

UNIVERSITY OF NAIROBI

SCHOOL OF COMPUTING AND INFORMATICS

**VIRTUAL BLOOD BANK (V2B)**

*BY*

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*A project proposal Submitted in partial fulfillment of the requirements for the award of Bachelor of Science in Computer Science of the University of Nairobi.*

# **DECLARATION**

I hereby declare this project proposal entirely my own work. The work reported and undertaken in this proposal has been executed by me except where explicitly stated otherwise. I affirm that this project proposal has not been presented for any other university award.

Signed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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This project report has been submitted in partial fulfillment of the requirements for the Bachelor of Science in Computer Science of the University of Nairobi with my approval as the University supervisor.

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# **ABSTRACT**

Blood is a saver of all existing lives in the cases of emergency needs. It is the work of blood banks to receive blood from donors, monitor donors’ databases, and send the required blood to hospitals in times of need. In Kenya, blood is excruciatingly insufficient during emergencies, especially rare blood groups. The problem is not scanty number of donors, but finding willing donors at the right time. This is further aggravated by the predominance of family replacement and commercially remunerated blood donors, rather than regular benevolent, non-remunerated donors who give blood out of altruism. There is an urgent need to develop innovative ways to recruit voluntary blood donors in times of emergency. An application that allows donors and hospitals to find donors on real time and with flexibility during emergencies is thus inevitable. The proposed application uses GPS to locate donors on real time in correlation to a hospital/blood unit of interest. In the urgent time of blood requirement, one can quickly check for blood banks, donors or hospitals matching a particular and reach out to them through the App. The Virtual Blood bank (V2B) App provides list of blood banks/units or blood donors in a particular area. In this application, GPS technology is also used to trace the way to the blood bank. The user will get the route to reach the desired location and he won't have to ask manually, therefore time can be saved.

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**CHAPTER ONE: INTRODUCTION**

## **1.1 background**

Blood is a specialized body fluid that delivers necessary substances to the body’s cells such as nutrients and oxygen. Blood donations are an essential part of our healthcare system. If we did not have volunteers giving blood, many medical procedures we take for granted could not take place. Doctors and surgeons rely on blood donations to carry out life-saving and life-enhancing treatments every day. Examples of the operations include anemic treatment, people undergoing surgical operations, patients with cancer and leukemia, accidents victims, complications during pregnancy

Blood banking is a cache or bank of blood or blood components, gathered as a result of blood donation, stored and preserved for later use in blood transfusions. In addition to this, the blood type of patients also needs to be determined for compatibility sake for a blood transfusion. It is possible in some situations that the patient is unable to get the required amount of blood or some of its components at right time due to lack of interrelationship in form of a networked database among the blood banks and donors which leads to deaths.

(nation.co.ke, 2014); insinuates that, the country has 2,848 liters of donated blood countrywide which is equivalent to two days’ stock according to Kenya National Transfusion Service (KNTS). Well, this is too little to save enough lives in a country that is faced with many road accidents as well as several severe cases of blood loss during child births.

## **1.2 Problem definition**

In Kenya, on several occasions, blood recourse lacks in quantity which is a barrier to other people’s life. The problem is not inadequate number of donors, but finding willing donors at the right time i.e. time of emergency. Kenya has a blood deficit of as low as 39% yearly (nation.co.ke, 2014). In a country of more than 40 million people, it is ridiculous to imagine that we can’t meet the requirements.

Kenya requires at least 400,000 units of blood annually to deal with illnesses, surgeries and other medical conditions. However, meeting this target has been difficult. “The highest quantity of blood Kenya has ever had is 265,000 units. Kenyatta National Hospital alone uses between 110 to130 units per day (Patrick , 2015).

The problem which currently exists in the medical field is that blood is needed immediately for an injured person or for any major operation, sometimes it is not easily available even though blood banks are present. There are some websites present for donating blood were the phone numbers of the donors are present which are not reliable since they don’t get often updated. Many deaths, especially caused by road accidents and blood loss during child birth, can be avoided if nearby, benevolent and non-remunerated donors can be found on real time. Furthermore, it is more efficient if the donors can find the hospital/ blood bank using GPS which saves time and so are the number of lives saved.

Furthermore, other than emergencies, rare blood groups members must be sensitized, reminded and motivated to donate blood. Blood in the blood banks requires to be replenished with time. Motivation to all donors is fundamental in convincing blood donors; for instance, donors can be informed how their blood was used.

## **1.3 Scope**

As a whole, the system is focused to work with blood banks/units, blood donors and hospitals. System users include administrators, blood banks, hospitals: full privilege on the entire application‘s functions, can make request for donation and most importantly update donor details. Donors: can make blood request or donate blood. Public: can view the blood donation events, can donate.

