

Biomedical System Design for Long-Term Blood Bank Management

¹ M. Pradeepthi, ² B. Saisri,

¹Assistant Professor, Megha Institute of Engineering & Technology for Women, Ghatkesar.

² MCA Student, Megha Institute of Engineering & Technology for Women, Ghatkesar.

Abstract-

Blood donation, the selfless act of willingly parting with a portion of one's blood in order to save lives, is the foundation of modern healthcare systems. Donating blood is an important act that helps in times of medical crisis and has far-reaching consequences for both individuals and society. The ripple effects of blood donation go far beyond the realm of medicine. When people in a community pull together to help one another, especially when times become tough, everyone benefits. A sense of purpose and strength is fostered by giving, which in turn reinforces the belief that individuals have the potential to make a positive difference in the lives of others. Donating blood is essential because it ensures a continuous supply of blood for various medical treatments, surgeries, and emergencies. Donating blood is an act of selflessness and charity that exemplifies the virtues of compassion and teamwork. Donated blood that has undergone rigorous screening and processing is an invaluable resource for patients in need, including those recovering from serious injuries, having complex operations, or dealing with long-term health conditions. By the end of the day, donating blood is a representation of how kind and kind people are. It captures the sense of solidarity and support regardless of one's origin, culture, or country. People help ensure the well-being of those who get blood transfusions and strengthen society as a whole in times of crisis when they donate blood.

transfusion may be achieved if the medical institution inspects the donor and the blood before giving it. In this day of ubiquitous digital connection and rapid technological development, the administration of vital resources such as blood has entered a new era of efficacy and efficiency. Donating, storing, and distributing blood are all complex operations, but they have been simplified substantially with the advent of an online donor blood bank management system. By using the internet's potential to create a single platform that easily links healthcare institutions, donors, and recipients, this revolutionary solution solves long-standing problems and changes the whole blood management scene. Historically, blood donation and distribution have been marked by logistical obstacles, inadequate communication, and delays that might impact patient care. The newly-emerging Online Blood Bank Management System gives a comprehensive digital interface that answers these questions head-on. A unified ecosystem prioritizing rapid access to compatible and safe blood is created via this interface, which enables donor registration, real-time inventory monitoring, and timely notifications easy. This system's simplified blood collection, storage, and distribution operations rely on it as a crucial technological component. The blood facility controlling system improves the whole blood supply chain by integrating technology into blood banking processes, making it more efficient, accurate, and secure. Patient care, reaction times to emergencies, and public health are all enhanced as a consequence.

I. INTRODUCTION

The convenience of a blood bank ensures that donated blood is stored appropriately after its safe collection in blood donation concentration camps. Donated blood is collected and kept in a blood center so that it might be used for transfusions in the future. Another definition of a "blood bank" is a place where blood is stored and maintained in a safe environment with regular testing to prevent transfusion-related problems. The process of storing and retrieving blood is not as simple as it may seem; this responsibility falls on hospital blood banks. A safer blood

II LITERATURE SURVEY

Research on the Administration of Blood Banks [1] This article covers the full functioning of a blood bank, which is the major purpose of this application. The program has to keep track of thousands of records. The search function also has to be lightning fast so that people may get the information they need without delay. If you need information, it's great. The goal is to improve the efficiency and precision of blood donation and its administration. They look at the state of blood banks as they are now, weigh the

pros and cons, and propose a new approach that uses state-of-the-art technology. A system for managing blood banks. [2] In An emergency-useable cloud-based blood center organization system is developed and discussed in this work. In addition to a complex blood management system, it offers an online database of medical institutions, blood donation centers, and donors. To collect, store, and analyze different data about bloodstream and people's well-being, their primary goal is to establish a network that links all blood bank medical centers contributors and blood the financial institution clinics. Access to this database's contents is conditional on the user being signed in; creating an account is a breeze using the system's intuitive mobile app. Automated Blood Test [3] After searching the database, the Smart Blood Query (SBQ) smartphone app selects the top five donors and gets in touch with them to request blood. If no one is willing to donate blood, the requester is informed about a blood bank in the area. The one submitting the request would gain from it. In order to guarantee the purity of blood and enhance the efficiency of operation management, this study introduces a system that uses location-aware mobile devices to recruit blood donors, retrieve data, and exert control. Relying on Smartphones[4] In the Project for an Online BloodCenter, which is detailed in the article, the method also finds a local blood donor in the database and provides the requester with their contact details. The VBB project is constructing a system that provides people with access to up-to-date information on blood donors in the Delhi area via the use of mobile devices. Subscribers have 24/7 access to the service without the need for specific technology, all because of the Virtual Blood Bank initiative. Improving Blood Donor Data and Administration [5] To build a safe, effective, and efficient method for managing information, Priya et al. [5] presented an Android app with built-in GIS capabilities. The proposed solution identifies fraudulent app users and contributors who misuse user data. The patient's safety necessitates the use of one of the several possible levels of blood quality testing. The managers can see all the data related to the blood bank's system and easily change the specifics about donors, recipients, and customers with the help of the improved web tool they show. To prevent unauthorized parties from using contributors' personal information in online apps, the suggested work additionally uses the push mechanism with security. An Analysis of the Blood Bank Administration System[6] An effective data management system for keeping track of contributor and customer information was built just for this website. Thanks to an extra security measure, only

