



LIFE DONORS: SAVING LIVES BY USING CURRENT ERA SMART TECHNOLOGIES

Dr. Fatimah Abdullah Al-Dossari¹
Manal Mohammed Al-Mubarak²
Marwa Khalil Al-Bukhowa³
Maryam Khalifah Al-Saif⁴
Dr Noor Khan⁵

*College of Computer Sciences and Information Technology,
King Faisal University, Saudi Arabia*

ABSTRACT

It is known fact that health is wealth and necessity of human beings. Money can't buy health but can buy modern technologies to ensure better healthcare by involving sophisticated technologies. New era technologies are being used most aspects of humans' daily life to bring comfort and ease together. Despites of it we are still limited at blood transfusion timely, which leads to high danger for human lives. In Saudi Arabia, based on statistics provided by government officials that numerous people are losing their lives every day in emergency situations; suffering from lack of blood in blood banks while at the same time a number of peoples are ready to donate. Few online existing systems are trying to do their best for this cause but still success seems far away due to some limitations. Our system namely Life Donors (LD) addresses these issues by providing link among patients, donors and hospitals whenever needed. LD is the combination of an Android application and a website. LD provides mechanism to contact with possible donors who will be available with the help of GPS whenever required. It shows a significant improvement over existing online blood donations systems.

Key Words: Life Donors, GPS, Android, Web-Based, Google Map.

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1 Dr. Fatimah Abdullah Al-Dossari	:	fatimah.aldossari92@gmail.com
2 Manal Mohammed Al-Mubarak	:	manal2almubarak@gmail.com
3 Marwa Khalil Al-Bukhowa	:	marwa-bu12@hotmail.com
4 Maryam Khalifah Al-Saif	:	maryam.alsaif@hotmail.com
5 Dr Noor Khan	:	

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1. INTRODUCTION

Health is an important issue and it has a huge impact on overall performance and efficiency. Many people don't realize the importance of good health, and even if they do, they may still disregard it. Based on an official statistics about various aspects of blood donation for males students in Saudi Arabia that 81% are non-blood donors while 19% are donors [1]. If we did not have volunteers donating blood, many medical procedures we take for granted could not take place. Patients who have Cancer, Hemolytic Anemia, Thalassemia and other chronic diseases need blood frequently. Furthermore we need blood donors to help and save the lives of accidental patients, advances in medical treatments and procedures requiring blood transfusions. The demand for blood continues to increase. It is a huge issue faced by community. Currently there are good numbers of blood bank systems exists to satisfy blood necessity such as "Free blood" [2], "B-blood.org"[3], and "Sudanese Electronic Blood Bank" [4] they contain static database which needs hard work to update, also they are unable to handle emergency situations timely. What about if someone needs blood now and there is no donor to donate for him/her, or if the donor's blood does not match the patient's blood group? Sometimes in emergency cases there is no enough blood in hospital so what should we do?

Our system expands the existing systems by providing the efficient search about the nearest blood donor through the coordinates considering, the type of blood, and available time of donors as fast as possible. Further it can send an instant notification messages to the blood donors, and all information of the donors will be update efficiently with database.

2. PROBLEM STATEMENT

The need for blood is great as it is life, as there is no substitute for human blood. Every day blood is required in hospitals and emergency treatment facilities for patients with Cancer, Thalassemia and other diseases, for organ transplant recipients, and to help save the lives of accident/trauma victims. With an aging population and advances in medical treatments and procedures requiring blood transfusions, the demand for blood continue to increase. In Saudi Arabia many people are losing their lives every day in emergency situations because we are suffering from lack of blood in blood banks, and they do not receive the blood timely. Their relatives and friends start searching for a donor to help, but there is no guarantee whether he will come or not. On the other hand, there are a lot of people who are willing to help and donate.

There are numbers of existing systems have become increasingly tried to activate the blood donation process. However, this is still inefficient up to day. Besides, we decided to use the latest technologies and the available tools to find a modern system which fills the gap and provides an organized solution. Our system has a quick mean to find the donors easily by their nearest location, available time, and same blood type, facilitate the search process for needy people and make it easier than before. Increase number of donors by increasing the facilities provided to them and Increase the awareness of the society about the importance of blood donation. Our system facilitates the donation process in our country.

3. LITERATURE REVIEW

With an aging population and advances in medical treatments and procedures requiring blood transfusions, the demand for blood continues to increase. Every day blood is required in hospitals and emergency treatment facilities for patients to help save their lives. There are numbers of existing systems that have become increasingly tried to activate the blood donation process. The following sub sections will explore some of the recent works in this field one by one.

3.1 Proposal of Smart Blood Banks Central Distribution System in Saudi Arabia

This Saudi online system has a goal of substitute for the blood center in Saudi Arabia and to search for the required quantities of each blood type, save time, improve the process of exchange and distribute the blood units before expired. It links all the hospital blood banks through one control system. It uses linear digital programming algorithm which helps to apply the calculations for the supply and demand on the blood units.

This main outcome of this system is that it eliminates the problem of blood shortage and make sure to use blood before it is expired. However, following are the limitations of this system [5].

- Depending only on the hospital entity and the blood exists inside it.
- We did not guarantee that the existing blood in hospitals blood banks is matching the required blood type.
- It is quick but not instance in the time of need.
- There is no interaction between the donors and the hospitals.

3.2 Online Blood Donation Reservation and Management system In Jeddah

This is a Saudi management system website that enables individuals who want to donate blood to help the needy. It enables hospitals to record and store the data for people who want to communicate with them, and it also provides a centralized blood bank database. It manages the records of donors and recipients, and encourages voluntary blood donation, easily accessing any information about blood type and the distribution of the blood in various hospitals in Jeddah. Each hospital can register on the website and make its own account that contains information about the hospital: the blood types needed and the blood types available, the main outcomes of this system is to make it easier for donors to find the appropriate recipients to whom to donate blood by searching in the website by blood type (a list of hospitals that need that blood type will appear), make it easier for recipients to find the appropriate donors by searching in the website by his blood type (a list of hospitals that have that blood type will appear). However, following are the limitations of this system [6].

- It is a website only
- It is local for Jeddah only.
- Donors cannot specify their available time to donate blood.
- There is a week security for donor's information since it enables the patients search about the donors also the donors can search about the recipients.

3.3 Smart Blood Query

Smart Blood Query uses mobile phone and PC as a server for database and it is worldwide system. The seekers for blood communicate with the server through their mobile devices, specifying their blood type and current location in a subscriber application. The system provides top 5 search result donors to the seekers. If no response (YES/NO) comes from the donors within 5 minutes, a new search will be initiated for finding blood banks nearby to the recipient and an SMS will be sent to the recipient, providing the information. The donors have the option to either accept the request by replying 'YES' or deny it by replying 'NO'. When a donor updates the date of last donation by SMS, his name is disabled from the donor list for 89 days after donation. Donors are also given the option to edit their profile and update details such as change in location or availability. However, following are the limitations of this system [7].

