

## LIFE-LINK: Connecting Blood Bank with Technology

Prathmesh Moralwar<sup>1</sup>, Prashant Takale<sup>2</sup>, Atharva Yadav<sup>3</sup>, Yash Dahale<sup>4</sup> and Dr. Pallavi Deshpande<sup>5</sup>

<sup>1-5</sup>Vishwakarma Institute of Information Technology, ENTC, Pune, India.

Email : prathmesh.22311683@viit.ac.in, prashant.22311739@viit.ac.in, atharva.22311730@viit.ac.in,  
yash.22311523@viit.ac.in, pallavi.deshpande@viit.ac.in

**Abstract—** Blood is a crucial constituent in the human body which is not dispensable for human life, it provides nutrition and oxygen to all body cells, due to which blood bank was introduced in this paper. manual systems seem to take much time during the time of critical situations, so an online computerized system is presented in this paper. This research paper focuses on designing an integrated web platform towards the enhancement of the availability and efficiency of blood banks. The features of the platform would include real-time search access to all blood banks, which would enable the user to find local blood banks with immediate information about the blood types available. It includes emergency blood booking system so that the blood banks can be requested quickly in case of any such emergency. The study identifies the importance of timely blood donation and response in saving lives, which are often more demanding in emergencies. The proposed website connects blood donors with recipients in an instantaneous and user-friendly way, thereby filling up current lacunae in blood bank operations. This paper discusses the technical architecture of the platform, user interface considerations, and some potential challenges, such as data privacy and system integration. In sum, the research will contribute to more refined conditions in blood donation systems and, eventually, to better healthcare solutions through innovative technological approaches.

**Index Terms—** Blood Bank Management, Web Applications, Blood Donation, Emergency Blood Booking, User Interface Design.

### I. INTRODUCTION

An essential requirement is the demand for blood in medicine and healthcare systems. Someone exists for every second who needs blood to save his or her life [1]. The critical global need for blood confronts these places with puzzling shortages. According to the WHO, around 100 million blood donations take place each year; however, this is not enough to meet the demand by the patients, especially in poor countries where 65% of all transfusions given are to children aged below five years [2].

The pandemic further worsened the crisis as lockdowns and decreased voluntary donations increased shortages of blood [3]. Blood transfusion is the lifesaving intervention in the management of a patient in the complex healthcare systems of any country [4]. The essence of a BTS can be aspired to from its key functions, which include providing a safe, sufficient, and timely supply of blood and blood products [5]. Many countries face chronic shortages of blood, especially in those with undeveloped healthcare services. Such shortages delay the interventions medically, and there would be high death rates. It becomes hard to find suitable donors for emergency cases. The delays that happen at instances of required blood can cause grave deterioration of health conditions or even death [6].

More than 4 million are infected with the Human Immunodeficiency Virus (HIV) through unsafe blood transfusions, and 99% of 500,000 women die yearly from haemorrhage during pregnancy or childbirth [7]. For instance, Nigeria is yet to attain the WHO target of +1.5 million pints/annum), while 34% of pregnant women die in labour due to complications from bleeding and lack of blood for transfusion [8]. Such patients may then have to resort to a social media post or even a public call for blood, which is not always timely [9]. One strategic step towards this safe supply of blood is the establishment of a trustworthy and effective component of the blood transfusion service that screens blood [10]. The fig-1 indicates blood group compatibility for transfusion. That is, type O can give to all the blood groups-thus is a universal donor. Type A can donate to A and AB. Type B can donate to B and AB. Type AB can receive only from AB donors-the universal recipient. Arrows indicate compatible donor recipient pairs under the tables so that an arrow pointing from the type of donor to type of recipient means they share a compatible blood group, and thus safe transfusion is possible, and an arrow pointing between two types of donors/recipients indicates that both are incompatible to each other to be used as a donor or recipient, and thus unsafe transfusion.[15]

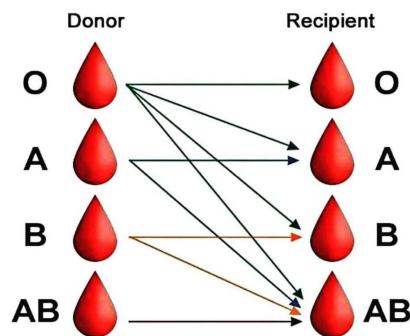


Fig.1. Blood Type Donor and Recipient Guide [15]

We referred to the work of Pallavi Deshpande et al. (2019) & (2021) to guide the structure, format, and flow of this paper for conference publication. While their studies informed our organizational approach, no direct content or references were used, ensuring the originality of this work [16].