authorized Blood Bank staff members who have been given a secret password may access and make changes to the data. They developed an app that helps people stay healthy by notifying them when they are eligible to donate blood, showing them where local blood drive centers are, making it easier for patients to ask about blood, etc. Through the use of IoT, the server and application may be connected, and apps can interact with one another. With the help of IoT, this data interchange and collecting procedure is more efficient. Creation of a System for the Management of Blood Banks [7] A web-based management system was created to cater to the Sultanah Nur Zahirah Hospital's (HSNZ) requirements. They could be treated differently by different hospitals. The staff members who are not physically present at the HSNZ will still be able to keep everyone informed about the blood donation event's schedule thanks to the data that has been recorded. This data is shared with other staff members, including nurses. This system was built using the Rational Unified Process (RUP). system for managing blood donors [8] The Blood Bank and Donor Managing System is an online website application that is used in this investigation. Users who are interested in donating blood may sign up for the app. Those in need of transfusions often search for others in the city who share their blood type. If a donor is found in his city, he gets all the donor's details; if not, he gets the number and address of the Life-Saving Contact Persons in his city. system for managing blood banks in PHP [9] Admin and User are the two distinct kinds of logins that may be used for this project. Once logged in, users have the ability to access the dashboard, make blood donations, and even request blood. Anyone with administrative privileges may add or remove states, cities, and members from the system. On top of that, the admin interface allows them to keep track of both current and inactive donations. To sum up, the system manages donors, processes blood donations and requests online, and stores data about blood donations. The user will have little trouble understanding, using, and navigating this project because of its simple design.

III PROPOSED WORK

From the ground up, an online blood bank management system has been built utilizing front-end technologies such as HTML, CSS, and React.js to facilitate user interaction, and back-end tools like Node.js and MongoDB to handle data processing and storage [9–13]. A comprehensive procedure outlining the development process is as follows: Front-End

Development with React.js, CSS, and HTML: Analysis of Needs is the First Stage In order to understand the requirements for the donated blood bank's administration system and to determine the critical attributes and qualities, it is necessary to communicate with stakeholders, such as health care providers and blood bank managers. Create the UI (User Interface) in Step 2. Build wireframes and mockups to see how the UI will look and function. Create a mobile-friendly, desktop-compatible, and tablet-friendly solution using responsive design. Thirdly, Make the Front-End Web developers utilize HTML as a base, CSS to design their sites for an attractive look, and JavaScript to provide interactivity to the user interface. Functionality on the client side, updates in real-time, and validation of forms are all part of this. Alternatively, we use React.js, which includes HTML and CSS by default, to build an interactive and dynamic user experience. You can create reusable user interface elements using React components. Step 4: Database Design and Setup for Back-End Development with Node.js, MongoDB, and SQL Use the MongoDB database system, which offers a robust document-based querying system that permits dynamic document queries, to build the database schema that will hold data such as user information, donor details, recipient records, blood inventory, donation history, and more. As a document database, MongoDB allows users to store many different kinds of documents in a single collection. The amount of fields, the content, and the size of a document may all differ from one to the next. Part 5: Building the Server Side Authentication and authorization are implemented using Node.js as a server-side runtime environment. Passport.js and other modules are used to handle HTTP requests and replies. Establish secure methods of user registration and login and assign certain permissions to users (administrator, donor, receiver, etc.). Sixth Step: Establish Business Logic Building a web-based blood banking system using Node.js and MongoDB is essential. The system should allow users to manage donors and recipients, store data, and monitor blood kinds, volumes, expiry dates, and low stock notifications. Overseeing contribution camps (including making plans, assigning tasks, and recording locations). Donors and receivers should be notified. Protect sensitive information by implementing measures for data validation and encryption. In the seventh step, we develop the API. Implementing CRUD (Create, Read, Update, Delete) procedures for data management and developing RESTful APIs using Node.js to better front-to-back communication are both recommended. The eighth step is to examine and ensure quality. Carry out user

