iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** XI **Month of publication:** November 2023

DOI: https://doi.org/10.22214/ijraset.2023.57097

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue XI Nov 2023- Available at www.ijraset.com

E-Blood Banking System Using Cloud Computing

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Abstract: ***Across the globe, there is an ever-increasing shortage of blood, which has led to many deaths. These losses are mainly due to the lack of a centralized blood donation system. Technologies have enhanced the efficiency and effectiveness of every aspect of the health industry, and information systems manage the distribution of blood through cloud computing. An automated system is needed to superintend the centers and provide information to interested parties. Research methodology involves a exploratory literature review and using aforesaid studies related to the ongoing situation to collect data. Our goal is to eliminate these problems through this website that satisfies all these requirements. The integrated framework includes a database for storing blood donation data in a centralized location for analysis. A database is used in this system to manage and store the data using HTML,PHP, and MySQL. In addition to educating the local community on the importance of blood donation, the website provides easy access to blood donation information, allowing hospitals in India to store and distribute blood. As a conduit between health care systems and the public, the Arogini blood bank management system acts as a liaison. In a short period,the system will enable users to locate donors who havespecific blood groups, permit new donors to register, and help patients to request blood.***
Keywords: (Internet based application, cloud computing, application programming interface, blood transfusions, non- verified donors)

I. INTRODUCTION

Meeting the needs of a customer, either onboard or online, is essential. Technology advancements have resulted in more inventive services these days. Here the question arises: Are we able to adequately serve the need? However, there are still many loopholes that might appear insignificant now, but will cause great destruction in the mere future, and may cause many services to fail.

Life depends on blood, from minor injuries to major surgeries, and blood banks play a major role in providing this need. This stores and collects blood in anticipation of its use for transfusions. These blood banks are in laboratories, ensuring the safety of donated blood and blood products. A blood donation occurs when a person voluntarily donates blood. In hospitals, the blood may be used in the future for transfusions when treating patients who need them. A person may donate whole blood (blood that has been drawn from the body) or specific components of the blood, such as platelets, plasma, and red blood cells. Blood banks play an integral part in the process of collecting blood and other procedures such as managing stocks, processing blood requests and updating donor information.

As the modern world has evolved technologically as mentioned earlier, easier and more convenient methods of working are now available online, including bank setups and systems. Blood requirements in an emergency can be met by the bloodbank. Likewise, the blood bank is reimbursed by the recipients' relatives or friends. Every blood bank must maintain certain units of blood for each blood group. And thus, the idea of an e- blood banking system via cloud computing which has been covering all these ambiguities is prepared. This project is a response to the ongoing pandemic of COVID-19, where four potential challenges arise due to the lockdown of transfusion services.

1) Donor and staff safety
2) Consumable supply and logistics
3) Servicing the needs of convalescents with plasma.
4) Lack of blood and its components

Blood banks play a vital role in ensuring an adequate blood supply. Their main task is to supply blood to hospitals to assist the present growing needs. Due to the manual nature of current blood bank management, blood banks find it difficult to maintain precision and reliability. Therefore, if the stock of blood is not available or insufficient, it is imperative to automate blood storage and management. Any emergency requires a large supply of blood. Our goal is to enhance the functionality of the system that stores, retrieves, and analyzes information regarding administrative and inventory management. [1]This is done by automating the blood management system in ablood bank. In an emergency, such a system would prove useful. In order to enhance the functionality of the current system, which stores, retrieves, and analyzes data about administrative and inventory management within a blood bank, we intend to automate the blood management system in a blood bank for use in the event of a blood bank emergency.

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With the knowledge that patients are more likely to call and get connected to nearby blood banks easily, our emergency service was created. This assists needy blood donors seeking donors while also using cloud services to keep track of donors' information.
This study aims at examining whether using online banking systems enhances blood transfusion safety as well as improves customer service.

Therefore, the following specific issues are addressed in this study:

a) What is the expected user base of the system?
b) What is the appropriate system architecture?
c) What is the extent to which the online bank management information system can boost blood quality transfusion safety?
d) Does the risk level of blood transfusion for manual blood transfusions and online blood banks differ significantly?