## II. LITERATURE SURVEY

According to S. Jayaraman et al. (2017), it is a web application that has been developed for automating the operation of a blood bank by ensuring the adequate availability of blood stocks and minimize wastage [11]. It gives real-time tracking concerning shortages of critical blood groupings and gets integrated with the management system of many hospitals. The study, therefore, marks the efficiency of digitization in communication between the blood bank and the hospital, terms of supplying blood in good time and, therefore, preventing instances of blood scarcity and reducing response time in such emergencies. A. Kumar et al. (July 2018), in this study, the IoT, in terms of improvement in manage event of blood banks, is kept in prominence. The IoT-based system will monitor real-time blood stocks; conditions of storage; and donor information. The alerts are produced every time the blood stock falls below some predefined thresholds or the condition of storage dips below a certain limit, making the management of blood banks reliable and efficient. S. D. Kumar, A. Raj, and P. Singh (2019.). The significant theme behind this paper is developing a cloud-based system to improve the easy running of blood bank operations. It centralizes data on the stock of blood and the details of donors, which permits updating across several hospitals in real-time [14]. It uses cloud computing, thus eliminating redundancy of data and regional access to guarantee availability of real and up-to-date information for all stakeholders involved. The research work presented the idea of using data analytics for predicting upcoming demand for blood and would help in controlling wastage by maintaining it at the optimal stock level. Further, automated notifications for donors and instant alerts to the hospitals would be immensely beneficial in enhancing the operational efficiency of the blood bank. Key issues of data security and privacy in the cloud environment were discussed and proposals given for robust protection of data. Generally, the system provides scalability, reliability, and much better management of blood bank operations. Schreiber, G. B., & Busch, M. P (2005), Population need is defined as the total number of units of whole blood and components that are required to transfuse all individuals who require blood transfusion in a defined population over a defined time (usually one year) [13]. Figure 2 - Population need, demand, supply and utilization This is the total blood transfusion need of

the population that is independent of all factors that may influence or prevent the population to get transfused in a healthcare setting. Population need is estimated through an epidemiological approach which requires estimation of incidence or prevalence of those conditions and interventions that require blood transfusion, the proportion of those who require transfusion and the quantum of blood or component requirement.

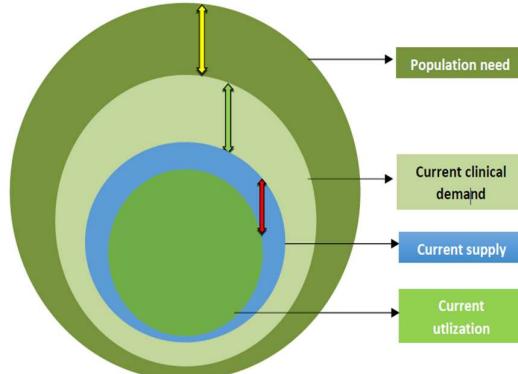


Fig.2. population needs blood

### III. METHODOLOGY

The methodology puts attention on creating a web application bay using latest technological domain for implementing our design application using a control and connect for user authentication and database

Key resources needed to implement this connecting technology will be a user-friendly front-end web interface and a secure authentication system integrated with an exhaustive database. The database must incorporate data from blood banks, hospitals, blood camps, and delivery systems to ensure easy communication between stakeholders.

Moreover, other resources of software to use, such as Visual Studio Code for development and design templates, would be required in the development of a user interface. All these factors would enhance efficiency with the process of technological implementation at the blood bank.

