



ASSUMPTION UNIVERSITY
Vincent Mary School of Science and Technology
Department of Information Technology

IT 4299 Senior Project

Blood Bank Management System

Project Advisor : Asst. Prof. Dr. Darun Kesrarat

Project Committee : A. Tapanan Yeophantong
Dr. Jittima Wongwuttiwat

Submitted by : Phyu Phyu Khaing 5718331
Wasin Rattanaroengchai 5737458
Sossarun Tupcullai 5645116

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Blood Bank Management System
Department of Information Technology
Senior Project

Project Title: **Blood Bank Management System**
By: **Phyu Phyu Khaing 5718331**
 Wasin Rattanoengchai 5737458
 Sossarun Tupcullai 5645116
Project Advisor: **Asst. Prof. Dr. Darun Kesrarat**
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The Senior Project committees of the Department of Information Technology, Vincent Mary School of Science and Technology, Assumption University had approved this Senior Project. The Senior Project submitted in partial fulfillment of the requirements for the degree of Bachelor of Science in Information Technology.

Approval Committees:

(Asst. Prof. Dr. Darun Kesrarat)
Project Advisor

(Dr. Jittima Wongwuttawat)
Committee Member

(A. Tapanan Yeophantong)
Committee Member

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1. Introduction

A blood donation is a process whereby a person voluntarily has blood drawn to be used for future transfusions when in need at hospitals for treatment procedures that require them. Donation may be of whole blood (blood drawn directly from the body) or of specific components of the blood; such as red blood cells, white blood cells, plasma, and platelets. Blood banks often participate in the process of collecting blood and other procedures such as managing stocks, approving blood requests and updating donation information.

The inspiration of this project is to improve blood banks in Thailand and to develop a blood bank information system which focuses on making an online system that is accessible for both donors and administrators. Donors can directly receive information regarding their previous blood donations, including their blood results and donation history, in order to easily schedule their next donations. They can also update the personal information through the system, without having to contact the blood bank registry.

The system is also developed for the administrators, who are the main authority in the system. Administrators can add, modify, delete, and query any donation

information if necessary. The administrator is also responsible for responding to the hospital's blood requests and checking the stocks in the blood bank's inventory.

2. Statement of the Problem

The following problem arises when using a typical blood bank's existing system:

- **Personal profile accessibility (P1)**

The donor's information can only be updated by the administrators of the blood bank. A donor can update their information by calling, faxing, e-mailing, but not by themselves. This is a waste of time just for updating a piece of information and it may be troublesome for some donors.

- **Lost or damaged card (P2)**

A typical membership card can easily get damaged if it is exposed to the sunlight or weather and this causes to ruin the card's barcode which is significantly important for retrieving records. If the card gets lost or stolen, the donor has to make a replacement card to keep their membership at the blood bank.

- **Donation record accessibility (P3)**

The donor ID card is the only tangible evidence that contains the donor's recent donation records, if the card gets lost, donors may find it difficult to schedule their next appointment since they are not able to see the last time they had donated blood.

- **Blood result notifications (P4)**

After the process of blood donation, the donor will receive a card that only contains their name and blood type. They will not be notified of their blood result unless they request that information from the blood bank.

- **Blood stock management (P5)**

Blood banks are required to maintain account of blood bags in the inventory. This increases with each blood donation recorded in our system, and decreases as they are checked out upon hospital requests. Our system will need to keep the information up-to-date to ensure correctness of the inventory.

- **Mailing by postal system (P6)**

Blood banks will only mail donors when the donated blood is disqualified, however, this mail is sent through the postal system to the donor's given address. If the donor's address is recorded incorrectly, the mail will be sent to the wrong address and the donor will never be notified that their blood is rejected and given the reason for that.