It will be beneficial to the management of blood bank information if the findings of this study are adopted. In addition, the system will allow hospitals to advertise on the homepage of the system if they want a particular type of blood. In addition, information aboutthe blood donors and their blood types will be available in each blood bag, and their expiration date will be indicated as well. The system can also be utilized by physicians to administer blood bags to theirpatients.
Here are some of the main benefits of the system:

- Donor details can be accessed and managed easily by the staff at the blood bank.
- The system can be used to view the expiration date of blood bags.
- Blood bags issued to hospitals can be reported.

Table 1: Compatible Blood type donors

BLOOD TYPE	DONATE BLOOD TYPE	RECEIVE BLOOD TYPE
A+	A+ AB+	A+ A- O+ O-
O+	O+ A+ B+ AB+	O+ O-
B+	B+ AB+	B+ B- O+ O-
AB+	AB+	Everyone
A-	A+ A- AB+ AB-	A- O-
O-	Everyone	O-
B-	B+ B- AB+ AB-	B- O-
AB-	AB+ AB-	AB- A- B- O-

II. LITERATURE SURVEY

A. Existing System

In this study, we gather and analyze data related to blood banks located in urban and rural areas. Few hospitals have blood banks with all the technical capabilities, but these facilities are insufficient for rural areas. [2] Cloud computing, health care, and social media have blended into several research programs. The existing system searches the cloud database based on the given blood group and quantity. The hospital can view the results when searched on the website.
Based on the geographical proximity of the blood banks, these results include basic information about the blood banks that hold that specific blood group. The Indian population does not donate blood over 10% despite the availability of potential donors. Modern medicine has increased blood demand. Additionally, most blood donors don't know the need for blood until they donate.
Some sources provide an online platform for blood donation:

1) American Red Cross Blood Services

The American National Red Cross Society[9] owns and maintains the website, a well-known organization providing health services. Blood donors can use this website for their blood donation needs. They organize blood drives to collect blood from donors and distribute it to blood banks. The company collaborates with various events, such as the Superbowl, to offer discounts to those who donate blood. Using this website, we can also participate in their activities as volunteers, which allows users to participate in conducting blood drives. Despite this, they do not provide the option to request emergency blood donations, even though it is an essential part of the whole process.

2) Blood Bank India[8]

A variety of functions are available on the site, including searching for available blood, registering donors, and requesting blood. As soon as one opens the website, the latest requests and recent donors are displayed. It is not a reliable source for all scenarios since it does not provide accurate location-based search results. There is no integration with blood banks. Any random user can obtain the contact details of donors without authentication, and the legitimacy ofdonors is not verified.

3) e-RaktKosh

E-RaktKosh[10] is a centralized system for managing blood banks. The Ministry of Health and Family Welfare holds this initiative. This website lists information on blood banks across the country. A list of blood types is made available. However, the data provided is not accurate. The site also includes information on blood banks, including contact information and locations.

4) Drawbacks of the Existing System

The website maintains a database of active donors that allows us to respond quickly to blood requests. To collect the blood which is to be saturated, we may use mobile camps, mobile vans, blood donation centers, and more for these events. In addition to voluntary blood donation programs, there are other types of blood donations. Since blood donors are self-selected,non- paid volunteers are considered the safest, and blood donation is highly trusted. There are defined operational guidelines and frameworks for this vital activity to increase the practice of voluntary blood donation in developing countries such as India.

B. Proposed System

The cost of developing and installing a system that the developer will use should still make it a sound investment for the organization. The system is financially viable. The organization would not have to purchase any additional equipment or software. The interface for this system uses existing resources and technologies, so there is only a nominal expenditure and economic feasibility associated with it. It will facilitate emergency services by providing easy access to Blood bank systems. In case of an emergency, users will be able to find the nearest blood bank using this system. Maintaining consistent minimum quantities of each blood group in the blood bank can eliminate the time-consuming process associated with blood services by having a database on our site that keeps track of active donors and responds to blood requests quickly. This database is constantly updated. When emergency blood is needed, this database allows us to locate and locate the closest donors. Information about the donors is kept confidential. Once the validity and legitimacy of the request are verified, the details are made available to the requestor. Our website can be divided into three modules, namely, Registration, Request, and Admin, to explain the entire process in a nutshell.