#### A. Web Description

**Main Motivation** This project is motivated by trying to give an easy solution to the blood donation system at the shortest possible time for both receivers and donors. Our core focus will be in developing an app that is easy to use, allowing the process of blood donation with efficiency. To perform blood donation securely, we will offer a blood verification guide prior to donation and encourage proper nutrition with volunteer help. All the features of this blood bank application require the designing of various classes and widgets. The structure of the web application will comprise of home page where users are able to enrol themselves as a donor as well as receiver of blood and further ahead to the whole process of donating the blood. After the home page, users are also forwarded to their login page where they would be able to look up the blood bank locations, check availability of blood, and contact information.

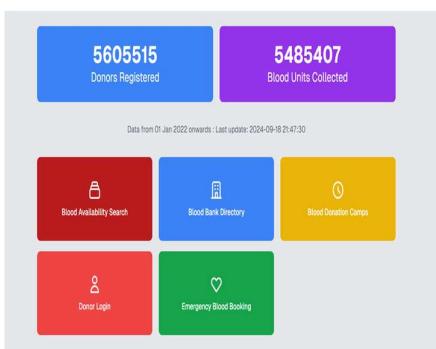


Fig 3. Front end / web interface

Fig 4. Blood Stock Availability

For instance, as illustrated in Figure 3, the Blood Donation Dashboard represents characteristics and functionalities the application under study. Figure 4 illustrates Blood Stock Availability-the instant check of availability for certain blood types.

Fig 5. emergency blood booking

The fig 5 shows the "Emergency Blood Booking" form is generated, which is literally a request for speedy assistance that has fields to be filled by the user such as his Aadhar number, address, and phone number; along with dropdown for blood type, which defaults to "AB+". The red-coloured button at the bottom is called "Request Emergency Blood," which lets the users submit their information. This streamlined form aims at making requests for emergency blood as simple and efficient as possible.

#### B. Technology used

This block diagram fig 6 implements the architecture of your website with the most important elements. A frontend gets assembled using HTML, CSS, and JavaScript to interactively create a user interface. Your business logic and interaction of the process that the user's requests would be handled by the backend created in Django. Besides, this website will integrate a database to save the data that would be taken from users along with other relevant information. The architecture shows full communication between the front end and the backend, guaranteeing efficient data management and user interactions on the website.