- It does not use GPS features to automatically update donors' location.
- It does not have a dynamic database.
- While the donors are registering to the system they cannot specify their available time.
- It sends SMS usually providing a list of the donors to the seekers so there is no confidentiality of the donors' information.

3.4 The Optimization of Blood Donor Information and Management System by Technopedia

It is a system based on GIS (Geographic Information System) integrated in android mobile application and website. Hospitals will not search about the donors. Acceptor is the one who needs blood for someone from his/her relatives. In case of emergency like rare blood group can request for the blood. The donors who are nearby location are tracked by the android application by GIS. The purpose of website is to update the relevant information regarding the donors who have already donated blood in various hospitals, so that when it is needed for any others they can view other donors where it can be accessed through this website. However, following are the limitations of this system.

- It is based on GIS.
- The detailed information is given to any user.
- The user login into the webpage not the application to store their information.
- There is no proper security for personal details which can lead to misuse by third parties.

3.5 Web-Based Information System for Blood Donation

It's a system provides multiple facilities like maintaining record, analysis of various parameters for research issues and providing online information. Patients may achieve the required blood by contacting the donors through Internet or just through phones. The software was developed through using ASP, XML, Java and SQL SERVER. Various reports were generated through the prototype software for this system [9]. The reports

were generated both in tabular as well as in graphical form. This system generates various reports as:

1. Registered Donors
2. Blood Donated Report
3. Donors' Confirmation Report
4. Donors Recipient Report
5. Areas-wise and blood groups-wise Report
6. Frequently Asked Questions
7. Comments and Suggestions
8. Gender-wise Analysis
9. Professional-wise Analysis
10. City-wise Analysis

The result is useful for both the administrators as well as patients to know the donors contact numbers. However, following are the limitations of this system.

- It's a website only.
- It's local for Pakistan.
- Donors cannot specify their available time to donate blood.

From above works, one can observe that the need for blood donation is required as it is life line, as there is no substitute for the human blood. The existing systems are striving hard to provide support for blood collection and donation. However, still the real success is far away, as they cannot manage them in emergent cases due to inefficient communication.

Amita Meshram et. al. [10], they also address to this issue with the help of GPS, however they only focus to online data while they didn't used the smart technology. Iona Buciuniene , et.al [11] they tried to come up with the blood donation system and come up with the new ideas for blood collection, however they mentioned in their studies that peoples are not willing to donate blood free of cost. Joseph Dalton, et.al. [12] The blood donation system that how to improve it collection using RFID, this boost up the donation system however they don't care about GPS system which is more accurate and having high range to locate the blood donors. Our system LD is more appropriate as it also uses GPS.

In this research paper, we decided to use the latest technologies and the available tools to find a modern system which fills the gap and provides an organized solution for blood donations process. Life Donors system is the combination of an Android smart phone application and a dynamic website. It addresses these issues by providing live link among patients, donors and hospitals whenever needed, Reserve the confidentiality of the information in the database which will be accessed only by designated officials in the hospitals.

4. RESEARCH METHODOLOGY

4.1 Conducted Survey

BACKGROUND AND OBJECTIVES

The blood donation system in the Kingdom of Saudi Arabia depends on a combination of voluntary and involuntary donors. The aim of this study is to ensure that we are

suffering from lack of blood in blood banks while there is a great number of people are willing to donate.

4.2 Materials and Methods

The study was conducted in Saudi Arabia. An online questionnaire was distributed among the peoples (n = 631) 502 were female while 125 were male. The questionnaire was in Arabic and English languages at the same time, and contains ten questions, initiated On October 2014.

4.3 Survey Questions

1- I am aware about the benefits of blood donation.

- Yes No

2- I'm ready to help patients and donate blood.

- Yes No

3- I'm willing to donate blood but I'm not aware what to do.

- Yes No

4- I heard that in hospitals a huge number of peoples who need blood urgently but unable to find it immediately.

- Yes No

5- Based on my first-hand knowledge that, if the blood banks receive the required blood timely then we can help more patients to survive.

- Yes No

6- As far as I know sometimes hospital's blood bank does not have enough blood especially for peoples who need long-term treatments such as, Cancer Patients, Haemolytic Anaemia patients, people who have surgery operations.

- Yes No

7- It is a matter of fact that patient's family and friends are willing to donate but unfortunately sometimes their blood type does not match to patient's blood.

- Yes No

8- I noticed large number of messages on social networks from patient's family and friends trying to search for blood donors but that way does not work effectively always.

- Yes No

9- In Saudi Arabia, currently we do not have any organized fast solution for blood donations.

- Yes No

10- It is an excellent idea to have a system which helps to find the nearest available blood donor with the same blood group at the time of need.

- Yes No

4.4 Statistical Analysis

The conducted survey was analyzed through computer, using data sheet (Microsoft Excel). The responses to the questions were expressed, where applicable, as in percent yes or no.

4.5 Results & Discussion

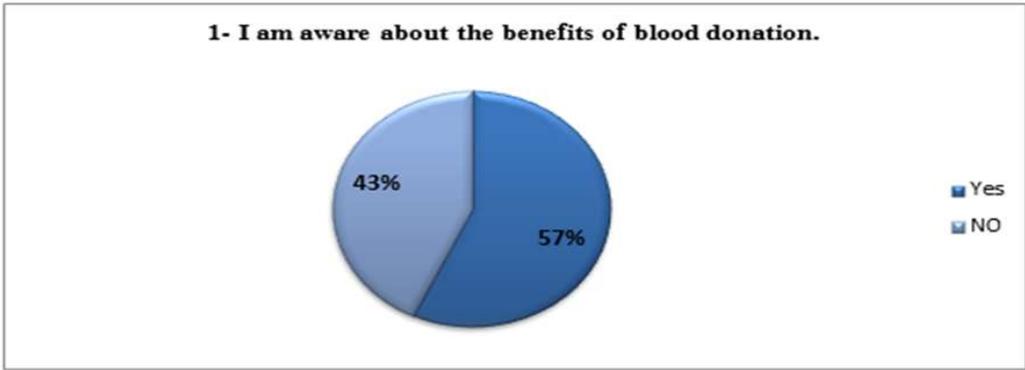


Figure 1: Result of Question 1

Approximately more than half of all subjects (57%) reported that they are aware about the benefit of blood donation which gives a positive sound that many of the respondents had the basic knowledge of blood donation and encourage us to continue working in our system.

