

# **plasma donor Web application**

## **A PROJECT REPORT**

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in partial fulfilment for the award of degree of  
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We would like to extend our gratitude to the **IBM** for **Nalaiya Thiran** project for providing us with all the facility that was required.

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**DATE:**

16/11/2022

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## **1.ABSTRACT**

The world is suffering from the COVID 19 crisis and no vaccine has been found yet.. But there is another scientific way in which we can help reduce mortality or help people affected by COVID19 by donating plasma from recovered patients. In the absence of an approved antiviral treatment plan for a fatal COVID19 infection, plasma therapy is an experimental approach to treat COVID19-positive patients and help them faster recovery. Therapy is considered competent. In the recommendation system, the donor who wants to donate plasma can donate by uploading their COVID19 certificate and the blood bank can see the donors who have uploaded the certificate and they can make a request to the donor and the hospital can register/login and search for the necessary things. plasma from a blood bank and they can request a blood bank and obtain plasma from the blood bank.

## **2.INTRODUCTION**

The main goal of our project is to design a user-friendly web application that is like a scientific vehicle from which we can help reduce mortality or help those affected by COVID19 by donating plasma from patients who have recovered without approved antiretroviral therapy planning for a deadly COVID19 infection, plasma therapy is an experimental approach to treat those COVID-positive patients and help them recover faster. Therapy, which is considered reliable and safe. If a particular person has fully recovered from COVID19, they are eligible to donate their plasma.

As we all know, the traditional methods of finding plasma, one must find out for oneself by looking at hospital records and contacting donors have been recovered, sometimes may not be available at home and move to other places. In this type of scenario, the health of those who are sick becomes disastrous. Therefore, it is not considered a rapid process to find plasma. The main purpose of the proposed system, the donor who wants to donate plasma simply upload their covid19 traced certificate and can donate the plasma to the blood bank, the blood bank can apply for the donor and once the donor has accepted the request, the blood bank can add the units they need and the hospital can also send the request to the blood bank that urgently needs the plasma for the patient and can take the plasma from the blood bank

### 3. LITERATURE REVIEW

Several experiments have been carried out over the years by different groups of researchers. Here are some of the following groups:

[1] Denuis O'Neil (1999). "Blood component" Archived from the original on June 5, 2013. Normally, certain amount of human body weight comes from blood. For adults, it is 4-6 litres of blood. This essential liquid plays an important role in transporting oxygen and nutrients to cells and removing carbon dioxide, ammonia and other waste products. Blood is a very common tissue composed of over 4000 different types of components.

[2] ways to keep your plasma healthy, Original Archived November 1, 2013, Accessed November 11, 2011. Plasma donation is one of the most accepted practices for saving lives, While earning a few dollars. The whole process can take some time, but it's well worth it once you experience it a few times. Accepting money in exchange for plasma is welcome. It's a move when you feel like you're not just a hero, but you're adding value to yourself. The term "healthy" does not mean only in the absence of disease. It also means that you are healthy enough.

[3] Ripathis S, Kumar V, Prabhakar A, Joshi S, Agarwal A (2015). "Microscale Passive Plasma Separation: A Review of Design Principles and Microdevices," J. Micromech Micro 25 (8): 083001; Plasma separation is of great importance in the fields of diagnosis and healthcare. Due to the lagging transition to microscale, these recent trends are a rapid shift towards shrinking complex macro processes

## **4) METHODOLOGY**

### **1. Project Identification and Selection**

In this project, we aimed to develop an online blood bank system which will focus mainly on managing the donor's blood information. Anyone who is interested in blood donation can donate the blood at the hospital or blood donation centers.

### **2. Project Initiation and Planning**

To begin the project, we have gathered user requirement of this system and prepare the scope and objective. The results from this phase are scope and limitation, objectives, cost and benefits, feature of the proposed system and user interface design.

### **3. Analyzing System needs**

We have studied and identified problems of existing system, then we develop data flow diagram for the existing system. We also develop data flow diagram (DFD) and entity relation diagram (E-R diagram) for the proposed system

### **4. Designing the Proposed System**

Based on the analysis phase, we converted E-R diagram into relational database model and created data dictionary and DFD and user interface are designed in this process.

### **5. Development of the Proposed System**

In this phase, we are going to convert the design of proposed system to computer software, which includes computer programming using phpMyAdmin as a software tool written in PHP, which is intended to handle the administration of MySQL, and translating the design specifications into the computer code.

### **6. Testing the Proposed System**

This step is the process of testing whether the programming code will work correctly with the conditions in our system or not. In this phase, we will fix bugs in order to produce a system with maximum performance.

### **7. Implementing the Proposed System**

We wish to launch this system on the internet, so that donors are able to view their blood donation records online and administrators can create, update, delete, and query records convenient

# 5. PROJECT PHASE

## A) PHASE 1

### PROBLEM SOLUTION

Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> Who is your customer? i.e. working parents of 0-5 y.o. kids <ul style="list-style-type: none"> <li>Plasma Donors</li> <li>Plasma Seekers</li> <li>Plasma Donation centers</li> </ul>	<b>6. CUSTOMER CONSTRAINTS</b> What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices. <ul style="list-style-type: none"> <li>Network connection</li> <li>Donor Health condition</li> <li>Unavailability of plasma</li> </ul>	<b>5. AVAILABLE SOLUTIONS</b> Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking <ul style="list-style-type: none"> <li>Accessible arrangements give a stage to the two givers and patients to keep a track of the accessibility and possibility of the gift method.</li> <li>A few existing arrangements likewise give ideas with respect to wellbeing, yet at the same time these ideas may not be fitting by a ensured clinical specialist.</li> </ul>	Explore AS, differentiate
Focus on J&P, tap into BE, understand RC	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides. <ul style="list-style-type: none"> <li>Difficult in finding the donors at the right time</li> <li>The Donors was not aware of the plasma requirements.</li> </ul>	<b>9. PROBLEM ROOT CAUSE</b> What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations. <ul style="list-style-type: none"> <li>Clients are hesitant to go through the draw-out and insignificant cycle that makes gift of plasma an overwhelming undertaking</li> <li>Moreover they will generally be less inspired in any event, when they qualify as a solid contributor. More regularly, they never get to envision their great deeds towards the general public genuinely</li> </ul>	<b>7. BEHAVIOUR</b> What does your customer do to address the problem and get i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace) <ul style="list-style-type: none"> <li>Contributors expect the course of gift is giver cordial, wherein in the event that they register in the application, a date and schedule opening are doled out for gift in a close to by focus.</li> <li>Likewise, the subtleties stay secret furthermore, there will be no inclination among the accessible contributors.</li> </ul>	Focus on J&P, tap into BE, understand RC
	<b>3. TRIGGERS</b> What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news. <ul style="list-style-type: none"> <li>Blood Donation improves or saves lives and enhances social solidarity. it is also influenced by increasing deaths due to unavailability of plasma at required times</li> </ul> <b>4. EMOTIONS: BEFORE / AFTER</b> How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design. <ul style="list-style-type: none"> <li>Before: Patient / hospital find it hard to get a right resources.</li> <li>After: The donors and customers feel confident and hopeful.</li> </ul>	<b>10. YOUR SOLUTION</b> If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour. <ul style="list-style-type: none"> <li>An adjustable Plasma Donation Web-Based App that permits clients to enlist either as a giver or a patient needing plasma. Givers will get a date and schedule opening doled out for gift in a close by focus.</li> <li>The application will likewise give a method for putting away plasma and patient history alongside ideas and methods of sound way of life by ensured clinical specialists.</li> </ul>	<b>8. CHANNELS of BEHAVIOUR</b> <b>8.1 ONLINE</b> What kind of actions do customers take online? Extract online channels from #7 <b>8.2 OFFLINE</b> What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. <p>ONLINE:</p> <ul style="list-style-type: none"> <li>use the website to find donors</li> <li>Through social media</li> </ul> <p>OFFLINE:</p> <ul style="list-style-type: none"> <li>Ask friends or other previous users recommendation</li> <li>Awareness program and campaign can be done.</li> </ul>	Focus on J&P, tap into BE, understand RC

