification updates, view camp details, and communicate with the admin.

The system workflow is implemented in such a way that all user activities are logged and managed digitally. This ensures accurate record keeping and improves system accountability.

2.3 Receipt Verification and Real-Time Stock Management

A key feature of BloodNet is its transparent and secure receipt verification process. Donors upload digital receipts after blood donation, which are reviewed by the admin for authentication. This prevents duplicate submissions and reduces the possibility of fake receipts, improving trust in the donation process. Once verified, the donor receives an updated verification status in their dashboard.

In addition, the system enables blood banks to update blood unit availability instantly through the stock management module. Real-time stock updates improve decision-making during emergencies by providing accurate and updated blood availability information. The integration of receipt verification and live stock monitoring makes BloodNet more reliable and effective than traditional manual blood donation systems.

3. IMPLEMENTATION DETAILS

The implementation of the BloodNet System converts the proposed design into a fully working web-based application. The development focuses on integrating all stakeholders such as Admins, Blood Banks, Volunteers, and Donors into a single centralized platform. The system is implemented using the Django framework, which provides secure authentication, role-based access control, and efficient database handling through ORM. The frontend is designed using HTML, CSS, and JavaScript to ensure smooth navigation and usability. SQLite is used as the backend database for lightweight storage and fast development.

The complete system is divided into multiple modules, where each module is responsible for handling a specific set of operations. The modules are interconnected, enabling real-time interaction between users. The implementation also supports digital receipt uploads, stock updates, volunteer approvals, camp management, and messaging between users and administrators.

3.1 Development Environment and Tools

The BloodNet System is developed using Python and Django as the core backend framework. Django is selected due to its built-in security features such as authentication, authorization, session management, and CSRF protection. The project is created using Django project initialization and is organized into separate applications for better modularity and maintainability. SQLite is configured as the database since it provides an easy-to-use and lightweight storage solution suitable for prototype-level implementation. Django's Object Relational Mapping (ORM) is used for handling all database operations such as creating, updating, retrieving, and deleting records.

The user interface is implemented using HTML for structure, CSS for styling, and JavaScript for interactive elements. Django templates are used to dynamically render data such as camp details, receipt status, and stock availability. Media handling is configured in Django to support secure uploading and storing of donor receipts.

3.2 Module Implementation and Database Integration

The implementation is structured into four major role-based modules: Admin, Blood Bank, Volunteer, and Donor. Each module is implemented using Django models, views, templates, and URL routing. Models are designed to store key entities such as user accounts, donor receipts, blood stock, camp details, volunteer requests, and messages.

The Admin module is implemented to manage the entire system workflow. It provides functionality for verifying donor receipts, approving volunteer requests, managing blood bank registrations, updating camp details, and replying to donor messages. The Blood Bank module is implemented to allow blood banks to update blood stock levels in real time and organize donation camps. The Volunteer module supports registration and participation request submission, where volunteers can track their approval status. The Donor module provides features such as registration, profile management, receipt upload, verification tracking, and camp viewing.

All modules interact with the centralized database through Django ORM. This ensures that all data is stored securely, and the system can retrieve updated information instantly. This integration improves data accuracy, reduces redundancy, and enables smooth coordination between different stakeholders.

3.3 System Workflow and Architecture Integration

The BloodNet System follows a structured workflow where each user interacts with the system through role-based dashboards. After registration and login, users are redirected to their respective modules. Donors upload donation receipts, which are stored securely in the system and forwarded to the admin for verification. Admins verify receipts and update the verification status, which is then reflected in the donor dashboard.

Blood banks update blood stock details regularly, and these updates are reflected immediately within the system. This real-time stock monitoring improves emergency response by providing accurate blood availability information. Volunteers register and request participation approval, and the admin updates the volunteer status based on eligibility and requirements.
The architecture diagram represents how all modules interact through the Django backend and centralized database. It also shows the flow of data between users, ensuring that the system supports real-time updates, transparent verification, and secure communication. This implementation ensures that BloodNet operates as a complete integrated platform, reducing manual effort and improving reliability.

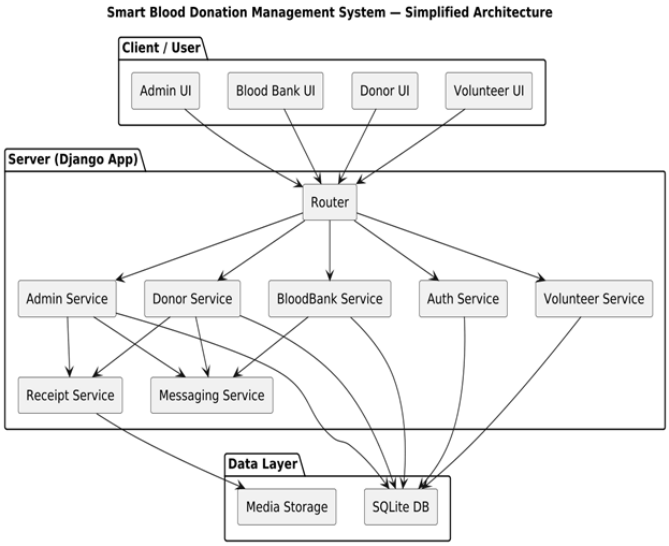

Fig-1: High-Level Architecture of Smart Blood Donation Management System

4. RESULTS AND PERFORMANCE ANALYSIS

The The BloodNet system was successfully implemented as a Django-based web application and tested to evaluate its functionality, usability, and system performance. The results confirm that the proposed system effectively digitalizes the blood donation workflow and improves coordination among Admins, Blood Banks, Volunteers, and Donors. The system was tested under different scenarios such as user registration, login, receipt upload, receipt verification, camp creation, volunteer approval, stock update, and messaging. The platform provides real-time interaction between stakeholders, reduces manual processing, and ensures secure handling of sensitive data. The system outputs were validated through multiple test cases to ensure correctness and reliability.