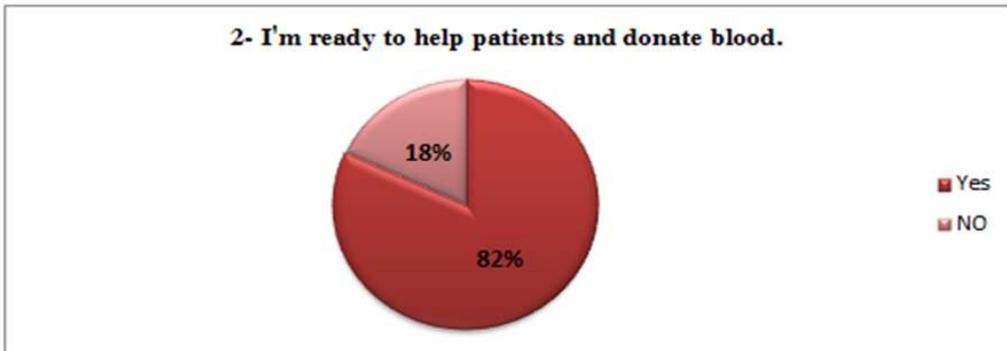


Figure 2: Result of Question 2

The majority (82%) are ready to help patients and donate blood which indicates that there is a large number of volunteers who are willing to support our system and donate blood.

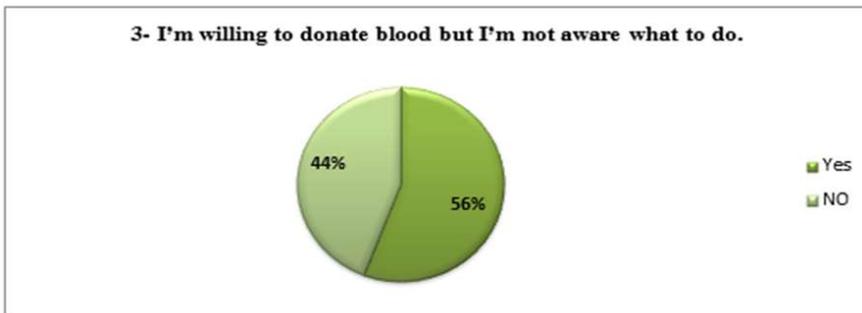


Figure 3: Result of Question 3

On this question more than half of the participants (56%) are willing to donate blood but they are not aware what to do that means filling in the gap between blood donors and needy people is very important.

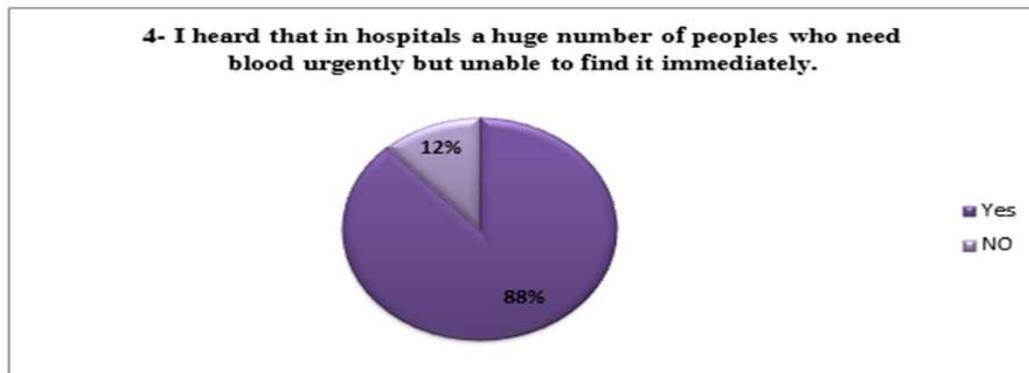


Figure 4: Result of Question 4

Eighty-eight percent agree that in hospitals a huge number of peoples who need blood urgently but unable to find it immediately which illustrate that the KSA community facing a problem regarding finding the blood timely.

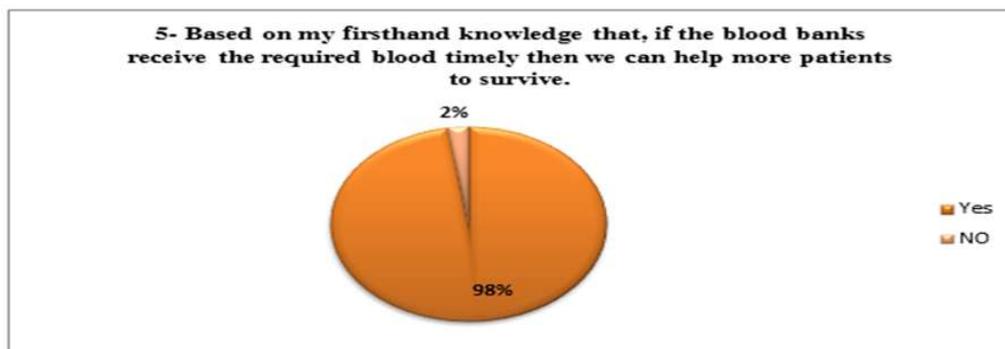


Figure 5: Result of Question 5

A huge majority (98%) believed that we can help more patients to survive if they receive the required blood timely which prove that many people aware about the importance of receiving the required blood timely (the basic functionality of our system).

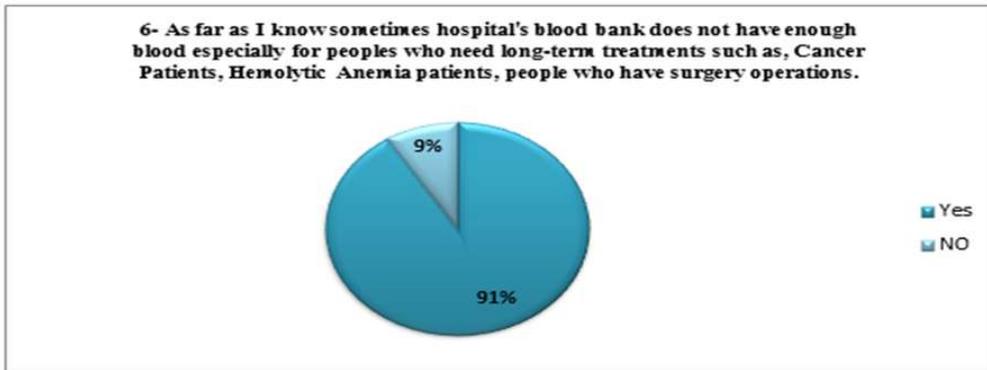


Figure 6: Result of Question 6

A big majority (91%) support our observation about lacking of blood in blood banks as sometimes hospital's blood bank does not have enough blood especially for peoples who need long-term treatments such as, Cancer Patients, Hemolytic Anemia patients, people who have surgery operations.