## PROPOSED SOLUTION:

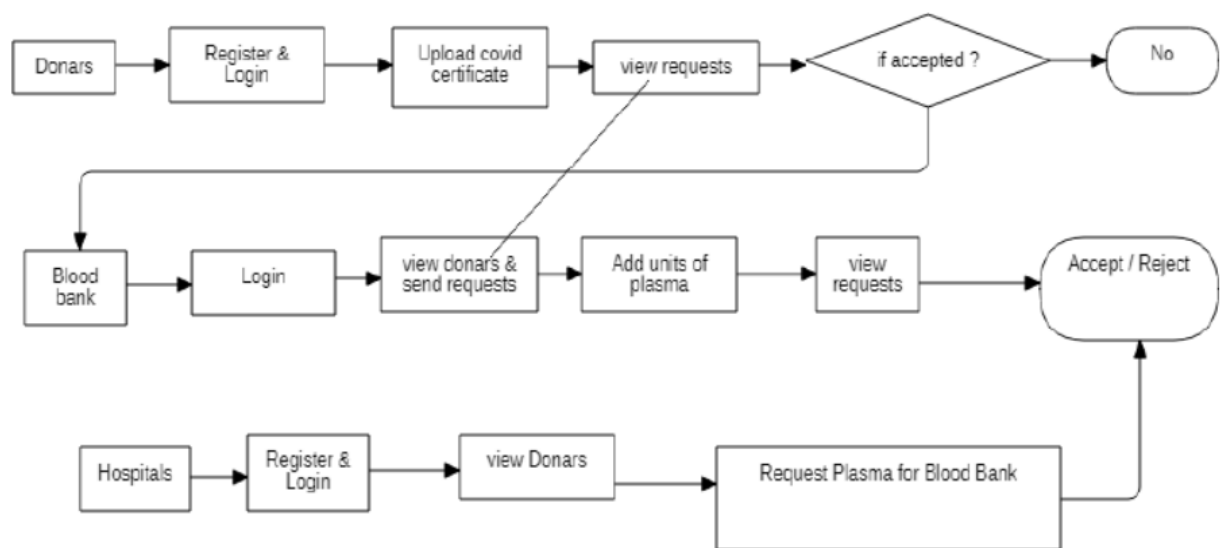
In this proposed system, a donor who wants to donate plasma can simply upload their recovered covid19 certificate and can donate the plasma to a blood bank. The blood bank after checking the donor certificate can make a request to the donor when the donor accepts the request, they can add the required number of units they need. The hospital can send a request to the blood bank that needs the patient's emergency plasma and to get the plasma from the blood bank.

Project team shall fill the following information in proposed solution template.

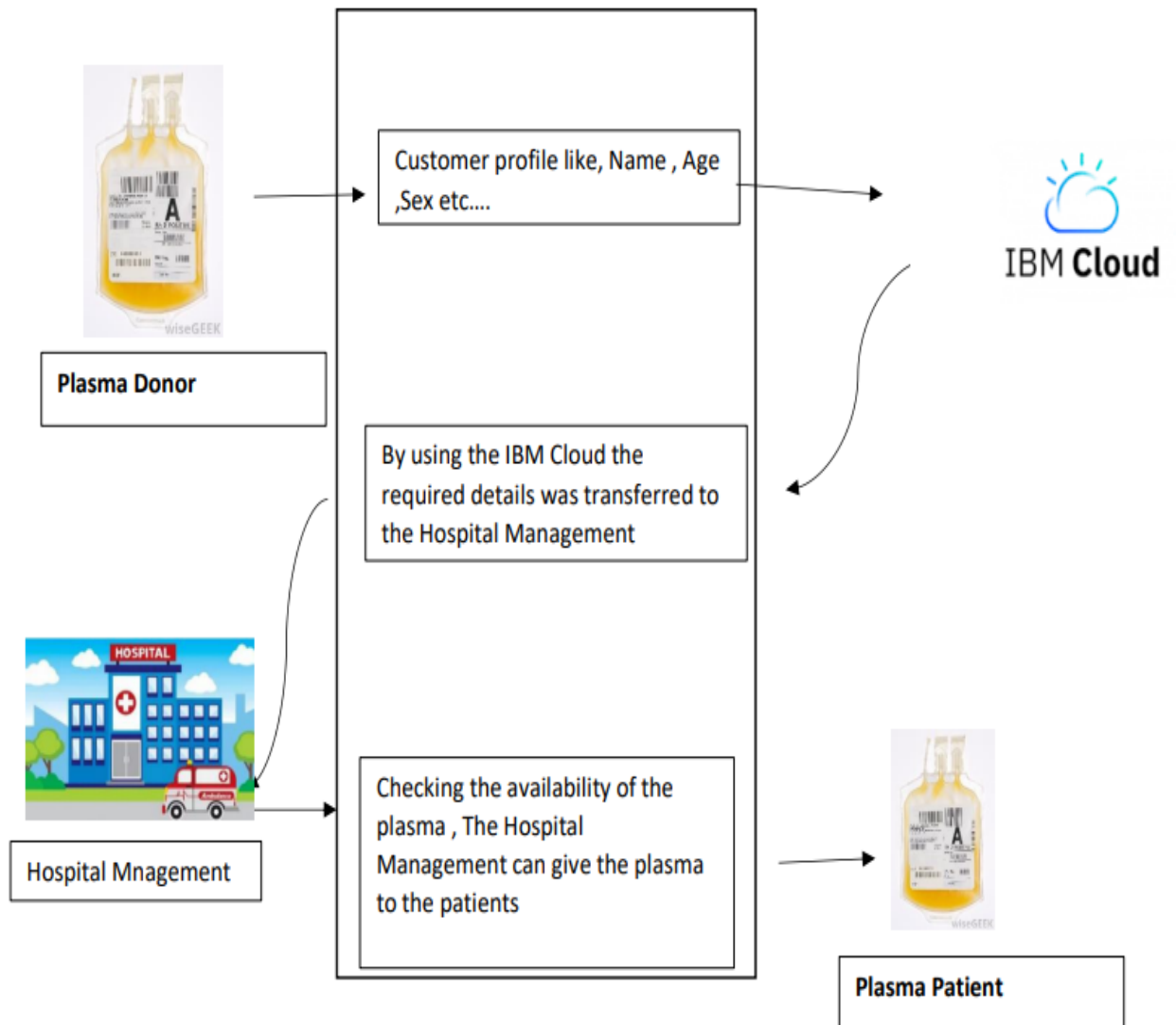
S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<ul style="list-style-type: none"><li>• Obtaining data about the availability of plasma in the Hospitals, blood banks and recipient's blood</li><li>• This system proposed here aims at connecting the donors and the patients by an online application.</li></ul>
2.	Idea/Solution description	<ul style="list-style-type: none"><li>• This application will link all the donors, control a plasma transfusion service and create a Database to hold data on stocks of plasma in each area</li><li>• By using this application, the users can either raise a request for plasma donation or they can Donate to the people that want.</li></ul>
3.	Novelty / Uniqueness	<ul style="list-style-type: none"><li>• This application make sure to have a constant availability of the all types of plasma for the Patients.</li></ul>
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"><li>• It helps the donors to donate plasma for required recipients</li><li>• Which will help to save a lot of lifes</li></ul>



5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> <li>The need of the plasma was increasing day by day , so it will help lot of people to create a revenue</li> </ul>
6.	Scalability of the Solution	<ul style="list-style-type: none"> <li>The demand of the plasma can able to control by this application, it will provide a simple way to connect the Donors and the Patients</li> </ul>