## **1.4 Objectives**

The goals of the Virtual Blood Bank are as follows:-

1. To enable reliable and quick search of donors in times of emergency or shortages in their nearby area; who will be immediately available.
2. To allow the probable recipients to make search and match the volunteer donors, and make request for blood.
3. To save donor’s time when finding a donation point i.e. hospitals, blood units.

## To facilitate donor sensitization and motivation

## **1.5 Project Purpose**

The aim is to create a mobile application (android) that facilitates reliable blood donors’ search and acquisition on real time using GPS.

## **1.6 Problem justification**

A large number of blood donors can be found or attracted using an Android application. Since almost everyone carries a mobile phone with them, it ensures instant location tracking and communication. With an increasingly mobile society and the worldwide deployment of mobile and wireless networks, wireless infrastructure can support many healthcare applications.

Today, mobile and mobile based applications have become a part of our day to day life. With the revolution in mobile computing many great features were added to the field and the mobiles got smaller, faster and better as the decade passed. This Android application is developed to easily search for blood or blood donors in nearby areas during emergencies. In this Android app (V2B) one will get easy access to blood in real time and right place.

It is therefore essential to build a network of people who can help one another during an emergency. Instead of providing people who need blood with outdated lists of regular donors who might even not be available to help in the current situation, V2B contacts the right people the moment they find out the need.

# **CHAPTER TWO: LITERATURE REVIEW**

## **2.1 Key concepts**

**GPS (Global positioning System):** it is a space based navigation system that provides time and location anywhere on or near the earth in all weather conditions. It will be used to locate the nearby donors for immediate actions during emergencies.

**Google maps:** it is a mapping service which offers satellite imagery, street maps, real time traffic conditions (google traffic) and route planning (get directions) for travelling by foot, car, bicycle (in beta stage) or public transportation.

**Android:** Is a mobile operating system based on the Linux kernel, designed fundamentally for touchscreen mobile devices such as smartphones and tablets.

## **2.2 Use of ICT in similar applications**

### **Smart Phones to the Rescue: The Virtual Blood Bank Project**

The Virtual Blood Bank project in India's National Capital Region of Delhi uses smart phones to build a pervasive network that gives people instantaneous information about available blood donors in their vicinity. The Virtual Blood Bank project lets subscribers access the service any time with no need for sophisticated hardware (Singh, Bhargava, & Kain, 2007).

### **The Optimization of Blood Donor Information and Management System by Technopedia**

In the Optimization of Blood Donor Information and Management System by Technopedia (Priya , Saranya, Shabana, & Subramani, 2014), the authors, have proposed an efficient and reliable blood donor information and management system based on GIS integrated in android mobile application. The service provided by the proposed system is needed and valuable to health sector where the quality of the blood is considered for the safety of the patient through a systematic process by the blood management system. This system will be the solution for the problems such as wrong information of donors, misuse by third parties and updating the donated blood by the donor which replaces the older systems. The proposed system is a web based android application helps us to reduce the human mistakes which are done in the existing system. The wireless internet technique enables the flow of data to work more rapidly and conveniently.

Furthermore, people will be able to see which patients need blood supplies via the application. They will be able to register as donors and thus receive request from their local clients who needs blood to donate blood in cases of need.

### **Android application for volunteer blood donors**

In (Turhan, 2012), a smart phone’s application for the volunteer blood donor to increase the willingness and accessibility with the purpose of providing a continuous blood supply is presented. This application helps health care centers to provide the blood as quick as possible when their stocks are insufficient. The application sends periodically actual location information of available donors to main system and the blood requests to the donors. In this way, it provides an uninterrupted communication between the health care centers and volunteer donors. The distance of the volunteer donors to the healthcare center is an important criterion in the determination of the donors. Therefore an optimization is also realized on this process. In the initial system, the distance calculation is made by taking the distance as crow flies. In the optimized system, it is converted to the actual distance. This optimization makes the system more realistic. The second improvement is performed on the system’s infrastructure. Especially, by taking into consideration the rapid development of mobile device technology which uses Android operating system, the system has been carried from the ANT building environment onto Grade build automation platform. In further studies, we aim the add evaluation of traffic density between living donors’ locations and healthcare centers to the living donor selection criteria

### **Virtual blood banking, Hong Kong**

(F & et al, 2012); In their proposal of a virtual blood banking system, the authors concluded that under the system, 58 923 units of red cells were released intra-operatively for 18 264 patients (11% of the total number of blood units issued by the blood banks in these institutes during the study period). About 1% of them (613 units) entailed unmatched red cells given to 183 patients for emergency transfusions during surgery. The mean time required for the issue of the first unit of red cells was less than 1 minute. A total of 1231 units of red cells were returned unused after being released. Among them, 95 units were deemed unfit for re-issue because they had left the temperature-monitored blood storage refrigerators in the operating theatres for more than 30 minutes. There was no delay in transfusion or postponement of surgery due to problems or downtime of the Operating Theatre Blood Transaction System.