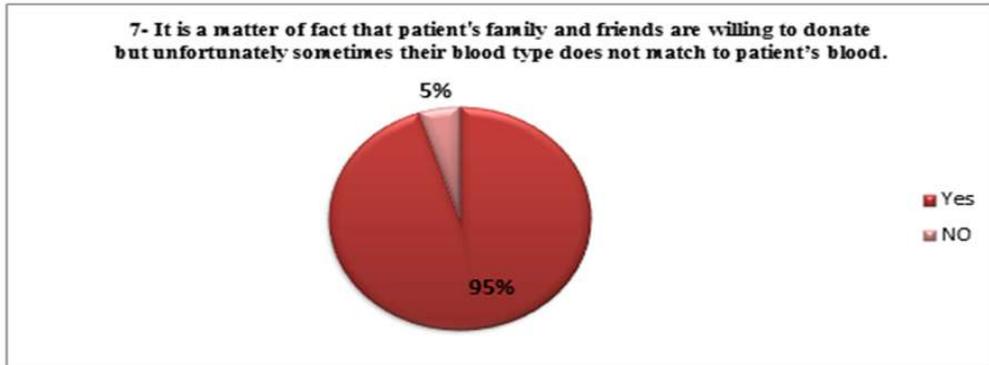


Figure 7: Result of Question 7

Ninety-five percent agreed that there is a need of a method for finding volunteers with the required blood type as sometimes patient's family and friends' blood types do not match to patient's blood type.

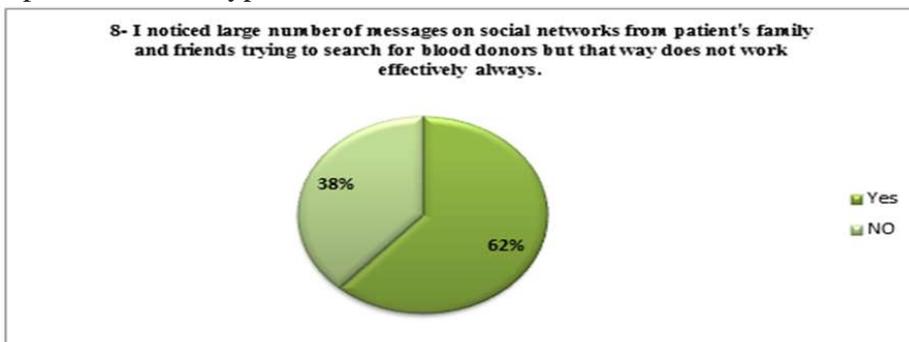


Figure 8: Result of Question 8

Approximately more than half of the participants (62%) approved that people faced a lot of difficulties in searching for blood donors as posting a number of messages on social networks does not always work effectively.

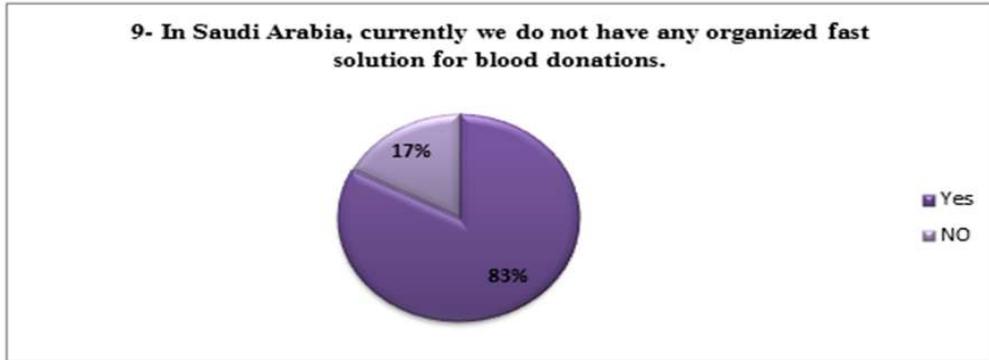


Figure 9: Result of Question 9

Eighty-three percent (83%) agreed that there is no organized fast solution for blood donations in our country.

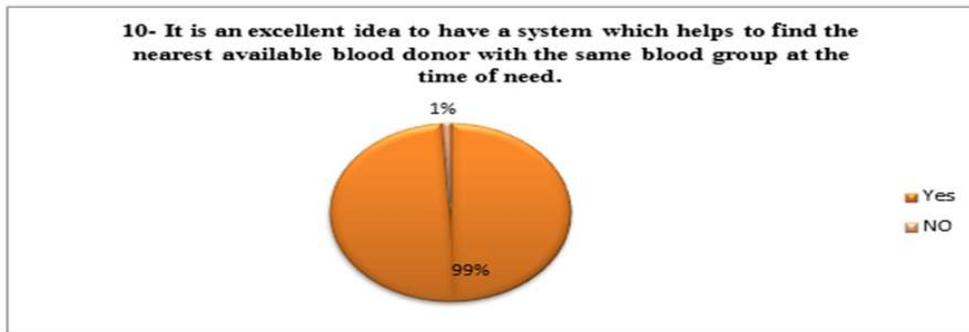


Figure 10: Result of Question 10

Ninety-nine percent (99%) support the idea of having a system which helps to find the nearest available blood donor with the same blood group at the time of need. According to the results we found that a huge majority (82%) are ready to help patients and donate blood at the time of need. On the other hand, approximately more than half of the participants (62%) noticed that most of the people faced a lot of difficulties in searching for the blood donors and find the required blood timely. Furthermore, a vast majority (91%) support our observation about lacking of blood in blood banks especially for peoples who need long-term treatments such as, Cancer Patients, Hemolytic Anemia patients, people who have surgery operations. Eighty-three percent (83%) agreed that there is no organized fast solution for blood donations in Saudi Arabia. Moreover notice that ninety-nine percent (99%) support the idea of having a system which helps to find the nearest available blood donor with the same blood group at the time of need.

Survey Question	Yes	No
1- I am aware about the benefits of blood donation.	57%	43%
2- I'm ready to help patients and donate blood.	82%	18%
3- I'm willing to donate blood but I'm not aware what to do	56%	44%
4- I heard that in hospitals a huge number of peoples who need blood urgently but unable to find it immediately	88%	12%
5- Based on my firsthand knowledge that, if the blood banks receive the required blood timely then we can help more patients to survive.	98%	2%
6- As far as I know sometimes hospital's blood bank does not have enough blood especially for peoples who need long-term treatments such as, Cancer Patients, Hemolytic Anemia patients, people who have surgery operations.	91%	9%
7- It is a matter of fact that patient's family and friends are willing to donate but unfortunately sometimes their blood type does not match to patient's blood.	95%	5%
8- I noticed large number of messages on social networks from patient's family and friends trying to search for blood donors but that way does not work effectively always.	62%	38%
9- In Saudi Arabia, currently we do not have any organized fast solution for blood donations.	83%	17%
10- It is an excellent idea to have a system which helps to find the nearest available blood donor with the same blood group at the time of need.	99%	1%

Table 1: The Results of the survey

4.6 System Analysis

Systems analysis is a process of collecting factual data, understand the processes involved, identifying problems and recommending feasible suggestions for improving the system functioning. This involves studying the business processes, gathering operational data, understand the information flow, finding out bottlenecks and evolving solutions for overcoming the weaknesses of the system so as to achieve the organizational goals. System Analysis also includes subdividing of complex process involving the entire system, identification of data store and manual processes. A number of different tools were used on this stage.

