



Proposed Blood Donation System for Rural Areas: A Case Study in Iraq

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ABSTRACT

Blood donation saves people’s lives every day in various situations. Compared to the actual need, extremely few people donate blood. This study introduces a proposed System for managing blood donation in rural areas. Any hospital, blood bank, or medical facility that employs blood banks can employ a blood bank management system. This study's primary objective is to suggest a blood donor management system specifically for third-world rural environments. Firstly, a web application developed using the appropriate Server and Client-side scripting languages. Secondly, an Android application was developed to be installed on the donor’s mobile. The goal of such systems is to stop the anxiety brought on by a blood shortage in an emergency. In an emergency, the proposed system can locate the necessary amount of blood from a blood bank or even a blood donor. The proposed system provides a service for the donor to communicate directly with the patient who needs blood, and the patient can search in the nearby area to invest time that could contribute to saving the patient's life.

Keywords:

Emergency, Donors, Blood Bank, Rural Area, Donor management .

1- Introduction

Traditionally, a patient who requires blood must get in touch with a blood bank or a potential donor from their network of friends, family, and acquaintances who has the appropriate blood type [1]. However, finding a qualified donor within a small number of persons at a given time is challenging. There is also no assurance that blood banks will have compatible blood groups on hand. Modern smartphones have made a substantial improvement in RAM, storage, and the number of additional appearances [2, 3].

Because it is an open platform, Android OS is frequently used by manufacturers of smartphones. Numerous sensors are contained in the hardware that makes up Android smartphones. The Google Play store offers a wide variety of unique appliances (apps) for installation. The study in [4] proposed an

application for blood donor . The donor can use GPS in that application to determine the precise route (Global Positioning System). It will be possible to save blood donor information. Only the administrator is permitted to view private and confidential information. They have methodologies like PHP,MY SQL, Android .

In “ MBB:A Life Saving Application “ by Narendra Gupta et.al [5]has proposed a method to create a website with android application . They have proposed that the donor is monitored using a Geographic Information System in their application (GIS). The website's goal is to modernize their present system, which only allows authorized users to read data. They contain two device type:1)An android phone with android os, 2) A computer for website and database which is used to store the information about the donor In “ An

Android Application for volunteer Blood Donors “. The study in [6] Presented a volunteer blood donor application, with the main goal of this application being to notify Rh++ of the donor location on a regular basis. Rh++ is a clever information system that aims to manage the blood supply and donation chains.

to create a system that connects each blood bank and donor in a chain, allowing this connection to help patients who are in dire need of blood. Such a system is intended to lessen confusion and panic in emergency situations, allowing the patient's family to remain together rather than racing to acquire blood. The user has the option to both request blood and donate it in the suggested system. The user can keep the app updated and maintain making regular donations to keep track of when they are next eligible for donations. Rural and remote areas lack health care systems and institutions such as hospitals, medical centers, and blood banks. Also, adhere to a stringent system for obtaining units of blood in an emergency. So these reasons may lead to a risk in the lives of patients or those who need a blood transfusion or due to various accidents and may lead to death. If the required amount of blood is available, the hospital will provide it. Otherwise, the patient's relatives will need to do a disorganized blood search. The current system has a slow response time, is exceedingly complex, and is not subtle. Quick blood updates are not supported by the system. Furthermore, it does not link donors in a chain for emergency cases.

2- Literature Review

Information and communication technologies (ICTs) are widely used (smartphones, smart TVs and tablets). The rapid expansion of m-health has been affected by the development of smartphones and tablets because of the need to make quick life-saving decisions in several events, such as road accidents, major surgeries, long-term treatments (chemo or blood treatment) and regular blood transfusions in special situations, such as patients with anaemia and thalassemia. Specifically, Android devices offer various health and medical