## **2.3 Existing similar systems**

### **The Bangladesh virtual blood bank**

Blood requests are placed at the website so that donors can respond when they visit the site. Voluntary donors register their contact details for public viewing so that relatives or friends of a recipient can browse the database and find donors in their locality (http://www.rokto.org/, 2016).

### **Bloodline Android app**

It is an android application developed together with a website to match people in need of blood with those willing to donate, instantly (Ramya, 2013). Once a request is placed, bloodline runs algorithms to match potential based on location and blood group and notifies only them.

### **Virtual blood Banking, Medscape**

The operating theater blood transaction system (OTBTS) is a virtual blood banking system that allows computer crossmatch-compatible blood ordering and delivery in the operating theater remote from the hospital blood bank. It was developed and implemented in 1997 and was expanded in 2002 to include an unmatched blood module that allows ordering and issuing unmatched RBCs for intraoperative transfusion. During the past 7 years, the system has handled 6,333 crossmatch requests for intraoperative transfusion and issued 20,073 units of RBCs, including 100 units of unmatched RBCs (group O, 72 units; group-identical, 28 units). The OTBTS has proven to be efficient (with a turnaround time for blood ordering and issuing less than 30 seconds), effective (with a reduced crossmatch/transfusion ratio and blood wastage), and error free (no delay or error in transfusion or postponement of operation). Furthermore, our experience with the unmatched blood module has attested to the safety and efficacy of computer-controlled, online ordering and real-time, on-site delivery of unmatched RBCs for emergency transfusion.

One of the major challenges to blood bankers is to provide real-time donors.

## **2.4 Critique/ the “gap”**

There is an indispensable need of connecting donors using recent technologies such as GPS, Google maps and android due to its wide use. Most of the systems need real time information when finding donors/volunteers during emergencies/urgencies to ensure saving of more lives. In order to reduce the delays to a minimal, google maps can also be used to enable donors/volunteers with easier navigation.

## **2.5 PROPOSED SYSTEM**

This application is providing the facility of viewing all information about Donor GPS details. This system can provide the information about the Donor based on the blood group and the place where the Donor is available for blood donation. The user has to first download the application. He/She will be provided with two options: Login and sign in. If the person has already registered, then he/she has to login. If not, he/she has to create an account providing basic details like name, address, contact, date of birth, blood group, email id etc. The user is allowed to update his/her information. Once the user registers, he/she can check various blood banks that are located. The user will get various options on screen:

1. Blood camps
2. Search donors
3. Search blood banks
4. Request for blood
5. Nearby hospital
6. View notification
7. Emergency contact details
8. Emergency medical details

The user can select any of the option and according to the selected option he/she will get the information. The user can also get the exact path from his/her location to blood bank or hospital by using Global Positioning System (GPS). The details of the blood banks, hospitals etc. will be saved in database and only the admin will have access to database. Private and confidential data of the users can only be viewed by administrator. This system promises very less paperwork and also provides help to blood recipient, blood banks and donors also. With help of our application the user will not have to go to the blood bank and ask for the required blood he/she can directly check from our application (irinnews.org, 2012).

# **CHAPTER THREE: SYSTEM ANALYSIS AND DESIGN**

## 3.1 SYSTEM ANALYSIS

### **3.1.1 Methodology**

During system development, the spiral modelling technique will be used because of the following reasons:-

It is an adaptive approach in which project activities can be adjusted as project progresses.

Continuous or repeated development helps in risk management; it is “risk driven model” and allows overlapping of activities.

Product requirements often change during development, making the spiral model very ideal.

It is ideal for large mission critical projects

Additional functionalities can be added late during development.

There is always a space for customer feedback.

The diagram below shows the spiral model.

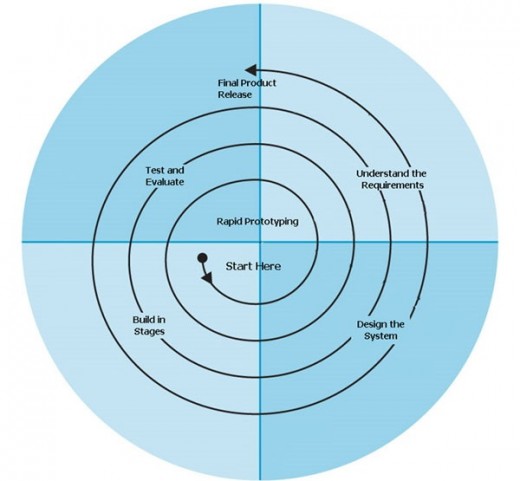


Fig 1. Spiral model (adapted from hubpages.com)

The diagram below shows how GPS technology will be used to find donors



NB: The future work of the system is to extend the security provided by this application so that the contact details of the donor is hidden from other members; whereby the strangers cannot misuse the details of the donor and the strangers would become the helping hand for life at emergency.

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