4.7 UML Diagrams

4.7.1 Context Diagram

Context diagram is a diagram that defines the boundaries between the system, or part of a system, and its environment, showing the entities that interact with it. [Figure 11] shows the context diagram for the Life Donors system. It contains three external agents that interact with the system, the agents areas are,

1. Admin: Will be responsible for making account (ID, Password) for hospitals employees.
2. Hospital employee: who has the control to the system, search about the nearest available donors, update users' profiles, and communicate with blood donors in the time of need.
3. Volunteer donor: Normal user who will register in the system then can use it for volunteering by blood donation.

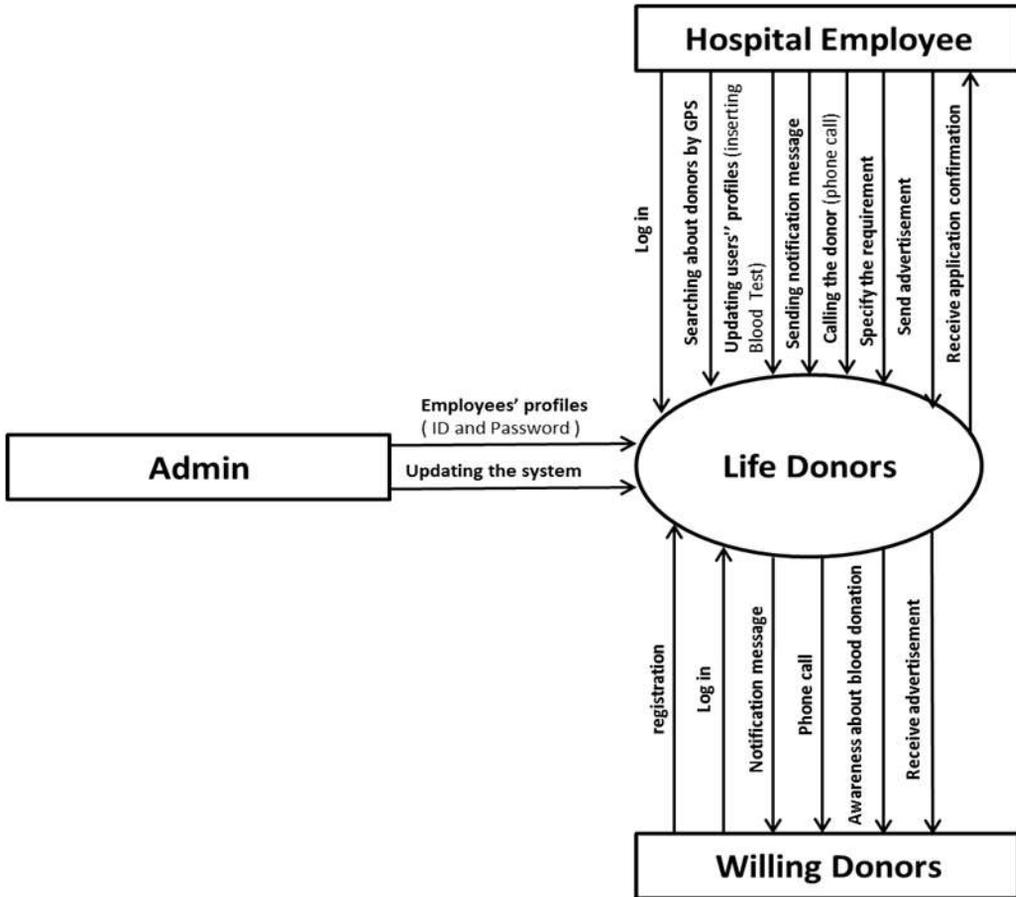


Figure 11: Context diagram for Life Donors system

4.7.2 Use Case Diagram

A use case diagram is a graphic depiction of the interactions among the elements of a system. A use case is a methodology used in system analysis to identify, clarify, and organize system requirements [13]. [Figure 12], [Figure 13], and [Figure 14] show the use case diagrams for the Life Donors system. It contains three external agents that interact with the system, the agents areas are:

- 1- Admin: Is responsible for making account (ID, Password) for hospitals employees.
- 2- Hospital employee: Has the control to the system.
- 3- Volunteer donor: Normal user who will register in the system then can use it

for volunteering by blood donation.



Figure 12: Use case diagram for the hospital employee of Life Donors system

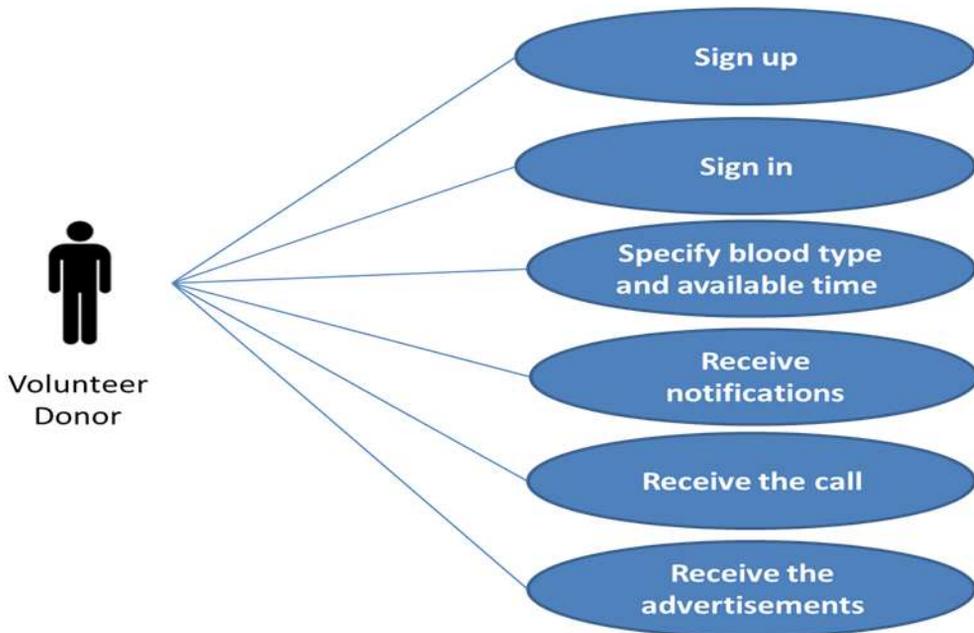


Figure 13: Use case diagram for the volunteer donor of Life Donors system

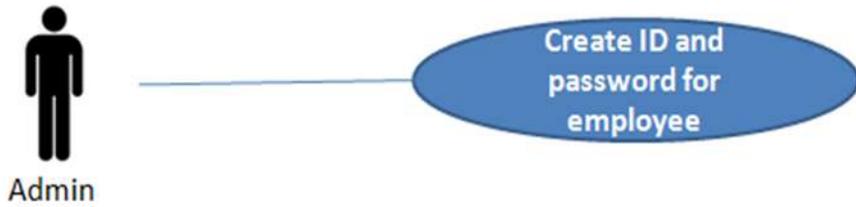


Figure 14: Use case diagram for the admin of Life Donors system

4.7.3 Entity Relationship Diagram ER

An entity-relationship diagram (ERD) is a graphical representation of an information system that shows the relationship between people, objects, places, concepts or events within that system [14]. [Figure15] shows the entity-relationship diagram for the Life Donors system. It contains three external agents that interact with the system, the agents areas are:

- 1- Admin
- 2- Hospital employee.
- 3- Volunteer donor.