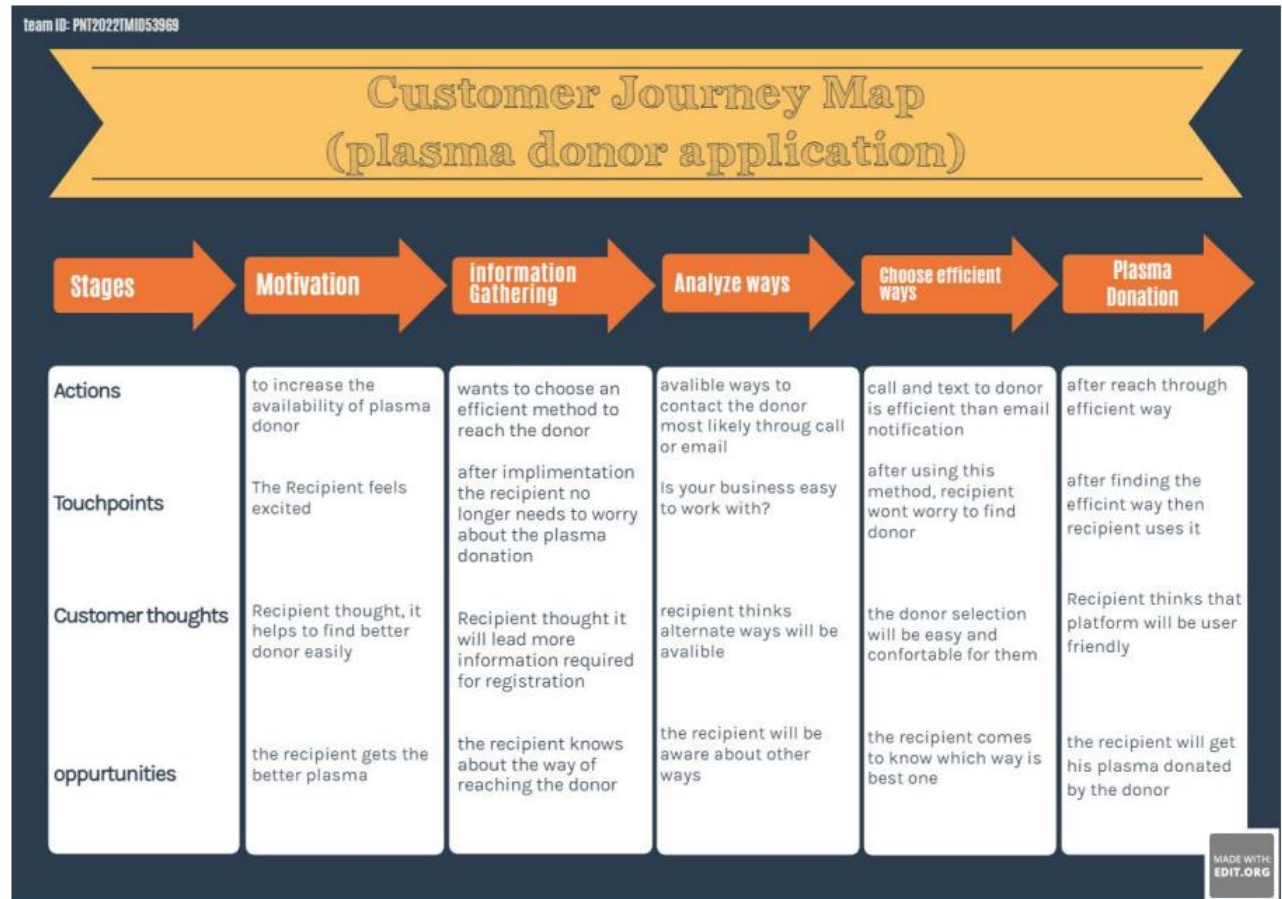


## SOLUTION ARCHITECTURE:



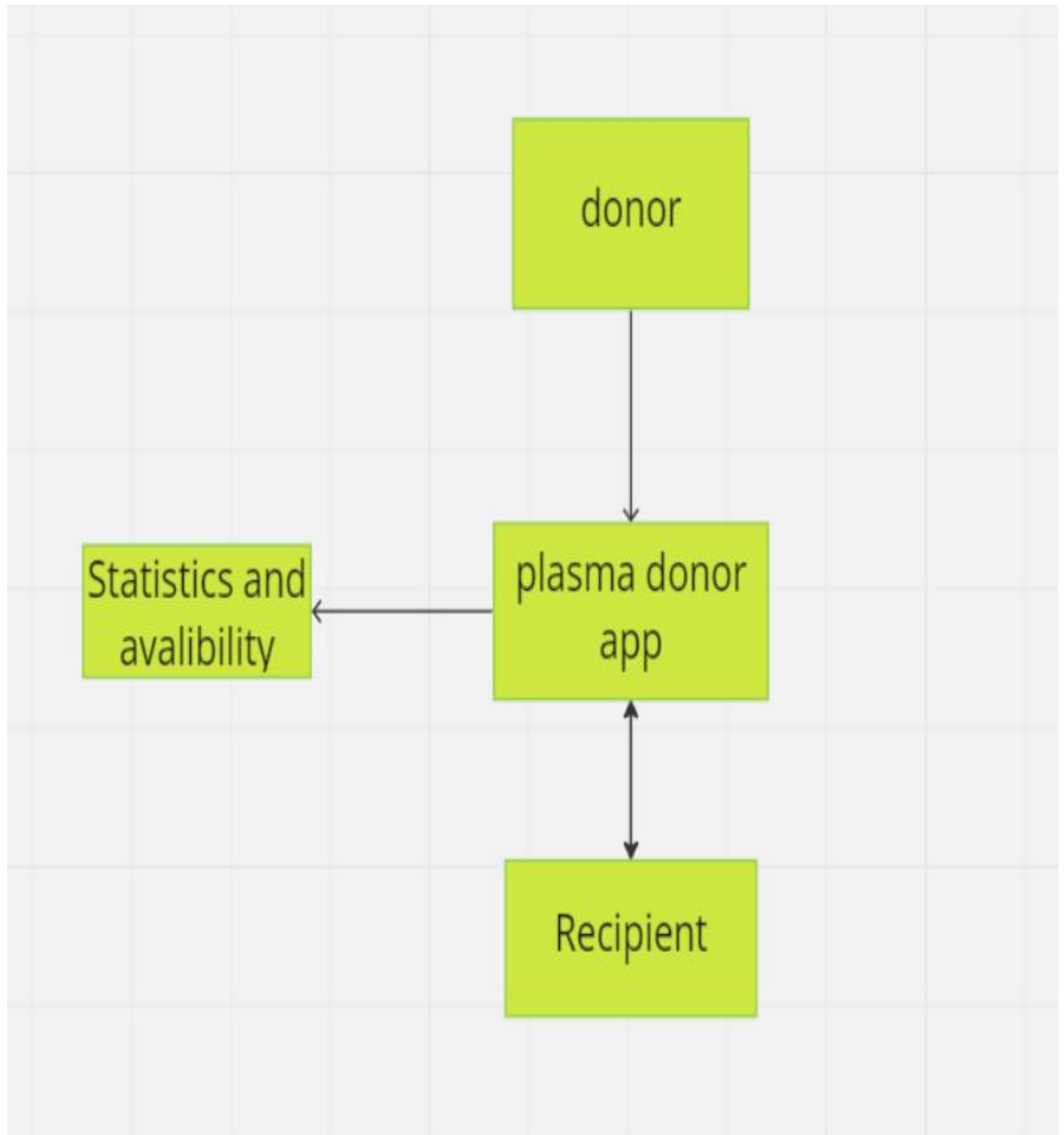
## B) PHASE 2 :