applications that aid patients and caregivers in reducing effort and saving time. Applications can assist a blood donor or a person in need of blood in determining how, when and where the blood donation is complete, particularly mobile applications[5, 7, 8] For the reasons above, numerous researchers and developers have contributed to enhancing the blood donation process by designing or developing systems, applications and prototypes depending on different technologies. They have used an Android system based on mobile applications with GPS technologies to improve the blood bank system, management and ability to find the nearest blood donors. For instance, in Algeria, the Zomraty application[4] saves thousands of lives by connecting volunteers to donate blood and individuals in need within 10 kilometres of the user in need of blood. Meanwhile, the prototype in[5] is a blood donor system based on a smartphone application that uses crowdsourcing to find donors within 5 kilometres. Furthermore, the project in[9] uses smartphones to store information on donors and local hospitals by tracking the position of the neighbouring blood banks or hospitals using cloud computing technologies. In addition, the research in[10] proposed an approach to shorten the donor and recipient time using an Android application with a GSM modem and a Raspberry PI to provide real-time results. Creating an Android mobile application framework[6] will make blood services more accessible to blood banks, blood donations and blood recipients. Meanwhile, another study[11] presented the correlation between the existing blood bank framework of the blood bank information system and an upgraded framework to increase effectiveness. Such improvement is dependent on the database, web services and mobile services that use data from the cloud. Meanwhile, other studies have focused on web applications to provide information on blood and organ donation that blood banks and patients need in emergencies. Hence, researchers have created a one-of-a-kind platform, a web application, through which registered users can enter the system's blood and organ management system[12]. In

In addition, the intelligent GIS-based organ and blood donation system increases efficiency in donation areas based on a web application built with HTML5, CSS3, JavaScript, PHP and AJAX[13]. The system described and executed in[14] has been proposed and implemented as a functional system for the blood bank service system to thrive even in the most remote areas. It is straightforward for both young and older adults, as it ensures that patients have immediate blood donors in any circumstance. Given that the system is a web application that uses Unstructured Supplementary Service Data (USSD) code, Short Message Service (SMS) and a free toll line, it is available for online and offline database searches. To reinforce the effective information management of blood banks and to find blood donors in emergencies, other researchers proposed to merge both web-based and Android-based applications[15].

A mobile application provides direct communication between the donor and the beneficiary by allowing them to send SMS notifications. Meanwhile, a web-based program can generate a database using a web interface and store the collected data in a centralised server[16].

To sustain and increase the number of blood donors, researchers also developed a blood donation promotion application and built a

donor support system as part of a new framework focusing on a service design. The design is called the Blood Donors Support System (BDSS). In addition, a survey on awareness of blood donation promotion applications was undertaken[17].

3- Methodology

3.1 Proposed System Architecture

Our application is being created to drastically reduce the amount of time spent looking for the right donor and the amount of blood that is available. As a result, this application delivers the required information quickly and facilitates quicker decision-making. This helps the citizens of rural areas and far from city centres to stay with their patients from the families or friends in danger situations, rather than getting scared and searching for blood units. by providing a database-based real-time application for connecting blood banks and donors.

Client and server are the two components that make up the system. The user side and the blood bank side are the two components of the client side. These parties will use tablets and mobile phones to access the system. Users can use this to check whether they qualify to donate and to find blood units when they're needed, and blood banks can use it to update the blood units they currently have available.

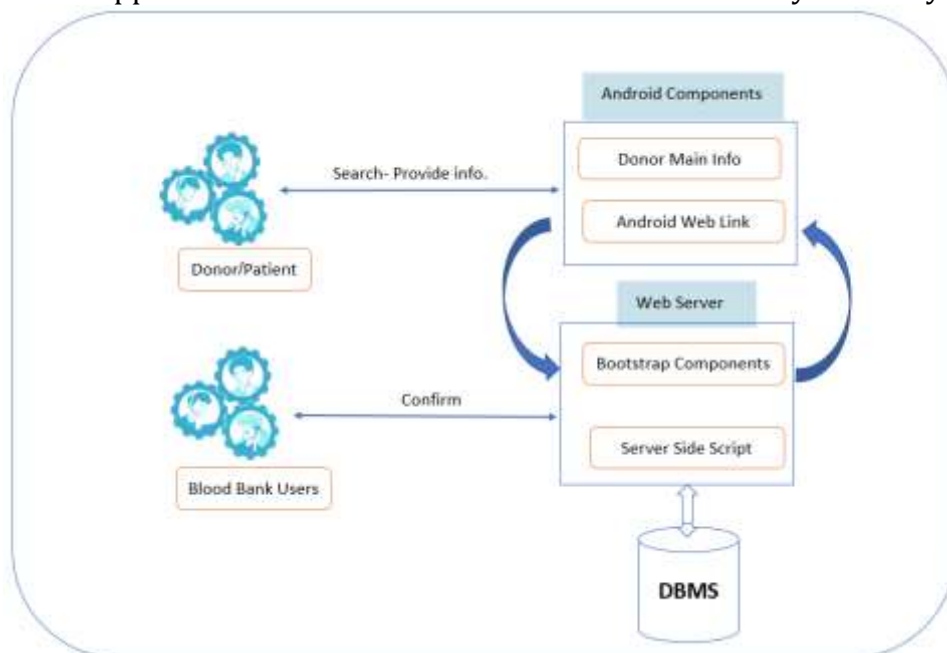


Figure (1):- Proposed System Architecture

Information about users and blood banks will be stored in the server's real-time database. Information about users and blood banks is stored in a real-time database on the server.