Relationship	Type	From	To
Create Account	1:M	Admin	Hospital employee
Search	1:M	Hospital employee	Volunteer donors
Update	1:M	Hospital employee	Volunteer donors
Send SMS	1:M	Hospital employee	People/volunteer donor
Send Email	1:M	Hospital employee	People/volunteer donor

Table 2: Identification of Relationships types

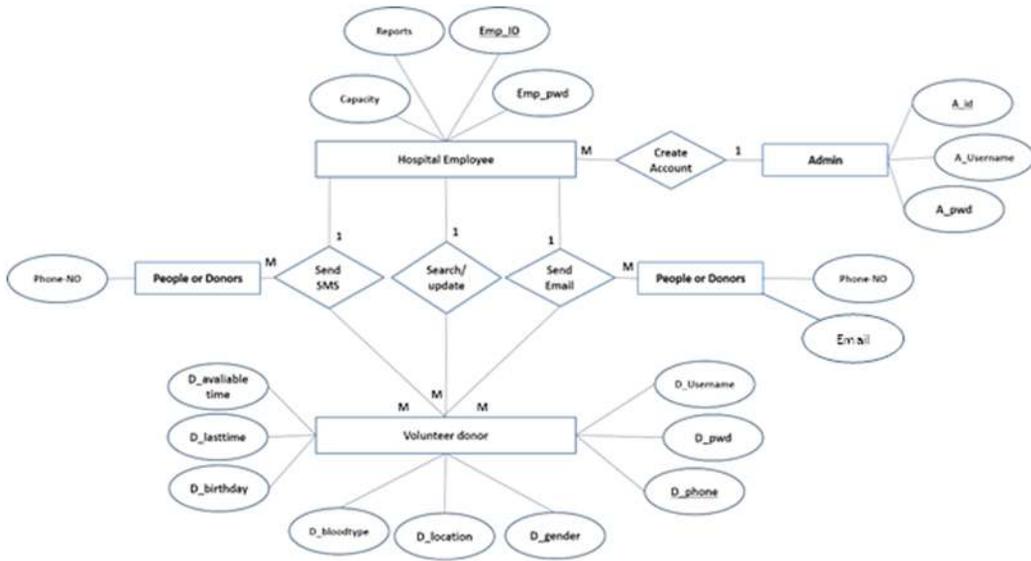


Figure 15: ER diagram for Life Donors system

5. BRIEF ABOUT LIFE DONORS GUI

The Login page of the website is for the hospital employees, the hospital employee can log into the system by typing his/her username and password. After checking the authentication from the database, then the user can access the system.

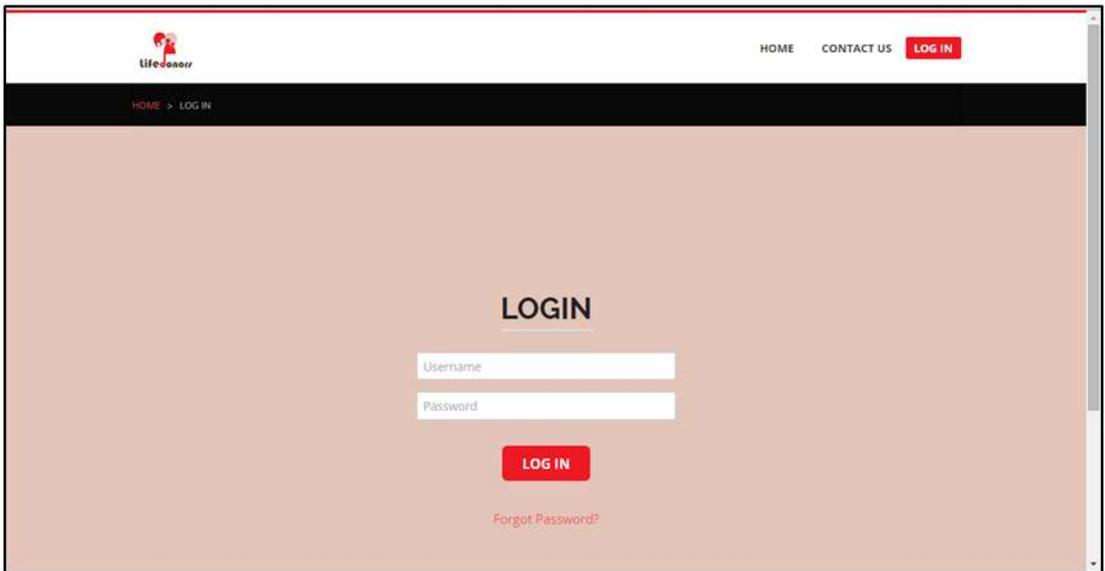


Figure 16: Login page Life Donors Website

Search about Donors web page will allow the hospital employee to search about willing donors along with their nearest possible locations considering hospital's location. Search About Donors will allow the hospital employee to determine the required blood type in the textbox and then search and communicate with the donors by sending a notification message or calling them and this can be based on user's choice.

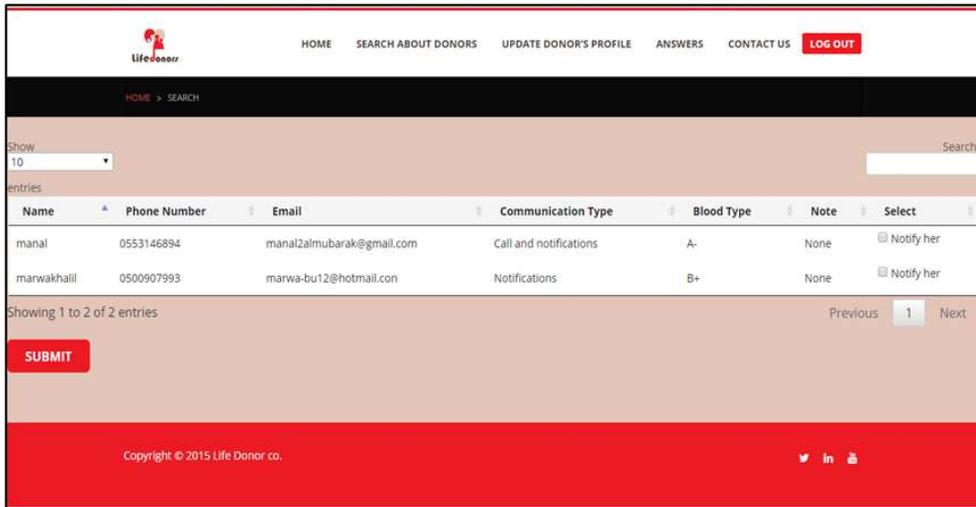


Figure 17: Search about donor's page of Life Donors Website

Hospitals' employees can easily access and update donor's information. It allows the hospital employee to update blood type, last donation time and inserting medical notes into donor's profiles.