### CUSTOMER JOURNEY

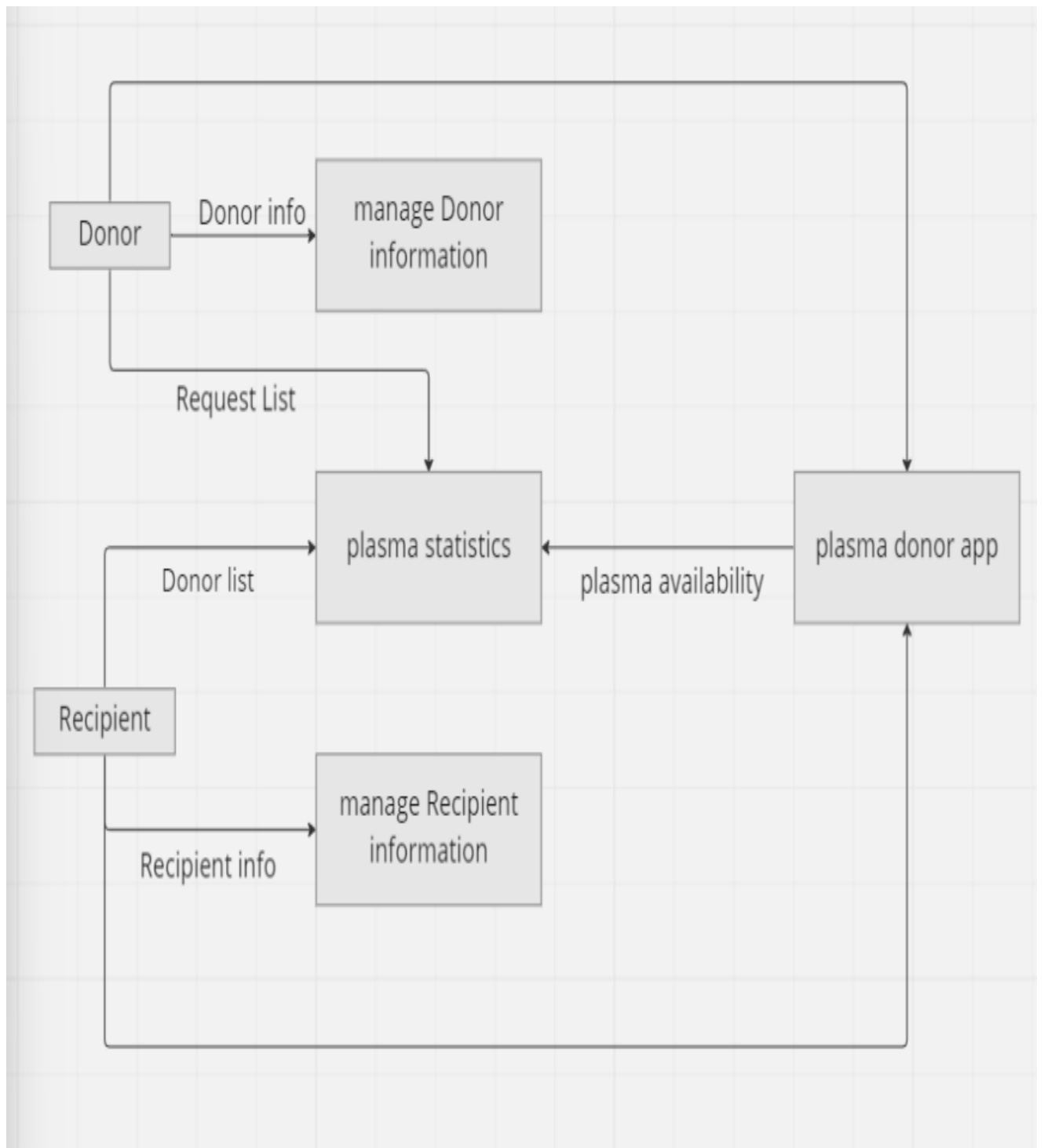


## Data Flow Diagram & User Stories

### Flow 0:



## Flow 1:



## USER STORIES:

### User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
User (Donor)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
	Sign in	USN-2	As a user, I will receive confirmation email once I have registered for the application and login	I can receive confirmation email & click confirm	High	Sprint-2
	Donation list	USN-3	As a user, I can register for the application and see the request and receive request.	I can register & see the requests and accept or reject it	high	Sprint-3
User (Recipient)	Registration	USN-4	As a user, I can register for the application through Gmail	I can access my account / dashboard	High	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can receive confirmation email & click confirm	High	Sprint-2
	Plasma Request	USN-6	As a user, I can enter into the application and find the donor and request for plasma.	can register & access the dashboard with Login and request plasma.	medium	Sprint-3
	Find donor	USN-7	Being a patient, I can access the application and find the plasma donor	I can access it on the dashboard	high	Sprint 3
Administrator	Sign in	USN-8	I can login into the app as an admin	I can access the app details	high	Sprint 1
	Maintain Database	USN-9	I can see the exact details of the donor and the recipient	I can access the database	low	Sprint 2

## **SOLUTION REQUIRMENT:**

### **FUNCTIONAL REQUIREMENT:**

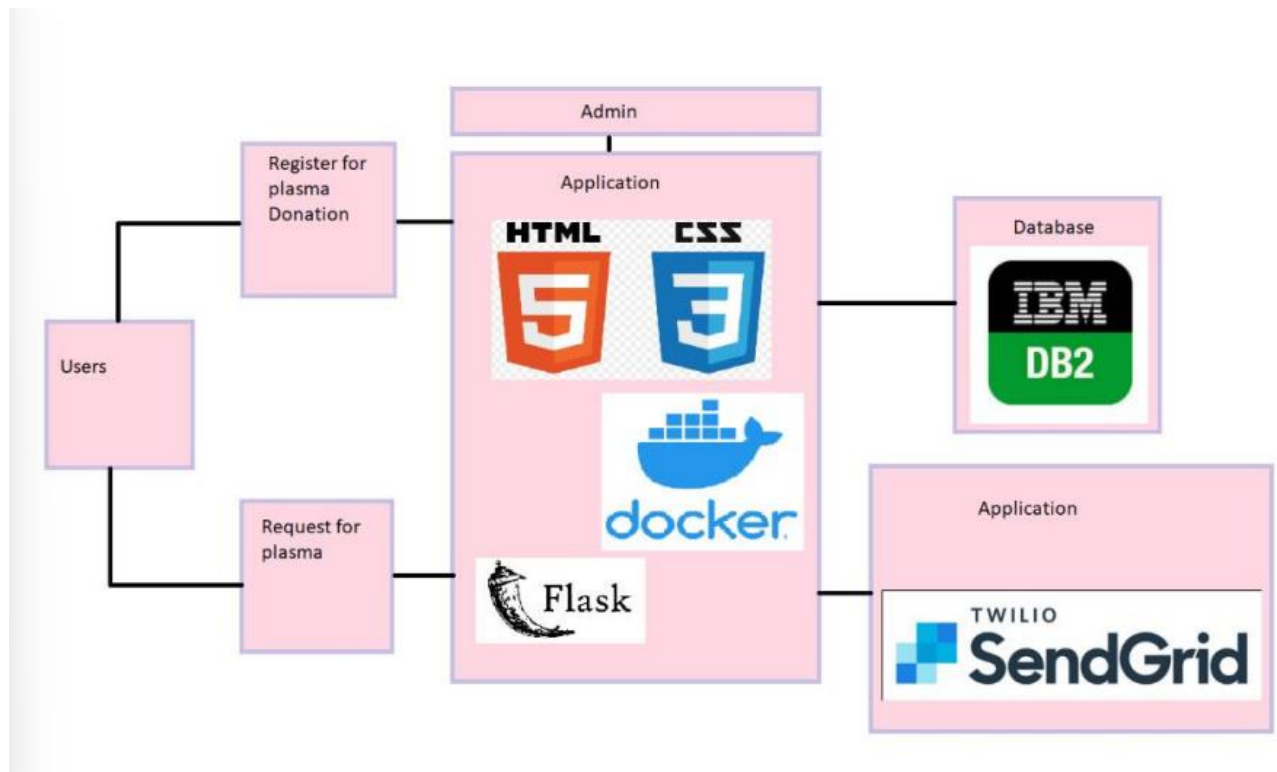
<b>FR No.</b>	<b>Functional Requirement (Epic)</b>	<b>Sub Requirement (Story / Sub-Task)</b>
FR-1	User Registration	Registration through Gmail Registration through Form (WebApp)
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Certification	After the donor donates plasma, we will give them a certificate of appreciation and authentication.
FR-4	Statistical data	The availability of plasma is given in the page as an availability status, which will be helpful for the users.
FR-5	User Requesting Plasma	Users can request to donate plasma by filling out the request form on the page. Once the request is submitted, they will get an email verification.
FR-6	reporting requirements	Users can use the search bar to look up information about where our camps are being held and other topics.
FR-7	Visual Assistants	A virtual assistant is deployed in as a overlay software agent that can carry out tasks to provide services on behalf of a person in response to basic inquiries When users enter their inquiries, the system will respond with information about plasma and details of plasma donation.

## NON-FUNCTIONAL REQUIREMENT:

FR No.	Non-Functional Requirement	Description
NFR-1	<b>Usability</b>	The user interface should be modern and user friendly to all age groups.
NFR-2	<b>Security</b>	it should be secured with 2FA authentication and other basic methods such as username and passwords
NFR-3	<b>Reliability</b>	The system should be made in such a way that it is reliable in its operations and for securing the sensitive details.
NFR-4	<b>Performance</b>	Users should have a proper Internet Connection.
NFR-5	<b>Availability</b>	As it is a health system it should be deployed and accessible 24x7
NFR-6	<b>Scalability</b>	The application has the ability to handle growing numbers of users and load without compromising on performance and causing disruptions to user experience