3. User Requirements

There are two internal users involved in this system. The user requirements are considered as follows:

Donor

1. To be able to view their donation records, including where and when they made donations, and the blood results for each, to learn of their donated blood quality and schedule their next donations. (Solving P3, P6)
2. To be able to view and update their personal information, including name, contact address, and phone number, to keep their donor's information record up-to-date with the blood bank. (Solving P1)
3. To be notified of the blood results of their previous donation by e-mail, to know the success of their donation. (Solving P4)

Administrator

1. To be able to create, update, delete, and query donor's records in order to manage donor information.
2. To be able to create, update, delete, and retrieve donation records to manage information about donations made.
3. To be able to deposit donated blood into inventory when donations are made.

4. To be able to withdraw blood from the inventory and keep a record of blood stocks to always keep count of the blood bags. (Solving P5)
5. To be able to create, update, delete, and retrieve request records from hospitals to manage hospital requests for blood.
6. To be able to create, update, delete, and query hospital's records in order to manage hospital information.
7. To be able to send e-mails to donors for their user account and blood results through the system. (Solving P6)
8. To be able to send e-mail responding to hospitals for their blood requests through the system. (Solving P6)

4. Objectives

The goal of the project is to develop a web application for blood banks to manage information about their donors and blood stock. The main objectives of this website development can be defined as follows:

1. To develop a system that provides functions to support donors to view and manage their information conveniently.
2. To maintain records of blood donors, blood donation information and blood stocks in a centralized database system.
3. To inform donors of their blood result after their donation.
4. To support searching, matching and requesting for blood convenient for administrators.
5. To provide a function to send an e-mail directly to the donor for their user account and the hospital, the availability of the blood bag.

5. Scope of the Project

The system functions and features of our system will include the following:

- **Registration**

This function allows the donor and administrator to register as a user to interact with the system. The system requires the user to login before viewing and editing any information.

- **View and edit information online**

Donors are allowed to view their blood donation records online by their given account. They can also edit their personal information through the system.

- **Data is input by the Administrators**

The donor's information and donation records can be sent from the hospital to the administrator by calling or e-mail. The administrator is responsible for keying the received data into the system.

- **Recording donation records**

The system is able to record data of whole blood which is sent from the hospital.

- **Manage blood inventory**

The system uses a First-In-First-Out stock management, where the blood stock that is checked-in to the system first will be the first one given to the hospital when requested. When the blood stock is expired, the administrator is responsible for removing the stock from the inventory and updating the system.

- **Blood requests**

The hospital can request blood via e-mail and by calling to the blood bank.

- **Notify by E-mail**

The donor's account and generated password will be sent via e-mail, following by their blood result of the previous donation sent in a separated e-mail. Hospitals can also receive e-mail responding to their requested blood whether it is available in our stock or not.

- **Summary report**

The system is able to generate a report to summarize all records including blood donation, blood requests and blood stock for the administrator.

6. Cost and Benefit Analysis

Cost Analysis

GoDaddy - Web Hosting (Economy)

- 1 website
- 100 GB storage
- Unmetered bandwidth
- 1 free domain
- ₱ 3,108/year

Benefits Analysis

1. Users do not have to contact the hospital to know the results of their blood donation. They can view their results through the website by logging-in with their username and password.
2. The reports and information are kept in electronic form and can be easily maintained by the administrators, and donors may access their donation records whenever they want to.
3. The reports of donations are kept in electronic files so that they may last longer and have less chance of being lost or damaged.
4. Administrators of the system can easily manage blood stock and blood withdrawals that have been requested by the hospitals.