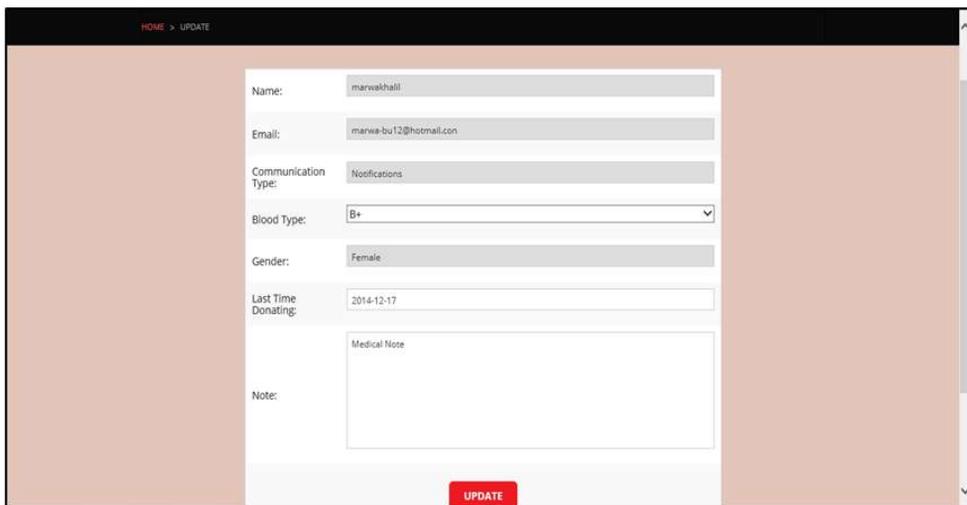


Figure 18: Update donor's profile page of Life Donors Website

The main interface (Home) of Life Donors application contains four options sign up, sign in, awareness and developers information. Sign up gathers the important information from the donors such as user name, password, full name, Phone number, email, last donation time, gender, communication through, blood type and specifying user's location with the help of GPS. The purpose of this option is that a user needs to create an account and store his/her information in the database.

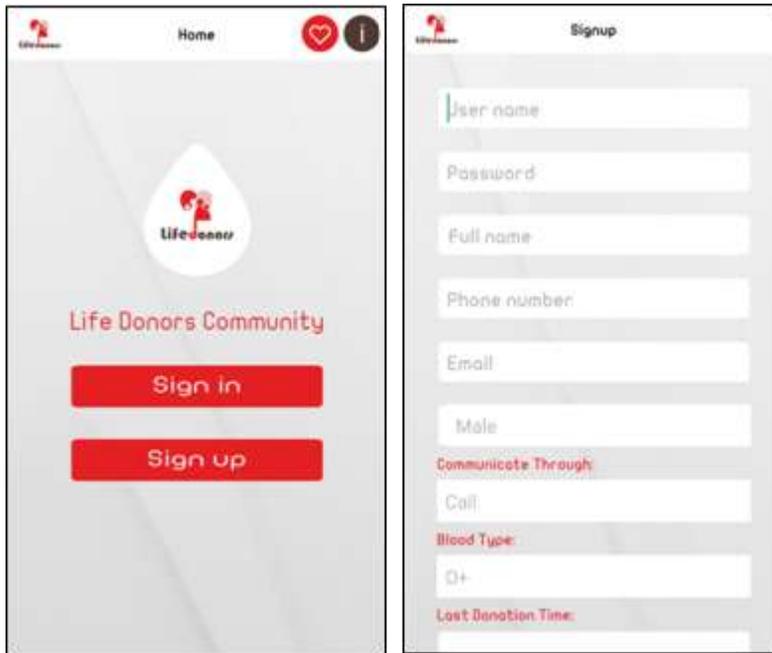


Figure 19: Main interface and registration interface of Life Donors Application

Sign in is available to make the app more secure, so the user's information will be private and not accessible except for the authorized users. The user should fill these text boxes with the same information as in the registration page. After that the user can go to "my profile" interface and can show/edit his/her information. Edit profile interface will allow him/her to edit his/her information and insert new information, and then he/she will get a message that inform about the result of editing process.

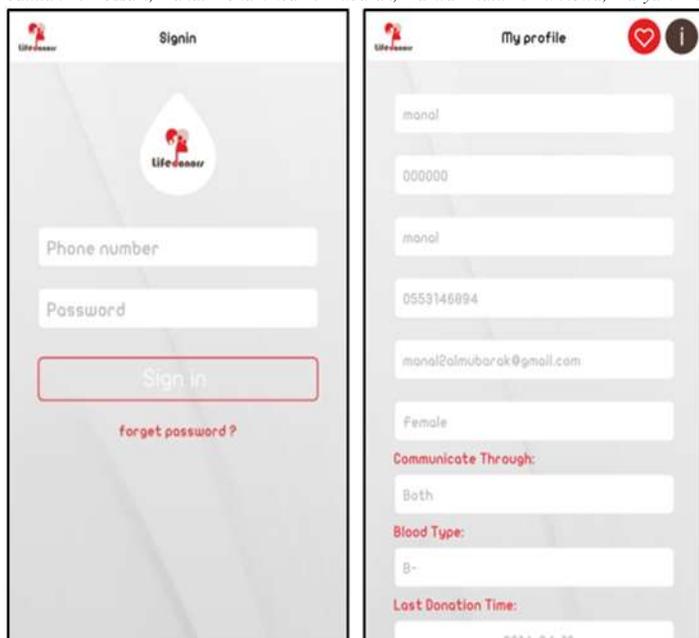


Figure 20: Sign in and my profile interfaces of Life Donors Application

This result is encouraging our systems as it is local for Saudi Arabia also Life Donors full fills the gap between blood donors and needy people, provides an easy way for finding the required blood timely, and possibly it will help many patients to stay alive and survive.

6. RESULT AND DISCUSSION(LIFE DONORS OUTCOMES)

The outcomes of applying Life Donors are as follow:

- To bridge the gap between blood donors and needy people, through this system.
- Life Donors system uses the latest technologies and the available tools to fill the gap between blood donors and needy people by offer comprehensive system services that make blood donation fastest, safest, most reliable and most cost-effective.
- Facilitate the search process for needy people and make it easier than before.
- Life Donors web-based facilitates the search process for needy people and makes it easier and more efficient by having a quick mean (web-based system and Android based App) to find the donors easily and timely considering their blood type, location, and available time, then calling or sending a notification messages to them timely.
- Find the nearest donor for the patient.
- Using GPS service help hospital employees to know if the donor is near to the hospital or not.
- Donor's information can be collected easily and efficiently.