## TECHNICAL ARCHITECTURE:



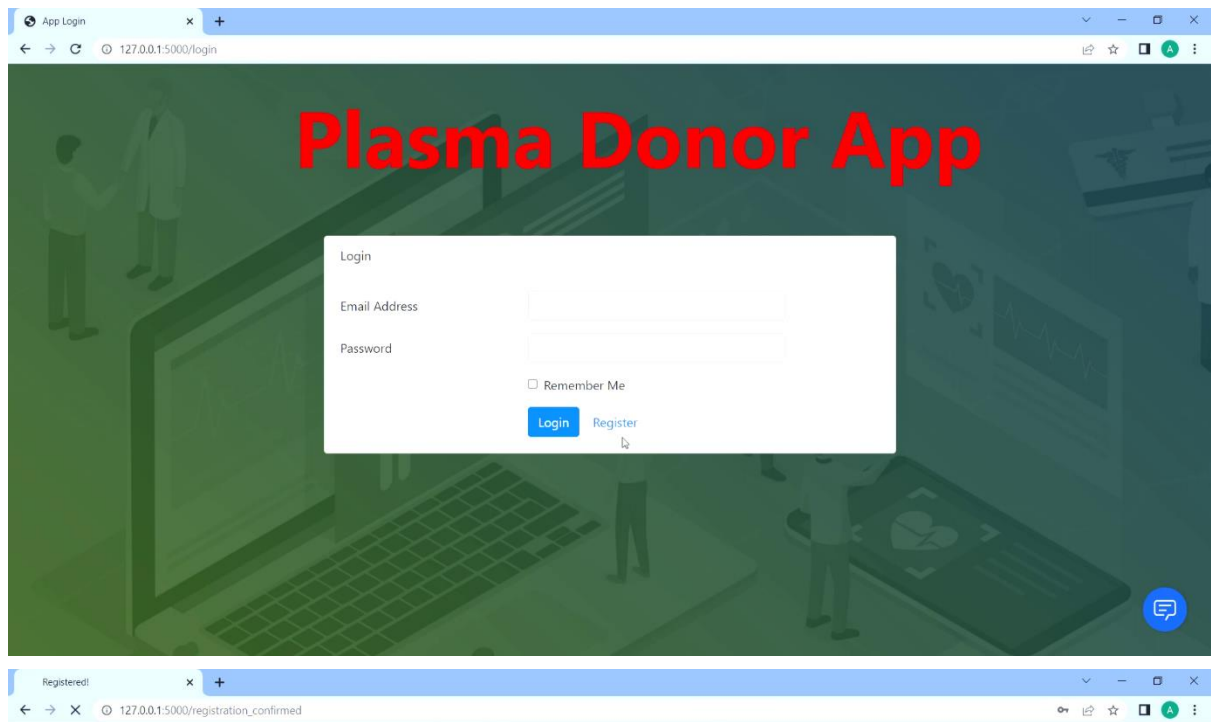
S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Python – flask is an open-source framework used to develop the application.	Python -flask
2.	Security Implementations	Container registry and Kubernetes Cluster are used for encryption of data.	Container registry and Kubernetes Cluster
3.	Scalable Architecture	Kubernetes Cluster, it makes containers to run across multiple machines and environments. Which also prevents downtimes do to hardware problems	Kubernetes Cluster
4.	Availability	Kubernetes Cluster provides all time availability. Additionally using Cloudflare networks to reduce DDOS attacks	Kubernetes and Cloudflare
5.	Performance	Docker improves the application performance	Docker

**Table-1 : Components & Technologies:**

S.No	Component	Description	Technology
1.	User Interface	user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Application Logic-1	Framework used for designing the application.	Python - flask
3.	Application Logic-2	Communication between users and the application via mails	SendGrid
4.	Application Logic-3	Docker is an open source platform for building, deploying, and managing containerized applications.	Docker
5.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	They make it easier for your developers to store, manage and deploy container images.	Container Registry
9.	External API-2	User data verification system to verify if they have any medical records and is healthy to donate plasma	checking database API
10.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: will be linked to IBM cloud with port forwarding available network Cloud Server Configuration: IBM cloud to host the local server	Local, Cloud Foundry, Kubernetes, etc.

## 6)PROJECT DEVELOPMENT PHASE

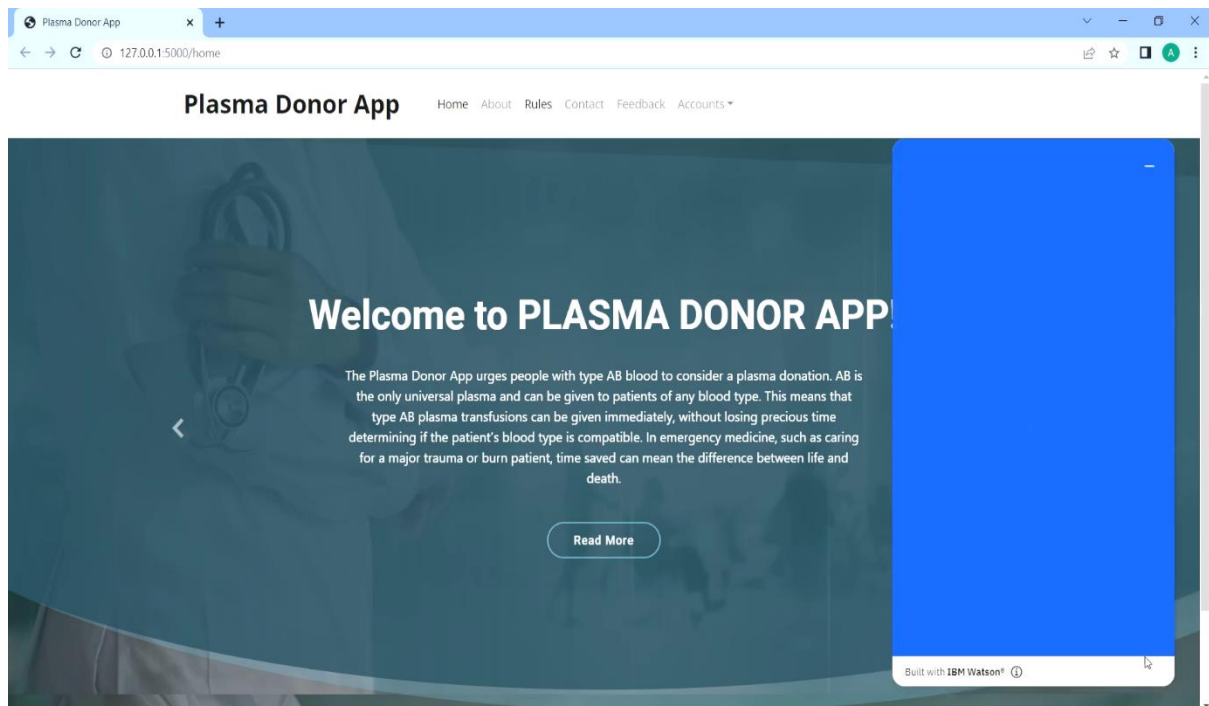
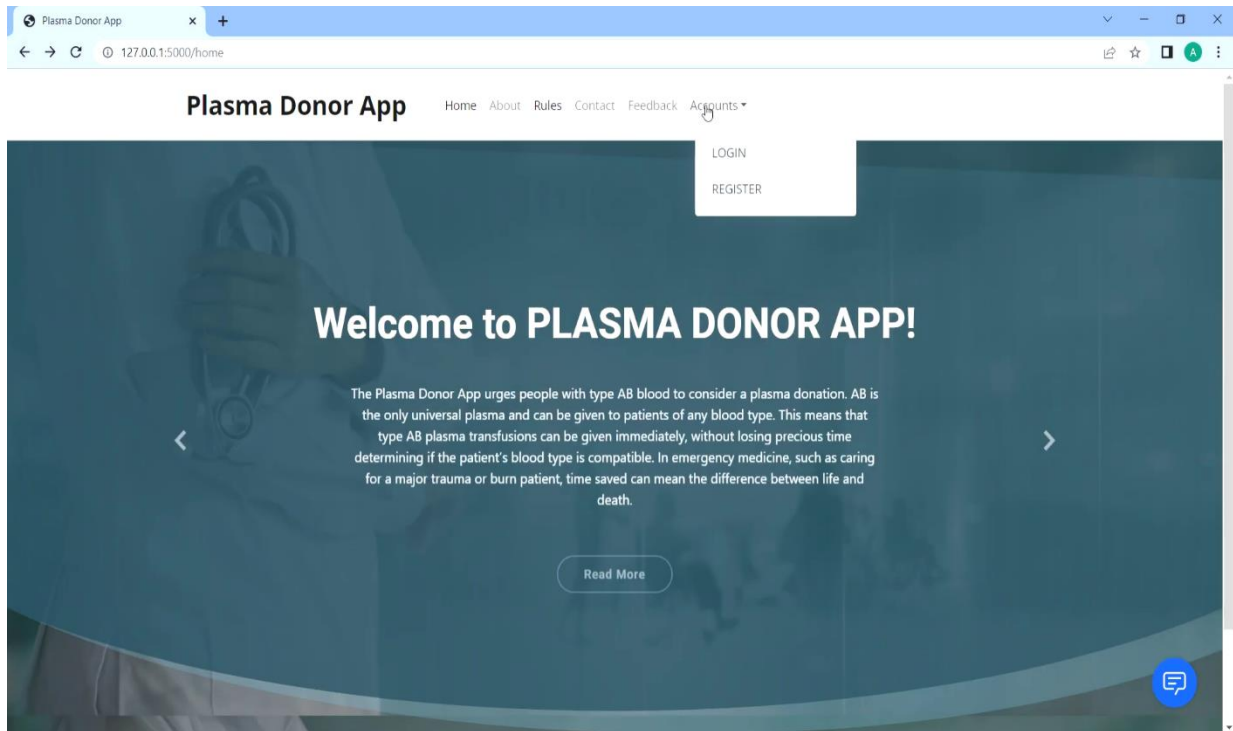
### a) LOGIN PAGE