1) Registration

The registration module includes procedures for registering donors, blood banks, and requestors. Donors may register either validated or non-certified donors in the system. Non-verified donors must provide basic contact information and blood group when creating an account. The system will supply them with blood donation camps near them, and the administration can verify their accounts if they donate blood at the centers. In addition, you can also confirm the charge by sending a valid doctor's certification that demonstrates your eligibility to donate blood.

2) Request

An individual or a blood bank can initiate a blood request. The procedure is much simpler if the requestor is a blood bank. The system automatically processes blood requests since blood banks are alreadyregistered users. It also displays a list of donors who are part of the searched blood group. We will now send notifications to selected donors and record their responses. A donor who accepts the request meets the blood requirement, and the requestor and donor can communicate.

3) Admin

It is the administrator's responsibility to verify donor accounts and requests. The verification process is by examining the documents uploaded by users. The administrator manages notifications sent to users about blood donation campaigns. Those interested in searching for the availability of a particular unit of blood in that region can use the system without providing information about donors. The administrator's responsibility is to maintain the database to keep track of the blood requests satisfied. To ensure that search results are populated only with active donor’s accounts inactive for about six months should be deactivated with prior notice. A donor may report fake requests to the administrator, and the administrator will temporarily block the respective requestor.

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III. METHODOLOGY AND MATERIAL USED

The approach is diffused to (blood bank name) alleviate barriers and improve system efficiency access. The web application follows quantity and quality methods to build the algorithm for the whole system. Various software and languages as project tools play an essential role, providing an excellent foundation for the entire structure.

A. Methodology Algorithm

1) Step 1: Become a donor by filling in the form. The locations of the donors are saved to the database and are also saved in search donors.
2) Step 2: Request blood by filling in the form. The donors' requests are saved to the database and are reflected in the current requests.
3) Step 3: Track the location of the user if blood is requested;
4) Step 4: Verify if a nearby blood donor is available.
5) Step 5: If the donor is eligible, accept.
6) Step 6: If the conditions are not satisfied, send the notification to other nearby donors and eligible.
7) Step 7: Admin updates the status of the donor.

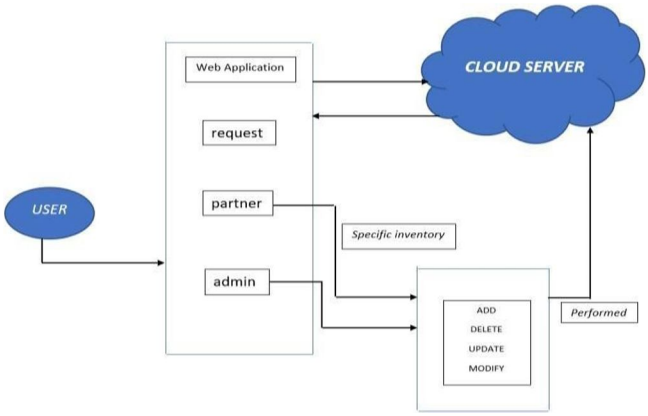


Figure- 1: Physical Architecture

The whole system is divided into seven modules, namely:

a) Home
b) Admin
c) Become Donor
d) Search Donor
e) Request Blood
f) Current Requests
g) Blood Banks

The application has focused on efficiently developing connections to manage various blood banks and donor- recipient operations. The central repository contains details on different blood groups and a list of their available donors, hosted on a cloud server. This repository includes donor name, blood group, medical info, and location. In addition to determining whether a particular blood group is available at nearby blood banks or among registered donors, cloud servers also allow one to determine whether an individual blood group is public. Requesters will be able to find the nearest blood banks and donors based on the location of their request. The complete procedure is divided into three parts of the whole system is as explained below:

- ❖ THE MAIN PAGE
- ❖ REGISTRATION AND SEARCHING FOR DONORS
- ❖ REQUEST FOR BLOOD AND UPDATES IN REQUESTS

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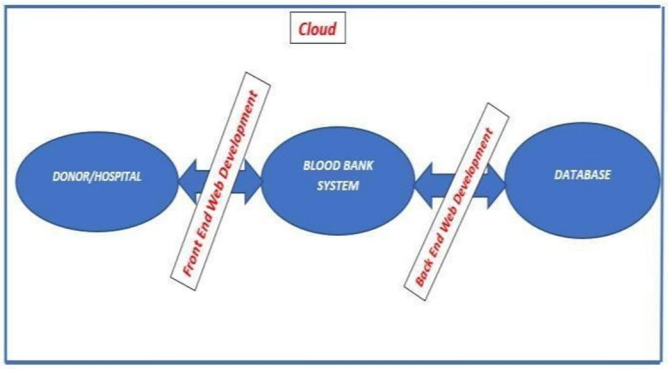