4.1 Functional Results

All major modules were tested to verify whether the implemented features work as expected. The Admin module successfully handled receipt verification, volunteer approvals, camp management, and message monitoring. The Blood Bank module updated blood stock correctly, and changes were reflected instantly. The Donor module allowed donors to register, upload receipts, track verification status, and view camp details. The Volunteer module enabled

volunteers to register, request approval, and track approval status.
The successful execution of these workflows confirms that BloodNet meets the requirements of a centralized blood donation management platform.

4.2 Admin Dashboard Output

The Admin Dashboard provides a centralized view of all system activities. It displays the total number of donors, volunteers, blood banks, camps, and reports filed. The dashboard also provides direct access to core administrative functions such as managing blood banks, managing camps, verifying receipts, handling volunteer requests, viewing messages, and sending notifications.
This output screen proves that the system supports effective monitoring and quick decision-making through a single interface.

4.3 Performance Evaluation

The system performance was evaluated based on response time, database query efficiency, and workflow execution. Django's ORM enabled smooth database operations such as receipt status updates, stock retrieval, and camp information access. SQLite provided fast read and write operations during testing due to its lightweight design.
The system significantly reduced the time required for receipt verification tracking and blood stock updates compared to manual processes. Real-time updates ensured that users received updated information instantly, improving emergency response efficiency.

4.4 Usability and Reliability Analysis

The user interface was designed to be simple and user-friendly. Role-based dashboards reduced complexity by displaying only relevant features for each user type. Status indicators such as receipt verification status and volunteer approval status improved transparency. The messaging module enabled structured communication between donors and admins, reducing dependency on offline communication. Reliability was ensured through Django's secure authentication, session handling, and validation mechanisms. The receipt upload module was also tested for valid file submission and secure storage, ensuring that donor records are safely maintained.

5. CONCLUSION

BloodNet: A Real-Time Blood Emergency Response System was developed to digitalize and streamline the blood donation and blood bank management process through a centralized web-based platform. The traditional blood donation workflow is often slow, manual, and poorly coordinated, leading to delays in receipt verification, inaccurate stock updates, and communication gaps between donors, volunteers, blood banks, and administrators. These issues become highly critical during emergency situations where timely access to blood availability is essential.
The proposed system successfully integrates multiple stakeholders such as Admins, Blood Banks, Volunteers, and Donors into a single role-based application. It enables real-time blood stock updates, structured volunteer participation, transparent receipt verification, and direct communication through an integrated messaging module. By using Django for secure backend operations and SQLite for efficient data storage, the system ensures reliability, accuracy, and improved workflow management.

Overall, the implementation and testing results demonstrate that BloodNet reduces manual errors, improves transparency, enhances user experience, and provides a faster and more efficient blood donation ecosystem. The system can be further extended in the future by integrating mobile applications, cloud deployment, geo-location matching, and smart notification services to support large-scale real-world usage.

6. FUTURE WORK

Although the BloodNet system successfully provides a centralized platform for blood donation management and real-time coordination, several enhancements can be implemented to improve scalability and real-world deployment. In the future, the system can be extended into a mobile application to allow donors, volunteers, and blood banks to access services more quickly and conveniently. The integration of SMS, email, and push notification services can further improve emergency communication by instantly alerting nearby donors and volunteers during urgent blood requests.The system can also be upgraded by deploying it on cloud infrastructure and replacing SQLite with scalable databases such as MySQL or PostgreSQL to support a large number of users. Geo-location based matching can be introduced to automatically identify nearby blood banks and donors, reducing response time during emergencies. Additionally, the system can be integrated with hospital databases and government health portals to verify blood requirements and ensure authenticity. Advanced features such as machine learning-based predictive analytics can also be added to forecast blood demand trends and identify shortage patterns, helping blood banks maintain better inventory planning. These future improvements will enhance the effectiveness, scalability, and reliability of BloodNet in real-world healthcare environments.

REFERENCES

[1] K. Maheshwari, V. Birchha, and R. Gavlane, "Blood Bank Management System," International Journal of Novel Research and Development (IJNRD), 2024.

[2] L. Li, M. Valero, R. Keyser, A. M. Ukuku, and D. Zheng, "Mobile applications for encouraging blood donation: A systematic review and case study," SAGE Journals, 2023.

[3] J. Ahmed, F. Hasan, H. C. Das, M. R. Hossain, and M. S. Mia, "Blood Management System," ResearchGate Publication, 2022.

[4] T. Pangtey and S. Upadhyaya, "Problems in Adoption and Implementation of E-Rakt Kosh Scheme in the Blood Bank: A Single Center Experience from Uttarakhand, India," Saudi Journal of Pathology and Microbiology, 2019.

[5] A. Shah, R. Bhuta, and S. Patel, "Blood Bank Management and Inventory Control Database," Procedia Computer Science, vol. 200, pp. 317–326, 2022.