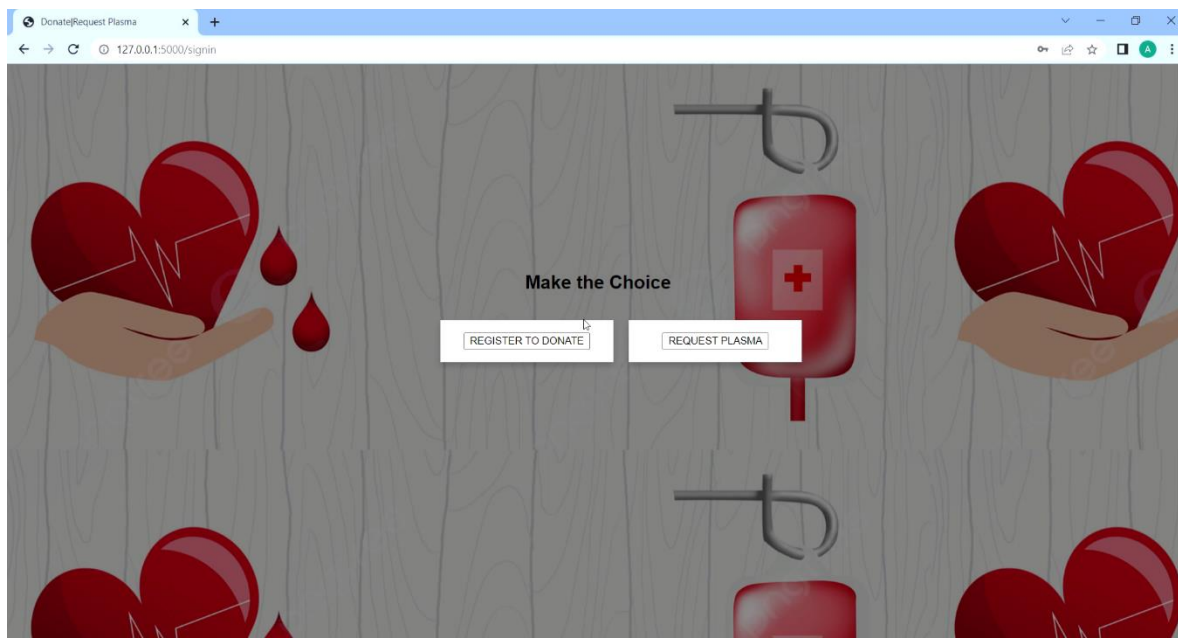
Registration  
Successful!

OK

## b)HOME PAGE



## C) PLASMA REGISTRATION PAGE AND RULES



A screenshot of a web browser displaying the 'Registration Form' page. The browser's address bar shows '127.0.0.1:5000/regdonor'. The page features a light blue background with a repeating pattern of red hearts and blood bags. The form is titled 'DONOR DETAILS' and includes the following fields:

- First Name: Aman
- Last Name: Sing I
- Age: [Empty field]
- Gender: Select
- BloodGroup: Select
- Email Address: [Empty field]
- Phone Number: [Empty field]
- Address: [Empty field]
- Postal Code: [Empty field]

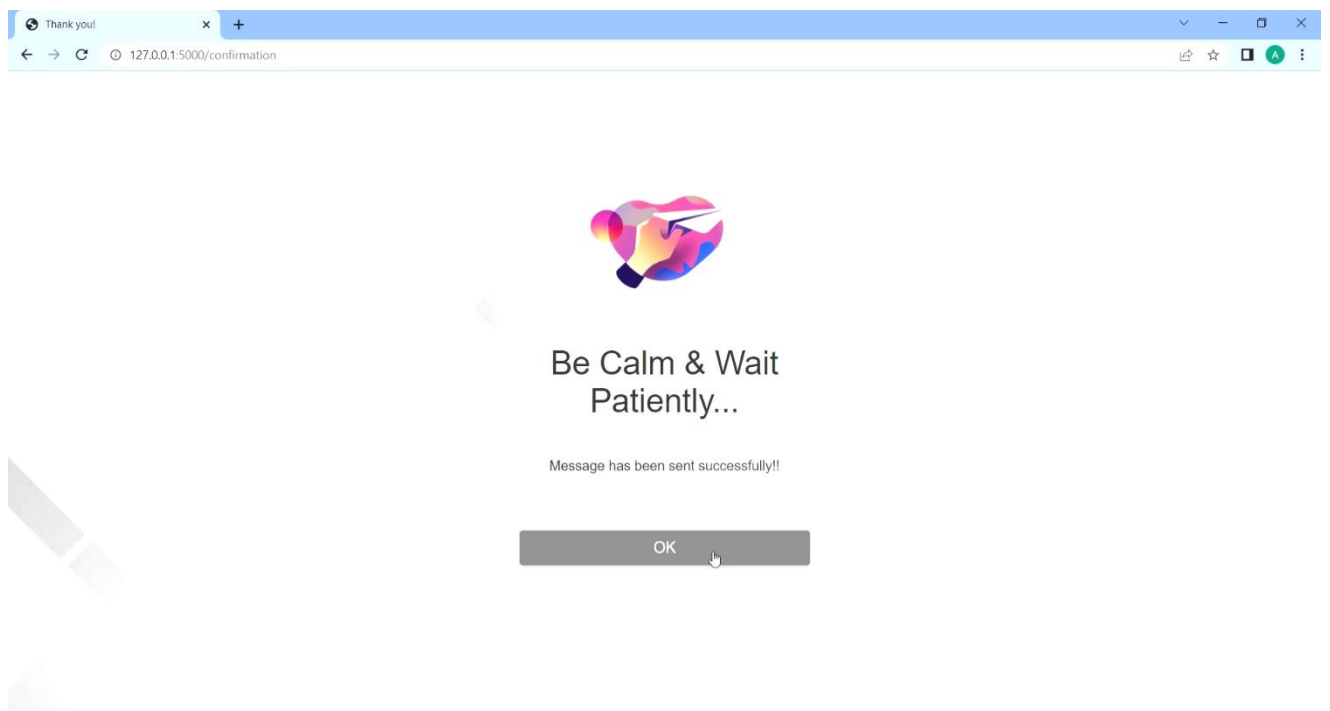
Below the form fields, there is a checkbox labeled 'Agreed to terms and conditions' and a red 'Register' button.