Figure- 2: Software interaction modules

B. The Main Page

1) Home

The website's home page is designed for admin, donor, and patient login. The home page provides a navigation bar with multiple options and displays a dynamic record of donors and blood units in the blood bank. The home page ends with a short description of the blood bank. The user is allowed to become a donorby registering for the same by clicking on the user button. To direct the users to different portals on the website, all the options for the user to perform particular tasks like searching for a donor, becoming a donor, Current request access, and general informationfor contacting the admins are provided on the main page.

2) ADMIN:

The admin panel is for admins who verify the requests and donor accounts, where the verification is done by checking the data provided and uploaded by the user/requestor. There are provisions in the admin for finding blood availability in a particular location, updating the status of the donor, and checking whether the donation has been completed successfully.

Additionally, updating requires activating and deactivating once the blood donation has been completed successfully and after not being active, respectively. During entering data into the system and displaying the status, the administrator deals with all security.

C. Registration and Searching Fordonors

1) Become a Donor

Become a donor is the registration module, which outlines the procedures for donor registration. A donor can register to the system by providing the details of the donor's name, date of birth, blood group, address, contact number, email id, and gender. The administrator checks for the eligibility of the donor to donate blood. During the registration process, donor location information is collected to facilitate efficient searches for nearby donors. A link will be automatically established between the module and the search donor module when the location shared by the donors is stored through API. The search donors' option will provide the requester with the designated place where they can search for nearby donors.

2) Search Donor

Locations entered by donors are added to the database and reflected when searching for donors within reach. The module takes the input of the location searched, matches the neighbor donor locations, and provides the requestor with the exact area of the donor along with his needed particulars (name, contact number, email id, blood group, gender, and location).

3) Blood Banks

The module provides the data of all the blood banks as the database is already stored in the backend. When the requestor searches for a blood bank in reach, the location is matched to the data present, and the details (blood bank name, location, contact numbers) of the nearby blood bank are reflected on the same. This keyoption will help the requestor quickly contact the blood banks instead of waiting for a donor in case of their absence.

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D. Request For Blood And Updates In Requests

1) Request Blood

Individuals raise blood requests. The requestor can provide the following information: Patient name, Gender of the Patient, contact name (the person who requests blood on behalf of the patient), Phone number, Email address, Blood Group, Date of blood requirement, City, Doctor name, Hospital details and can also provide comments in case of an emergency. All the provided data is saved to the database, and the request is sent to the admin. The system will now notify all selected donors and record the response.

2) Current Request

The current request module is connected to the database, which has all the details of the requesters forblood. The system will update the requests every time a new requester is added. In case of an emergency, donors can access the details of the requesters from thecurrent requests sections and donate blood.