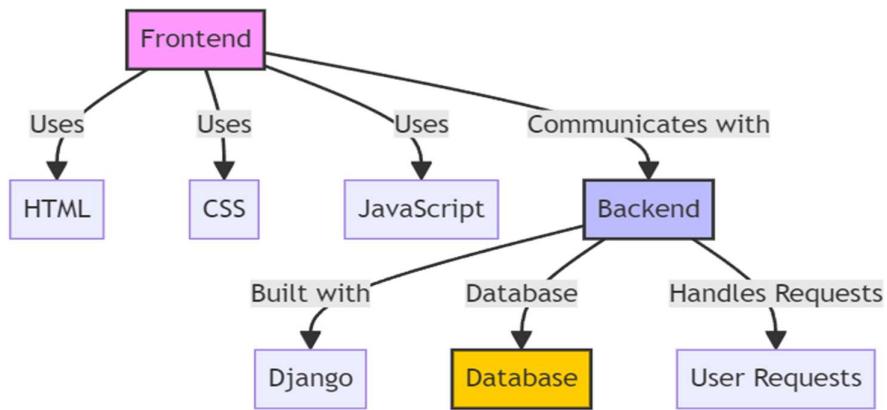


Fig. 6 Technology are used to build website

#### IV. IMPLEMENTATION

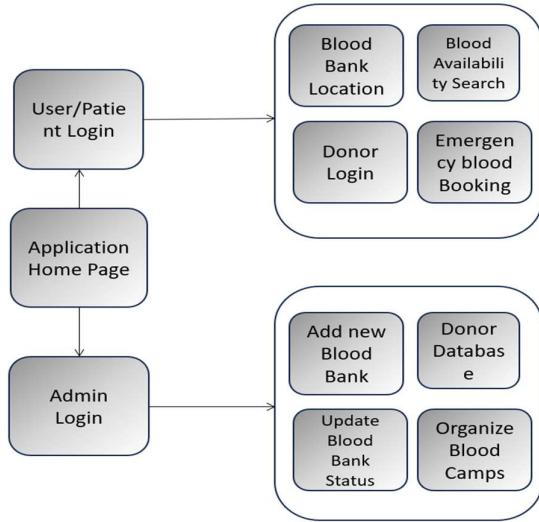


Fig .7. Block diagram

Figure 7 Blood Bank Operation Management System Interacting and with Administrative Functionalities Diagrammatic Representation Shows the following:

**User/Patient Login** It is the port of entry for people who want to have access to the system. After registration with the system, it takes the registered users to Application Home Page. This is a central point of all features in the application. There is also an Admin Login area, that separately provides more features and functionalities to the administrators to get at the blood bank information and manage the working of the system. The system has two prime functional areas that have different segments based upon the user roles. Features it offers to users and patients are Blood Bank Location, where it helps users in finding a blood bank near them; Donor Login, wherein registered donors can monitor their profiles; Blood Availability Search, from which specific blood types are searched for; and Emergency Blood Booking, where during an emergency, blood is requisitioned. For administrators, functionalities include Add New Blood Bank, adding new opportunities for blood banks into the system; Update Blood Bank Status, updating operational statuses; and Donor Database, used in maintaining information about donors. This structured way ensures efficient operations with improved user experiences in the blood bank management system.

#### V. RESULT

The whole process of blood donation and delivery would therefore be made hassle-free as possible for the user within the proposed Blood Bank Management website. The website can feature an online blood booking system where the user can easily schedule an appointment for blood donation via the website. This has enhanced accessibility, making it easy for donors to find their way through the interface and select the time and location they prefer.

The site also has a blood booking and delivery system in case of an emergency. The hospital and patients can book blood and request the same in cases of emergencies. It can place urgent requests for the users, and these requests are processed first to be delivered immediately.

**Interface:** the design of the platform was done with clarity and efficiency in mind, thus intuitive in navigation, while being responsive to both desktop and mobile gadgets. It offers transparency and reliability toward donors and recipients. The live monitoring of requests for blood donations ensures that the system would not breed distrust in the community. Generally, this all-encompassing solution seeks to increase the rates at which people participate in giving their blood donations and improves the blood delivery service efficiency rates.

#### VI. CONCLUSION

The blood booking website is set on getting the blood easier and quicker. It allows the user to locate blood availability within nearby areas and arrange for fast delivery. Its search feature makes it easy for any user to

locate from local blood banks, hospitals or donation centers the exact kind of blood needed, with the freshest information to be an assured correct one. This gives crucial time in case of emergencies whenever there is a need for urgent access to blood.

Besides, the facility provides blood delivery services with its partners in logistics companies to ensure its safe and timely delivery. Its interface available and capable of both being mobile and web-friendly puts it within reach of anyone that the needy is sure of having a quick experience.

Such a website enlists people who are willing to donate blood by displaying information conveniently and through scheduling options that can facilitate donating. This, in turn, ensures steady donation flows, along with sufficient blood supplies, and a growing blood donor and recipient communities.

#### *A. Conclusion About the Blood Booking Platform*

Altogether, this will be beneficial in terms of the availability of blood and their delivery into users' doors while saving their lives through streamlined processes for both donors and recipients.

#### *B. Acknowledgement*

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#### FUTURE SCOPE

Looking forward to the blood donation platform could improve data analytics through machine learning to forecast blood demand and inventory optimization. Mobile apps to increase user accessibility. Once integrated within healthcare systems, this will allow for better data sharing and the use of superimposed blockchain tech to increase privacy and security.

Campaigns are thought to increase dedication and educate potential donors. Forecasting contribution via engagement features, and telemedicine consultation by leveraging AI-powered matching systems, emergency responses would be greatly improved. Scaling up globally and developing education modules, including users feedback loop will further improve the impact of the platform leading to an overall improved healthcare outcomes with addressing blood supply challenges around the globe

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