Donor Details

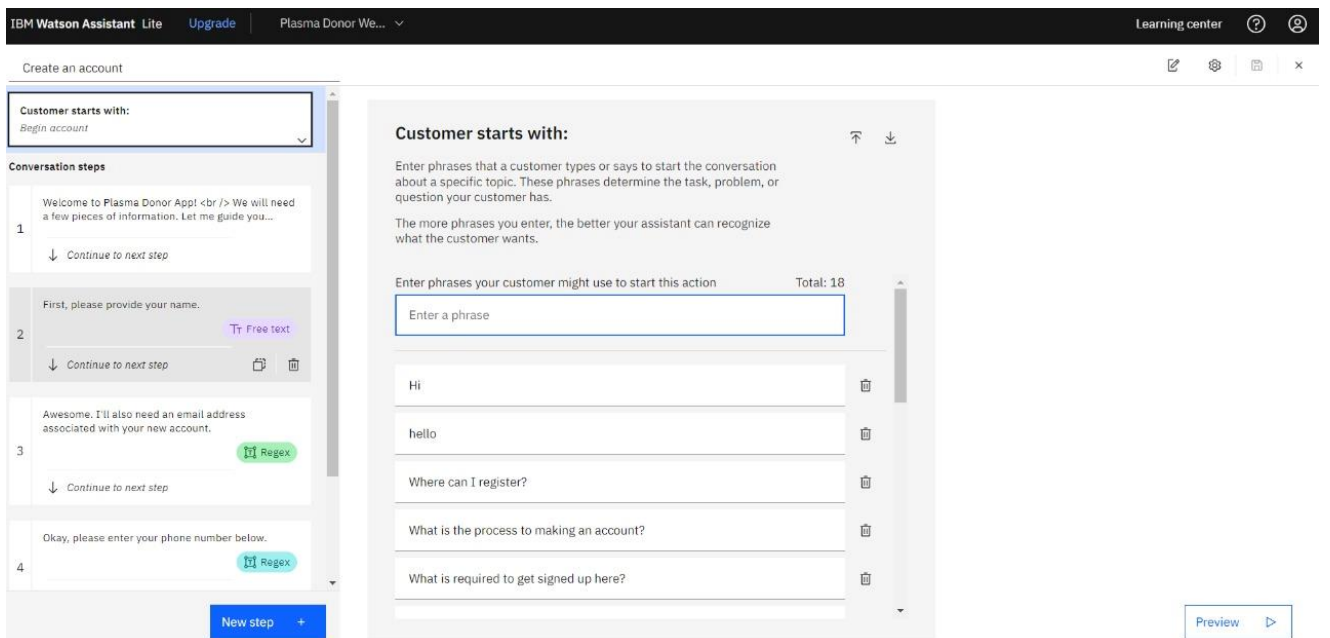
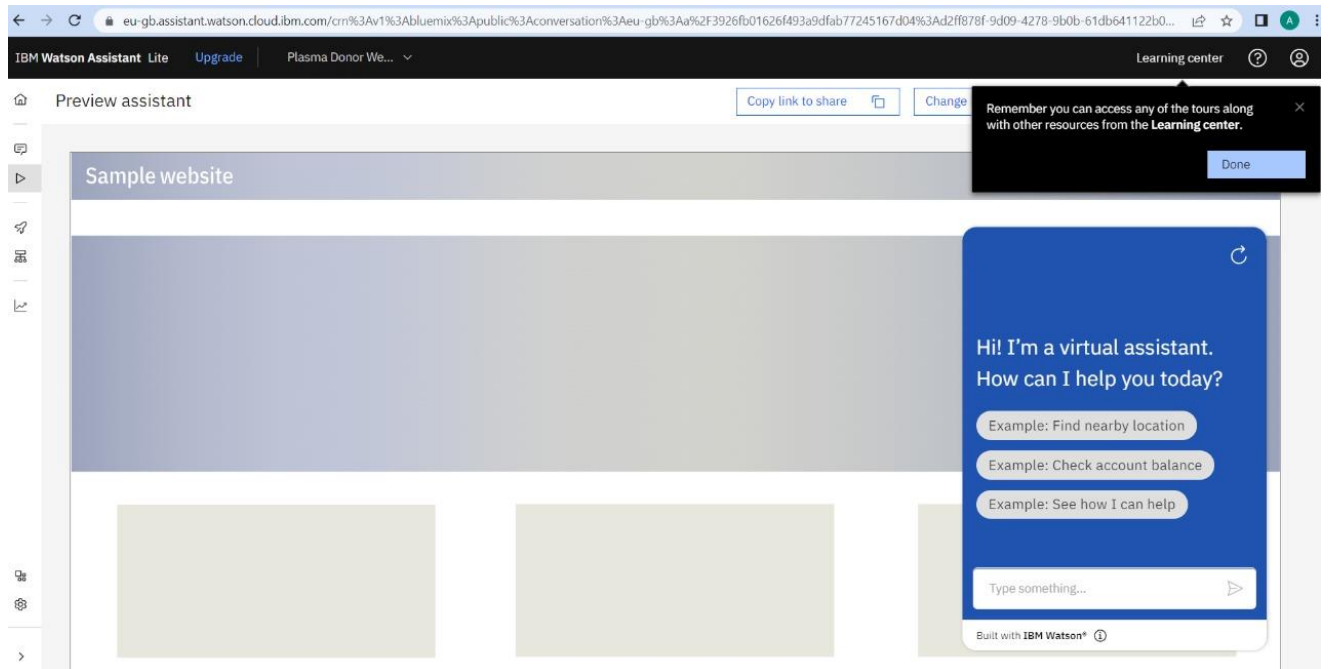
127.0.0.1:5000/requestdonor

DONOR DETAILS

First Name	Last Name	Age	Gender	Blood Group	Email Address	phone number	Address	
Bhuvanesh	J	22	Male	O	bhuvaneshj@gmail.com	9854789865	Vannarpettai	Message
Kishore	R	32	Male	A	kishore@gmail.com	6687958985	Madurai	Message
Jeffrey	Benison	29	Male	B	jeff@gmail.com	8889898685	Chennai	Message
Aman	Santh	20	Male	O	aman@gmail.com	6398521470	Tirunelveli	Message



## c)CHAT BOT





← → ↺

eu-gb.assistant.watson.cloud.ibm.com/cm%3Av1%3Abluemix%3Apublic%3Aconversation%3Aeu-gb%3Aa%2F3926fb01626f493a9dfab77245167d04%3Ad2ff87bf-9d09-4278-9b0b-61db641122b0...

IBM Watson Assistant Lite Upgrade Plasma Donor We... Learning center ?

Actions

Actions

Created by you

Set by assistant

Variables

Created by you

Set by assistant

Set by integration

Saved responses

Actions sit at the core of the new Watson Assistant build process. Think of them as problems or tasks that your customers want your assistant to resolve for them. They include the complete interaction between a customer and your assistant for a specific question or request.

[Find out more](#) [Take a tour](#) [Build with our guide](#)

Search

↑

New action +

Name	Last edited	Examples Count	Status
Create an account	16 hours ago	18	✓

Items per page: 50 Showing 1–1 of 1 actions 1 1 of 1 pages

Preview ▶

IBM Watson Assistant Lite Upgrade Plasma Donor We... Learning center ?

Web chat Live

Close Save and exit

Style

Launcher Home screen Live agent Suggestions Security Embed Resources

Customize your chat UI

Update the style to match your brand and your website. A developer can also add more advanced styling changes with code. [Learn more](#)