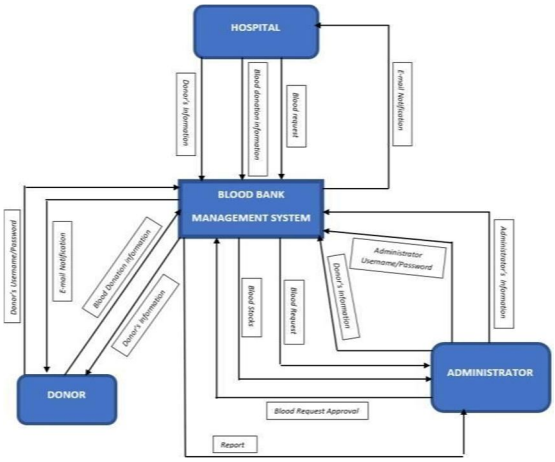


Figure- 3: Context diagram of blood bank management system

IV. RESULTS

A. Home Page



Figure-4: Home page

B. Request Blood

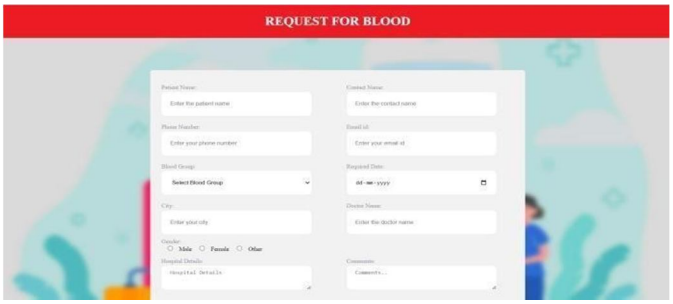


Figure-5: Request Blood registration form

C. Become Donor

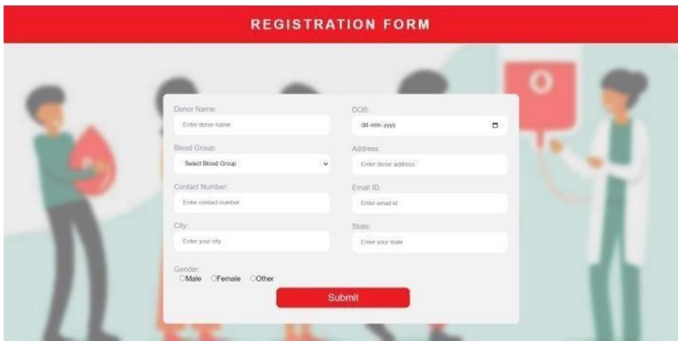


Figure-6: Become Donor registration form

D. Current Request



Figure-7: Current Request

E. Admin Dashboard

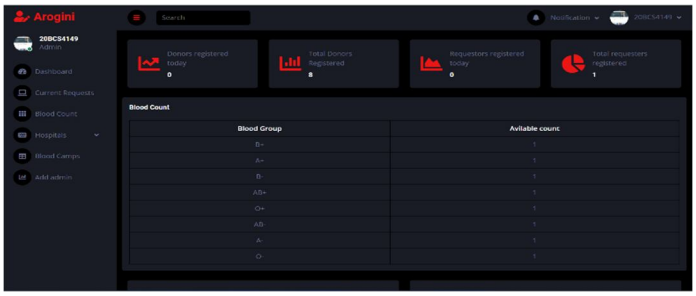


Figure-8: Admin Dashboard

F. Blood Camps

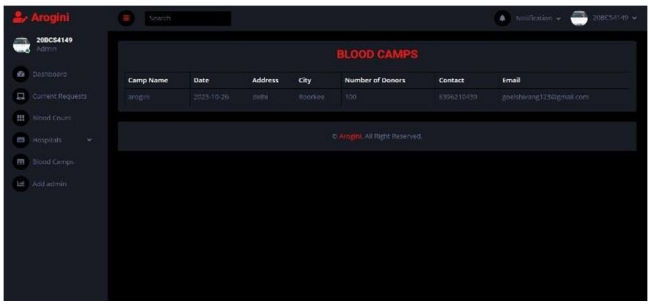


Figure-9: Information of blood camps

G. Charts And Details-Admin



Figure-10: Charts for donors

H. Admin Login



Figure-11: Admin Login

I. User Dashboard

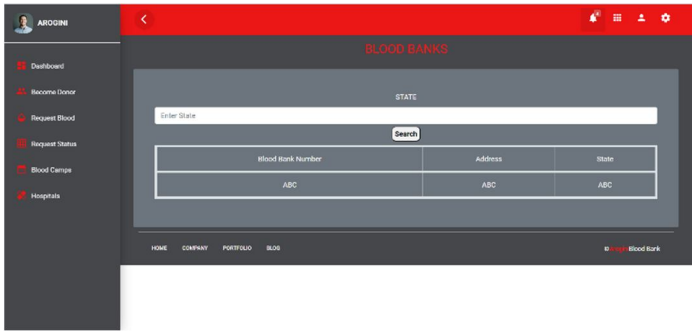


Figure-12: *User Dashboard*

V. CONCLUSION

Arogini blood management system is designed for helping people who require blood and for those willingto donate blood in an emergency. It is a cloud-based web that connects the blood donor/receiver with the hospital. This blood bank management system helps todo multiple tasks without standing in any line by just being at home through any device. This system shows the statistics of requested blood and the availability of blood. We strictly observe the confidentiality and security of all information of our users. The time is forthe public to become more confident and trusting of these blood services, where we hope to provide a single access point for all blood-related services and information. By increasing participation and usage, thesystem becomes more efficient. Given the importance of patient safety and life, the system will unequivocally offer benefits to the health sector; in thefuture. As a 24*7 system, this system is crucial for different kinds of people, including staff at blood donation centers, donors, recipients, and other users.