- During the registration to the system using the Android mobile app, all required information about the donors will be stored easily in life Donors database.
- Increase number of donors by increasing the facilities provided to them.
- Making mobile app for volunteer donors and web-based for hospital employees facilitate the communication between them, and this was not available before.
- Increase the awareness of the society about the importance of blood donation.
- Awareness section in the Life Donors mobile which contains many interfaces that are rich of valuable information about the importance of blood donation and some guidelines before and after blood donation.
- Fast and easy accessible system for patients and donors.
- Because of the Internet popularity and nowadays smart phones users are increasing every day in the world so this makes Life Donors accessible without any problem.
- The system can find several donors to refresh the supply.
- The system is able to handle emergency situations timely, and the hospital's blood bank will have enough blood for all patients by receiving the required blood timely.
- The safest, most reliable and most cost-effective blood donation system.
- Providing the blood at the time of need without spending much of time to contact with the donors. Also sending notification messages to the donors without any cost.
- Life Donors strives hard to save lives as many as possible.
- By helping more patients to survive because they will receive the required blood fast and timely.
- Encourages everyone to take the time to donate.
- Increase the awareness about the importance of blood donation by providing awareness section in the system will encourage and convince more people to donate.
- Can find the donor timely with the required blood group.
- The process of communication with the required donors by calling them or sending them a notification messages is based on their available time which is based on their choice.
- Organized system and integrated connection between the websites and mobile application.
- The database is one and common for both website and mobile app.
- Simple process of donor registration with high quality.
- Allowing the volunteer donors to register into the system easily by using its mobile app which will enable the user to fill the form of registration as new donor, and then submit the form. So he/she can access the application completely and stored his information into our database.
- The donor can select his/her available time to donate.
- After receiving the notification message there is a window will enable the donor to specify his/her available time to donate.
- The donor can specify his/her location easily by GPS.
- While a donor is registering to the system by the mobile application his/her location will be specified by enabling the GPS in the phone.
- Can easily find donors for needy people who have rare blood groups.

- Some blood types are rare so Life Donors system can find the required donors with the required blood type easily from the huge database by using search feature in the website.
- Dynamic database that is storing donors Information and can communicate with them easily.
- The GPS helps to update donors' location automatically, and edit feature which is available for the donors as well as for the hospital employees to edit donors information, this helps us to have dynamic database and then can communicate with the donors easily.
- Delivering an efficient and effective blood donation system for people.
- Life Donors system with all its features delivers to the people an efficient and effective blood donation system.
- Reducing the effort for finding a blood donor at the time of the need.
- Knowing the blood type, available time and the location for donors reduce much of efforts for finding who is available to donate with the same required blood type and near to the hospital.

CONCLUSION

As blood is primary line for human life, it has higher priority in routine life while it has highest priority in case of need arises in case of any emergence or accident. In current technological era, scientists are using smart technologies to help and improve human health care. In this paper, we developed a smart system for blood donation inside Kingdom of Saudi Arabia namely Life Donors, which is the combination of an Android smart phone application and a dynamic website. Donors are able to use the application to specify their information and availability. On the other hand, the web based system enables hospital management to trace possible willing registered donors along with their nearest possible locations with the help of GPS coordinates whenever needed. Life Donors system shows a significant improvement in timely blood collection especially in case of emergency by involving latest technologies. Life Donors, has significant increase in efficiency and timely blood donation which yields more than 70% over existing systems. Life Donors further will be implemented in different regions of the world to serve the humanity.

FUTURE WORK

We hope that Life Donors system will bring a significant change in our country. A new, updated and expanded edition of our project is to implement the functions for mobile application using IOS to increase the number of blood donors, and to translate the system into Arabic language because it is local for Saudi Arabia so it can have dual languages. Life Donors system can be extended further and make it available for the other developing countries then make it global. This work is not a one-time job but is a continuous work to be adopted for further research and the system can be used in various “what-if” scenarios. This work may be extended to interconnect all the blood donors’ societies in the world.

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REFERENCES

- [1] Alsharief, Baig, Habib, Haji, Makki, and Noor. "Knowledge, Misconceptions and Motivations Towards Blood Donation Among University Students in KSA." NCBI. Accessed September 22, (2014), pp.295-310.
- [2] Kapoor, B. and S. Sharma, concept Paper for the Energy Sector: Promoting Public Private Partnerships in Electricity Generation for Rural Areas." Malawi Government, (2009), pp.53-55.
- [3] Mizoguchi, R., "Using Technology as a Learning Tool, Not Just the Cool New Thing., S.S.a.R. Studer, Editor. (2003) pp. 275-295.
- [4] Fortuna, B., M. Grobelnik, and D. Mladenic , "Received Usefulness, Perceived Ease of Use and User Acceptance of Information Technology" , conference on Human interface. Beijing,(2007),pp.32-35.
- [5] Althenyana, and El-Masrib, 2013, "Proposal of Smart Blood Banks Central Distribution System in Saudi Arabia", china,(2002),pp.43-45.
- [6] Al-Amri, Al-Ghamdi, Aljojo, Al-Madani, Bashamakh, and Hashim, "Online Blood Donation Reservation And Management System In Jeddah." Life Science journal, (2014), pp.48-52.
- [7] Ahmed, Akter, Basak, and Rahman, "Smart Blood Query: A Novel Mobile Phone Based Privacy-aware Blood Donor Recruitment and Management System for Developing Regions", USA,(2002),PP.55.
- [8] Priya¹, Saranya², Shabana³, and Subramani, "The Optimization of Blood Donor Information and Management System by Technopedia." International Journal of Innovative Research in Science, Engineering and Technology,(2014),PP.42-45.
- [9] Khan, and Qureshi, "Web-Based Information System for Blood Donation." International Journal of Digital Content Technology and Its Applications, (2009), PP.24-26.
- [10] Ambatker, Bramhe, Jaronde, kamble, and Meshram, "Central Blood Bank Database With Anti GPS Mobile System." International Journal of Emerging Technology and Advanced Engineering, (2013), PP.23.
- [11] Blazevicene, Buciuene, Kazlauskaitand, Skudiene, and Stonienė, 2006, "Blood Donors' Motivation and Attitude to Non-remunerated Blood donation in Lithuania."Hand book: BMC Public Health",USA,(2000) , pp.28-30.
- [12] Dalton, Ippolito, Poncet, and Rossini, "Using RFID Technologies to Reduce Blood Transfusion Errors", Mexico,(2005),pp.440-443.

- [13] Duineveld, A.J., R. Stoter, M.R. Weiden, B. Kenepa, and V.R. Benjamins, Tuned in to Success: Assessing “The Impact of Interactive Radio Instruction for the Hardest-to-Reach” Washington,(2000),pp 52-57.
- [14] Funk, A., V. Tablan, K. Bontcheva, H. Cunningham, B. Davis, and S. Handschuh, “Training Refugee Afghan Women Teachers in the Female Education Program, Pakistan.” *Women Teaching in South Asia*. Edited by Jackie Kirk. New Delhi: Sage Publications, (2008), pp.85-88.