Assistant's name as known by customers

Watson Assistant

Primary color #FFFFFF Secondary color #3D3D3D

Chat header Accent color #0354E9

Significant and interactive objects

IBM Watermark Plus

Displays a link to the Watson Assistant website

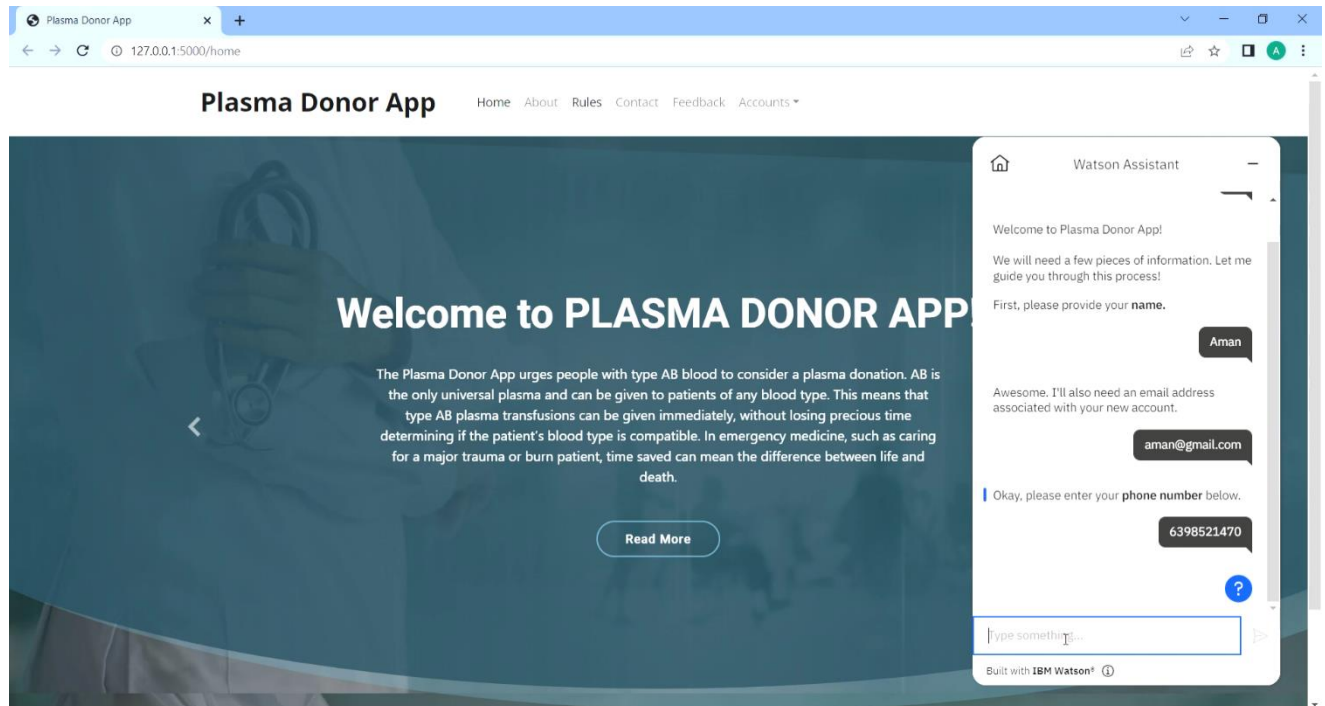
On

Add an avatar image

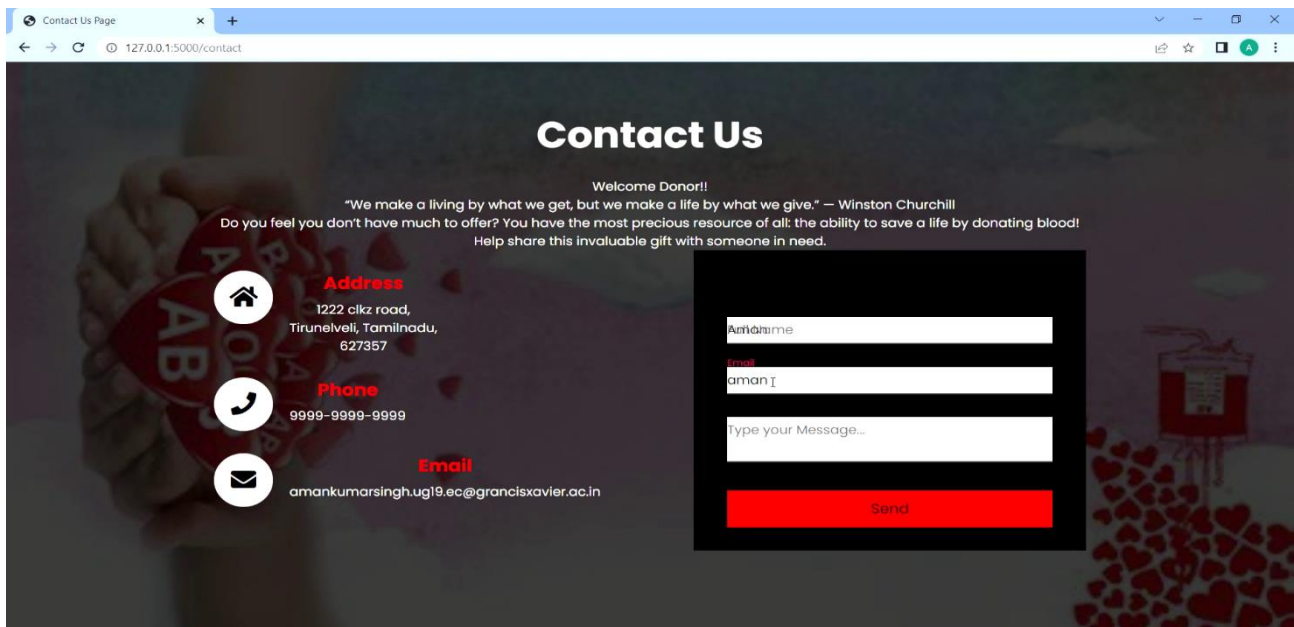
Hi! I'm a virtual assistant. How can I help you today?

Plasma Donor App




Restart conversation



## d) CONTACT US FEEDBACK



How satisfied are you with our application's performance?

Unhappy Neutral Satisfied

Send review

## **7)DISCUSSION**

Here, we discuss how the blood donor application works with the three types of users.

### **Blood donor**

Donors can be individuals and blood banks. Donor users can register to the application to receive notification about blood donation requests when their blood type is required for an admitted patient to a clinic. In the online registration, users need to provide information about their blood type and address. Once the user login, he would be able to see the latest blood donation requests in their city/region using “Blood Requests”. Each notification contains information about the required blood type and the clinic address together with a request status as pending if the donation is not done yet. If someone has donated, then the request status is marked as success so that potential donors would receive an updated notification indicating that the blood donation has been made and there is no further donation is required for this request. Blood donation has a significant impact on iron stores in frequent donors, particularly females. Several measures are necessary to prevent, detect, and treat iron deficiency in donors. These include less frequent donation by donors most susceptible to iron deficiency, and better education of both donors and their physicians about iron needs associated with blood donation. Regular blood donors may require a course of iron supplements to replenish the iron lost in blood donation. These individuals can often return to blood donation, after an adequate course of iron supplementation. As a result, Donor may track his/her donation history details using “Donation History” to avoid such risky intensive donations before that the body can make up its lost red blood cells. Donors can invite friends to register to the application using “Invite Friends” to increase number of donors. When a Donor is notified about a blood request, he/she can book an appointment with the clinic that requested the donation using “Book Appointment feature”.

### **Blood requester (patients through clinic)**

When a patient needs a blood, the clinic where he/she is admitted would request registered volunteers in the same or nearby city/state to donate using the “Send Request” of the app. For example, assuming that a patient is admitted in a clinic in Toronto, those donors in Markham, Brampton areas may be notified too. Requester can send notification to donors as emergency/normal depending on the need of the

patient. In some cases, surgeries are scheduled in advance and the blood donation then, if needed, is marked as normal. Once a request is fulfilled, i.e., when a successful donation made, then the clinic can send updated notification to the previous recipients. The function “Blood Requests Feed” is to display requests from other clinics. To enhance the cooperation and communication between different clinics, “Blood Requests Feed” can be used at one clinic to pass the need of other clinics to those potential donors who are unaware of the BLOODR app. Clinics can also see their request history and donation history using “Request History” and “Donations History” features, respectively. Using the history, clinics can know how many requests they requested and how many donations made and analyze the data for further research. Clinics are informed about the appointments scheduled by donors through using “Appointments”. As a result, this application can be helpful for clinics to send request to donors, keep track of requests and donations history, and view donor’s appointments with a clinic.

## **Admin**

Admin user can manage users and analyze data. User management includes adding/deleting co-admin users using “Admin Users” feature shown in. Admin can track the list of donations made at all clinics using “View Donations”. This donations’ follow up can be used to alert those donors who have frequent donations to avoid risks explained earlier. Admin can also view all requests made by clinics “View Requests”. This can be used to alert donors (registered or not) in situations where the donations are not enough to fairly respond to the increasing number of requests. Admin can see the registered donors list using “Donors List” to alert/delete those donors, if necessary, who are inactive for a period of time. Also, admin can encourage those limited number of donors in a specific area/city to invite their friends and relatives to register to the app. Admin can see the registered clinics using “Requesters List” to encourage those unregistered clinics to use this app. Using this data collected from all these admin features, admin can do data analysis.

## **8) CONCLUSION :**

Plasma is a liquid portion of blood; it is a mixture of water, proteins and salts. Antibodies are proteins made by the body in response to an infection. People fully rescued from COVID19 are encouraged to donate plasma, which can help to increase the lifespan of other patients because their plasma contains antigens which helps the affected person to recover faster. These immunoglobulins give your immune system a way to fight the virus when you are sick, so your plasma can be used to help others fight off illness. Individuals must fully resolve symptoms for at least 14 days prior are eligible to donate.

## **9)FUTURE SCOPE :**

User interface (UI) can be improved in future to accommodate global audience by supporting different languages across countries. Data scraping can be done from different social networks and can be shown in the Blood Request Feeds. Appointments can be synchronized with Google and Outlook calendars for the ease of users.

## **10)REFERENCE :**

- [1] Dennis O'Neil(1999). "Blood Components".Palomar College. Archived from the original on June 5,2013.
- [2] Tuskegee University(May 29, 2013)."Chapter 9 Blood".tuskegee.edu. Archived from the original on December 28, 2013.
- [3] "Ways to Keep Your Blood Plasma Healthy". Archived from the original on November 1, 2013.Retrieved November 10, 2011.
- [4] Jump up to Maton, Anthea; Jean Hopkins; Charles Wiliam McLaughlin; Susan Johnson; Maryanna Quon Warner LaHart; David LaHart; Jill D. Wright (1993), Human Biology and Health, Englewood Cliffs, New Jersey,USA.
- [5] The Physics Factbook - Density of Blood.[6]Basic Biology(2015)."Blood cells".
- [6] Elkassabany NM, Meny GM, Doria RR, Marcucci C (2008). "Green Plasma Revisited". Anesthesiology 108(4);
- [7] "19th WHO Model List of Essential Medicines(April 2015)"(PDF). WHO April 2015. RetrievedMay 10, 2015.
- [8] Tripathi S, Kumar V,Prabhakar A, Joshi S, Agarwal A(2015)."Passive blood plasma separation at the microscale; a review of design principles and microdevices". J.Micromech, Microeng 25(8); 083001.
- [9] Guo, Weijin; Hansson, Jonas; van der wijngaart, Wouter(2020)."Synthetic Paper Separates Plasma from Whole Blood with Low Protein Loss".Analytical Chemistry.92(9): 6194-6199.
- [10] Mani A, Poornima AP, Gupta D(2019) "Greenish discoloration of plasma: Is it really a matter of concern?", Asian Journal of Transfusion Science.
- [11] Starr, Douglas P.(2000), Blood: An Epic History of Medicine and Commerce. New York:Quill.