People can find information about blood donation systems, donors, and recipients of blood donation. In times of emergency, this system can help donors get their information right away. Its intention is to set up an online platform for matching mutually giving blood donors and patients who need blood.

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Our focus is on creating an interactive donor, blood requester, and blood bank clinic experience. The Web application system in its present form is envisioned as a dynamic site that requires constant information updates from both blood donors and blood requesters, and to enable both blood donors (volunteers) and blood requesters (patients) to place profile information and publish requests.

VI. DISCUSSION

Every year more than 100 million people donate blood, and there are approximately more than 12000 blood banks or blood camps situated in about 150 countries. About 35 percent of women and the majority of men donate blood worldwide. Statistically,donors of more blood are adults, whereas older individuals are more likely to have a health condition that makes them unfit to donate blood. Additionally, some people are unaware or believe that blood donation is a myth. As well as completing the tasks assigned to it, this software guides the user in the correct manner of blood donation.

Donors of blood can be divided into three categories:

1) Unpaid voluntary
2) family/replacement
3) Paid

It is possible to supply blood adequately and reliably through a stable source of unpaid, voluntary donors. Moreover, this group has the lowest prevalence of blood- borne infections, making them the safest group of donors. According to a resolution adopted by the 63 members of the United Nations General Assembly have been urged to develop national blood systems based on voluntary, unpaid donations and to make them self-sufficient (WHA63.12).

Unpaid blood donations have increased significantly according to the WHO:

a) The most common method for collecting blood is by voluntary unpaid donations in 73countries (38 high-income countries, 26 middle-income countries, and 9 low-income countries).
b) Among these 60 countries, 100% (or more than 99%) of their blood supply is donated byvolunteers.
c) Nearly half of the world's blood supply is still secured by family blood donors and paid blood donors (8 countries with high incomes,48 countries with middle incomes, and 16 countries with low incomes).
d) Approximately 1.5 million paid donations were collected in 2012 by 25 countries.
e) From 2004 to 2012, 162 countries reported an increase of 8.6 million blood donations from voluntary, unpaid donors.
f) Southeast Asia (78%) and Africa (51%) experience the highest increases in voluntary unpaid blood donations.
g) In the Western Pacific region, the absolute number of cases increased the most.
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m) Southeast Asia (78%) and Africa (51%) experience the highest increases in voluntary unpaid blood donations.
n) In the Western Pacific region, the absolute number of cases increased the most.

A. What is a Blood Transfusion?

In researching blood transfusions, researchers find that it is an exceedingly challenging procedure that can be life-threatening if not completed correctly. During an emergency, the demand for blood supply rises high, and we face many challenges in blood donation and transfusions because of the shortage of blood supply. This sacristy is primarily because of the lack of bloodstock management, incomplete data or information, and lack of communication. The study sought to establish relationships between hospitals, blood banks, and blood donors. Theblood banks have a shortage of blood because of the lack of management and analysis of the received bloodbags and donated blood. To meet the requirements of their viable needs, hospitals interact with their blood banks. It is not very efficient in an emergency for people to check with their blood banks or other blood banks for the availability of specific blood. The process of searching takes a long time and can lead to somebody's death.

The findings of this research paper are statisticson the patients who need blood. It is easy to access on all kinds of devices. In addition to serving as a bridge between hospitals and donors, this system also alerts hospitals before blood supply runs low. The information about the current requests is to be shown on the web so that users can contact the person without having a third-party in-between. Typically, the admin and the user access the digital blood bank modules, with the data being stored and retrieved manually, which makes the system slow and inefficient. Instead, the databases store and retrieve data.