acceptability tests, integration tests, and functionality tests on both the front end and back end of the system to identify and resolve any issues. Step 9: Writing Up Everything Give developers, administrators, and users detailed documentation. Make sure you include documentation for user manuals, APIs, system architecture, and code. Make sure the MongoDB database is connected to the Node.js server and that your Node.js application is set up for optimal speed, security, and scalability before you deploy it. Additionally, pick a reliable hosting environment. Step 10: Deployment and Hosting The eleventh step is to provide training and support, as well as contact information for aid with technical difficulties, so that users and administrators may make good use of the system. Principle No. 12: Ongoing Enhancement For continuous system enhancement, collect stakeholder and user input. Updates to the system as needed are essential for keeping it current and meeting changing demands. Throughout development, developers should have a tight emphasis on security, privacy, and compliance with applicable healthcare and data protection standards. Make sure the system successfully meets the specific needs of hospitals and blood banks by working closely with healthcare experts.

IV IMPLEMENTATION AND RESULTS

The flowchart illustrates the method for handling blood donations and requests, which helps to understand the implementation. The first stage is making the choice to give blood. Eligibility and registration of donors are verified. They are added to the database if they meet the criteria. Blood may then be requested by the patient. If the blood cannot be obtained, the receiver is notified. If a blood donor is available, the necessary information and contact details are downloaded from the database and validated. Both the donor and the receiver may see the correct information and get in touch with each other if it's correct. Finally, the flowchart shows how blood donations are handled and how recipients' wishes are met.

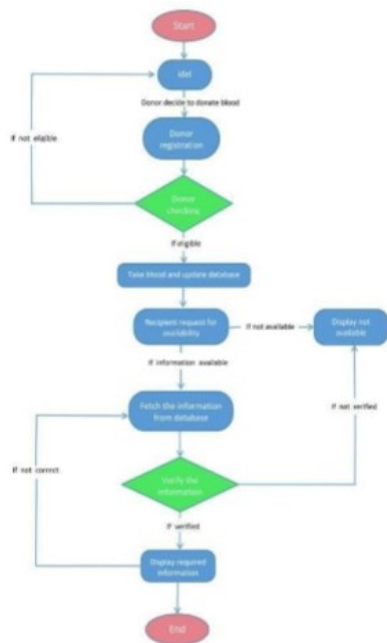


Figure 1 Flow Diagram

Figures 2 and 3 demonstrate how the results may be classified. Figure 3 of the findings shows all the donor registrations. Each one includes the donor's name, gender, age, phone number, and blood type, which is a great way to find out who donated what.

The screenshot shows a web form titled "Donor Registration" with a red header. On the left, there is a vertical red bar with the text "I WANT TO". The form fields include: Donor Name (text input), Gender (radio buttons for Male and Female), Age (text input), Mobile No. (text input), and Blood Group (dropdown menu). A "Save" button is at the bottom right.

Figure 2 Donar Registration

People in need may more easily get blood from various blood types thanks to this effort. The consumer may find out more about blood donors in their area based on their current position. The system is user-friendly and provides all the essential data that the donor requires. Many individuals rely on the online blood supply management system on a regular basis. This includes system staff, healthcare professionals, donors, recipients, and other users.

While working on this project, we learned about the importance of blood donations and how they save lives. It inspired us to regularly give blood and to encourage and inspire our fellow people to do the same. Since the benefits of blood donation and receipt have been well publicized, a database has been set up to keep track of relevant historical data.

The screenshot shows a web page titled "Life Saver" with a red header. On the left, there is a sidebar with "Admin Links" including: Add User, Update User, Delete User, Add City, Update City, Delete City, Add State, Update State, Delete State, Add Country, Update Country, Delete Country, Add Blood Group, Update Blood Group, Delete Blood Group, Add Category, Update Category, Delete Category, Add News, Update News, and Delete News. The main content area is titled "Update User" and contains a form with fields for: Select User Name (dropdown), Password (text input), Confirm Password (text input), and Type Of User (radio buttons for Donor, Recipient, Receptionist, etc.). A "Submit" button is at the bottom right.