3.3. The Flow of the Proposed System

The proposed solution consists of an Android application designed for individual users and blood banks linked by a network. Before using the system's features, both blood banks and individual users must register. At first when registered, the verification process begins, and

an email confirmation is sent to the registered email address. The user's data will be permanently stored in the real-time database once the verification is completed. The registration information will be very important because it will be used in an urgent situation. When a user searches for blood units, the contact information will be displayed. When searching, the application offers a direct calling feature. Blood banks will have the ability to keep updating blood units as soon as blood is given to patients or received by other donors.

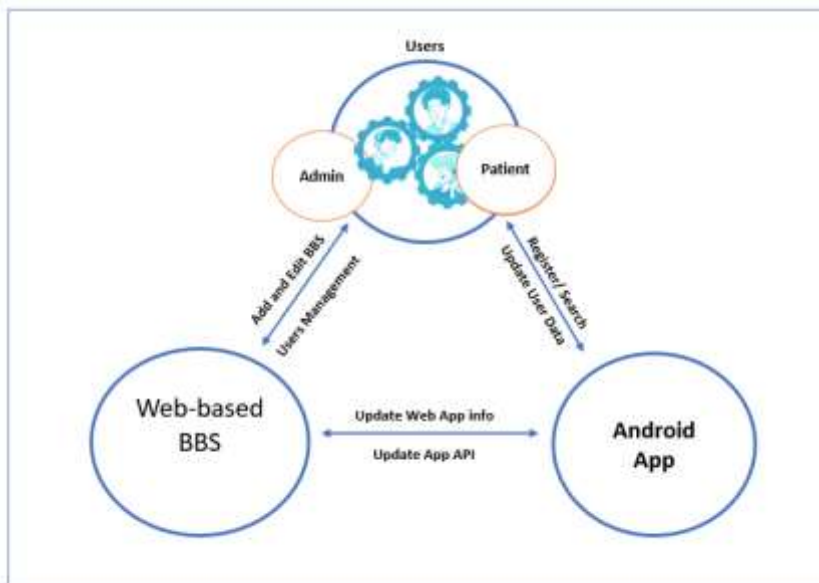


Figure (2):- Proposed System flow

4-Implementation.

Android is a Google-owned open-source operating system designed specifically for smartphones and tablets. Android is built on the Linux platform. By using an android-based application, the limitations of the existing system are avoided. The application is built on the Android Software Development Kit and coded in Java. Firebase provides connectivity

and a real-time database to the back end. The authentication process is also handled by the Firebase API.

A sitemap is a visual or textual representation of content and interactive content that allows users to navigate the web, which guides the users in recognizing the correct direction of the site and will serve as guidance.

Figure (3) shows the sitemap of the web application of the proposed system.