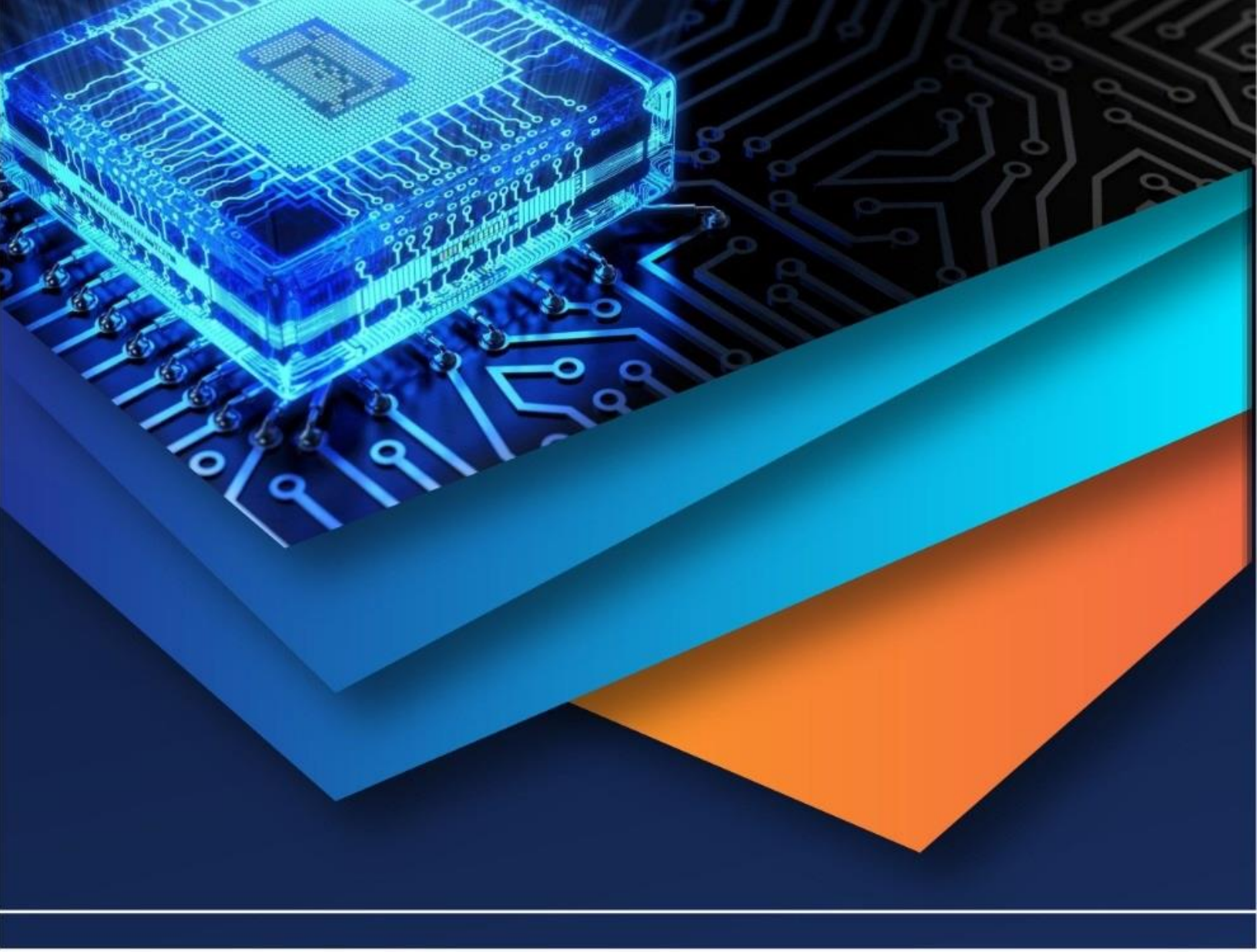
Web applications use the cloud to connect themselves to the internet. A server in the cloud creates this system to store the database and make it accessible via the internet.

Because there are many cloud models, this system uses IaaS (Infrastructure as a Service). In addition, it is cost- effective where no servers need to be purchased, where we rent required servers, and pay-per-use.

Depending on demand, we can change the storage type so that users can access information even during peaks in traffic. The blood bank strives its best to reach all the needs and facts mentioned above.

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