Figure 3 User Profile updation

If the user wants to change their profile password, they may do so by going to Figure 3, where they can see that they have to choose a user type (donor, blood recipient, receptionist, etc.), then enter their new password.

V CONCLUSION

Computers are slowly but surely permeating every facet of society, from the corporate world to healthcare to industry to academic institutions. Online solutions are ideal for these application areas since they save lives and offer healthcare. The proposed approach has the ability to alter these realities. The major objectives of the project were to develop a technological framework for the online management of blood donations, with the hope that this would facilitate the tracking of donors and the identification of a blood donor in the event of an emergency. In order to base future choices on actual analytical findings, these reports and studies demonstrate that it's, in addition to data from camps.

REFERENCES

- [1] A. Clemen Teena, A. Teena, K. Sankar, and S. Kannan, "A Study on Blood Bank Management," Middle East Journal of Scientific Research, vol. 19,

no. 8, pp. 1123–1126, 2014, doi: 10.5829/idosi.mejsr.2014.19.8.11202.

[2] R. Kumar, S. Singh, and A. Ragavi, “Blood Bank Management System,” 2017. Accessed: Apr. 20, 2022. [Online]

[3] M. S. Rahman, K. A. Akter, S. Hossain, A. Basak and S. I. Ahmed, "Smart Blood Query: A Novel Mobile Phone Based Privacy-Aware Blood Donor Recruitment and Management System for Developing Regions," 2011 IEEE Workshops of International Conference on Advanced Information Networking and Applications, Biopolis, Singapore, 2011, pp. 544-548, doi: 10.1109/WAINA.2011.115.

[4] A Geo-Location based Mobile Service that Dynamically Locates and Notifies the nearest Blood Donors for Blood Donation during Medical Emergencies DOI:10.5120/153353669.

[5] P. Priya, V. Saranya, S. Shabana³, Kavitha Subramani (2014) “The Optimization of Blood Donor Information and Management System by Technopedia” ISO 3297: 2007 3 (1).

[6] F A. Clemen Teena, K. Sankar and S. Kannan (2017) “A Study on Blood Bank Management System” ISSN (online): 2455-1457 03, (1)

[7] Sulaiman S., Abdul Hamid A. A. K. and Najihah Yusri N. A. 2015 Development of a Blood Bank Management System Procedia - Social and Behavioral Sciences 195 2008-2013. World Health Organization (WHO), “Quality Management Training in Blood Transfusion Services in SouthEast Asia Region”, Report of an Intercountry Workshop, 58 February, 2001.

[8] Catassi, C. A., Petersen, E. L. “The Blood Inventory Control System-Helping Blood Bank Management Through Computerized Inventory Control”, Transfusion, 7:60 (1967)

[9] Arif, M. ; Sreevas, S. ; Nafseer, K. ; Rahul, R, “Automated online Blood bank database”, 978-1-4673-22706 India Conference (INDICON), 2012 Annual IEEE .

[10] Gayathree, K., Arul Murugan, C., Banuselvassaraswathy, B., Ishwarya Niranjana, M. and Agnes Shiny Rachel, N., 2018. A robust single ended 10 T Schmitt Trigger based SRAM cell with enhanced read/write assist techniques. Int J Pure Appl Math, 118(20), pp.411-416.

[11] D. Ram Nivas, M. Kathirvelu, M. Ishwarya Niranjana, R. Krishnaraj and J. Dhanasekar, “Wireless Electronic Notice Board and Attendance Monitoring System, & quot; 2022 3rd International Conference on Communication, Computing and Industry 4.0 (C2I4), Bangalore, India, 2022, pp. 1-6, doi:10.1109/C2I456876.2022.10051245.

[12] akshmiNarayanan, M. Kasiselvanathan, K. B. Gurumoorthy, V. Ki ruthika, "Particle swarm optimization based artificial neural network (PSO-ANN) model for effective k-barrier count intrusion detection system in WSN", Measurement: Sensors, Volume 29, October 2023.

[13] AnkitBhardwaj, Arvind Sharma, V.K. Shrivastava, International Journal of Engineering Research and Applications (IJERA), Vol. 2, Issue4, July-August 2012, pp.1303-1309.