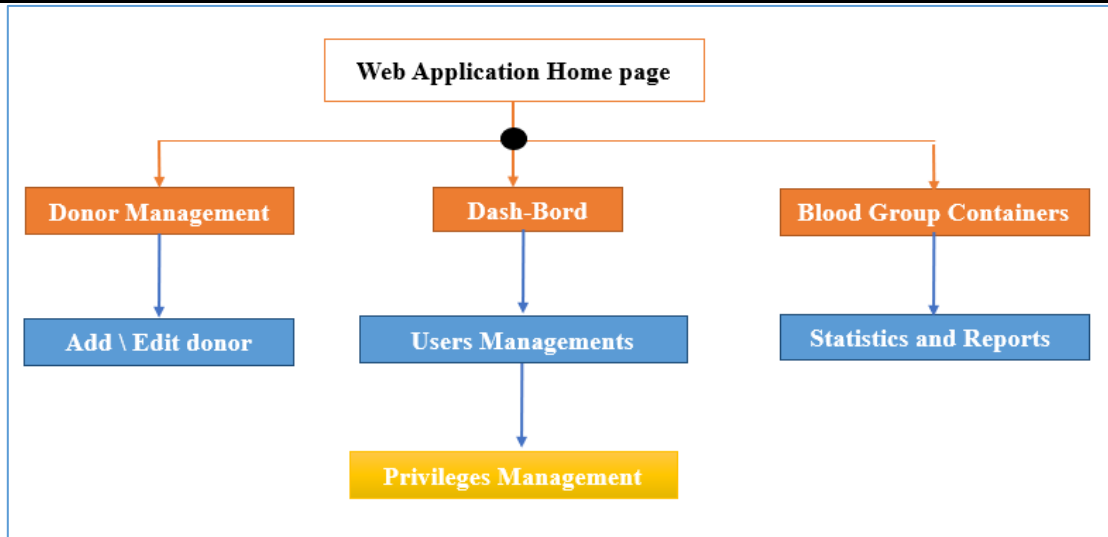


Figure (Error! No text of specified style in document.): Web Application navigation map

4-1 Interface Design

The design of a user interface is a type of software design. The screen is constructed the system's requirement to finish all required

functions. Figure (4) shows the login page for both the admin and medical staff. This form required the username and password to go to the next page.

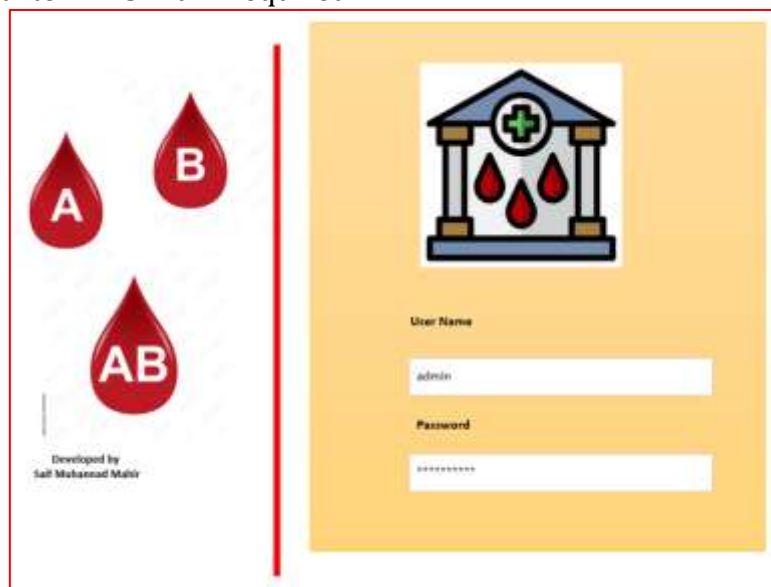


Figure (4): Login page

It is a launch page to the proposed donor management system as in Figure (5) which is responsible for showing all the web Application functions: user managing, privileges

managements and permissions. Monitoring the blood group quantities and shows the notifications.



Figure (5): Dashboard page

The following functions can be managed using the proposed Web application

1- Add Donor page: Adding, editing and managing the don information after the clinical test.

2- Add and Manage Blood Banks page: This section is responsible for add and edit the blood banks information.

3- Managing page of the account period validity (system policy):

This section is responsible for managing the duration date of the blood

banks and sub-blood centers accounts.

4- Users policies management page:

Users policies management section, which is responsible for managing the registered users.

5- Conclusion

The main objective of this study is to propose a blood donor management system dedicated to rural areas in third-world countries. Firstly, a web application developed using Server and Client-side scripting languages. Secondly, an Android application was developed to be installed on the donor's mobile. The goal of proposing systems is to eliminate the panic caused during an emergency due to a lack of blood. In an emergency, our system can locate the necessary amount of blood from a blood bank or even a blood donor. The proposed system provides a service for the donor to communicate directly with the patient who needs blood, and the patient can search in the nearby area to invest time that could contribute to saving the patient's life. Moreover, the proposed Blood Donor

Management System study aimed to take an active part in saving human lives and reducing panic in emergency situations. The Android-based Blood Bank Management system is designed so that users can see information about authorised blood donors and blood banks such as name, address, and phone number, as well as blood type detailed information and medical information. It not only connects users to various donors, but also to blood banks.

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