7. Methodology

1. Project Identification and Selection

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

2. Project Initiation and Planning

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

3. Analyzing System needs

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

4. Designing the Proposed System

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

5. Development of the Proposed System

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

6. Testing the Proposed System

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

7. Implementing the Proposed System

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

8. Project Management

	Task Name	Start	Finish	Duration	Oct-16		Nov-17		Dec-16	Jan-17		Feb-17		Mar-17		Apr-17		May-17		Jun-17	
					11/10	21/10	30/10	10/11		25/11	04/12	10/12	03/01	19/01	10/02	22/02	04/03	28/03	04/04	22/04	13/05
1	I) Identify and Selecting Topic	11/10/16	20/10/16	10d																	
2	Identify and Selecting Topic	11/10/16	20/10/16	10d																	
3	II) Project Initiation and Planning	21/10/16	19/11/16	29d																	
4	Collect Information	21/10/16	27/10/16	7d																	
5	Identify user requirement	27/10/16	02/11/16	7d																	
6	Define scope and Objectives	25/10/16	29/10/16	5d																	
7	Identify Technology Support	30/10/16	05/11/16	7d																	
8	Cost and Benefit Analysis	10/11/16	16/11/16	7d																	
9	III) Analysis System needs	25/11/16	22/03/17	118d																	
10	Study the Existing System	25/11/16	04/12/16	10d																	
11	Identify the Existing Problems	25/11/16	01/12/16	7d																	
12	Identify Data Flow Diagram of Existing System	25/11/16	01/12/16	7d																	
13	Develop Data Flow Diagram	04/12/16	22/03/17	108d																	
14	Develop ER Diagram	04/12/16	22/03/17	108d																	
15	IV) Design the Purposed System	03/01/17	02/03/17	58d																	
16	Design Relational Database	03/01/17	10/01/17	7d																	
17	Develop Relational Database	13/01/17	19/01/17	7d																	
18	Design some simple Interfaces	21/01/17	10/02/17	21d																	
19	V) Implementing and Documenting the System	10/02/17	31/05/17	113d																	
20	Refing Requirements	15/02/17	23/02/17	7d																	
21	Design Interface	22/02/17	04/03/17	10d																	
22	System Implementation	04/03/17	31/05/17	88d																	
23	Develop documents	22/04/17	13/05/17	19d																	
24	VI) Final Presentation Preparation	01/06/17	20/06/17	21d																	
25	Project Submission	05/06/17	05/06/17	1d																	
26	Slide and Presentation Preparation	06/06/17	10/06/17	5d																	
27	Final Presentation	20/06/17	20/06/17	1d																	

Table 10.1 Gantt Chart For Project Management

9. Analysis of the Existing System

There are two types of process in the existing system: the blood donation process by donors, and the blood request process by hospitals. In both processes, an administrator is in charge of managing the blood inventory in the blood bank.

Blood Donation Process by Donors

When a new donor comes to donate blood, they are required to fill out their personal information during the registration process before making a donation [1]. After the donation, the donor is given a donor identification card with their name, blood type and a barcode to be used as a reference for future donations [2]. The barcode is used to retrieve the donor's record containing their personal information, medical history and donation information, including blood results [3]. Only blood bank administrators have the authority to access the donor's records, since the system is only available for their use within the organization. This makes it difficult for donors to make changes to their personal information within the system. That is, for donors to update their personal information, such as their phone number, mailing address, or e-mail, they cannot update the information by themselves, but have to contact the blood bank center to update their information.

At the back the card is a table that contains number of donations, date, location, and the blood collector's signature. Existing donors can submit their donor ID cards to retrieve their personal information and donation records and start the blood donation process, and they will be given a new card after they have donated blood for a total of eight times. Having a donor ID card may be a tangible reminder to people that they are helping lives as a blood donor; however, possessing a physical card comes with drawbacks such as loss or damage. To ensure donors can still identify themselves with the system, other credentials, such as username and password, can be used as a safeguard if their donor ID card is lost or damaged.

If the donated blood is disqualified, the donor will be notified through postal mail that their blood component is reactive to viruses [4], meaning that there is a positive result of the blood being infected, and the organization will also inform the donor to perform another blood test at the blood bank to confirm the result of blood. If the blood is qualified, the administrator then will deposit the blood into the inventory for future requests.

Blood Request Process by Hospitals

Hospitals can request for blood by calling in or e-mailing the blood bank the type of blood and the quantity that is in need. The administrator is responsible in

checking the availability of the blood type according to the request. If the requested blood type is available, the administrator will withdraw the blood from the inventory and transfer it to the hospital. However, if the requested blood is unavailable, the administrator will send an e-mail to inform the hospital.

10. Logical Design of the Proposed System

10.1 Data Flow Diagram - Context Diagram

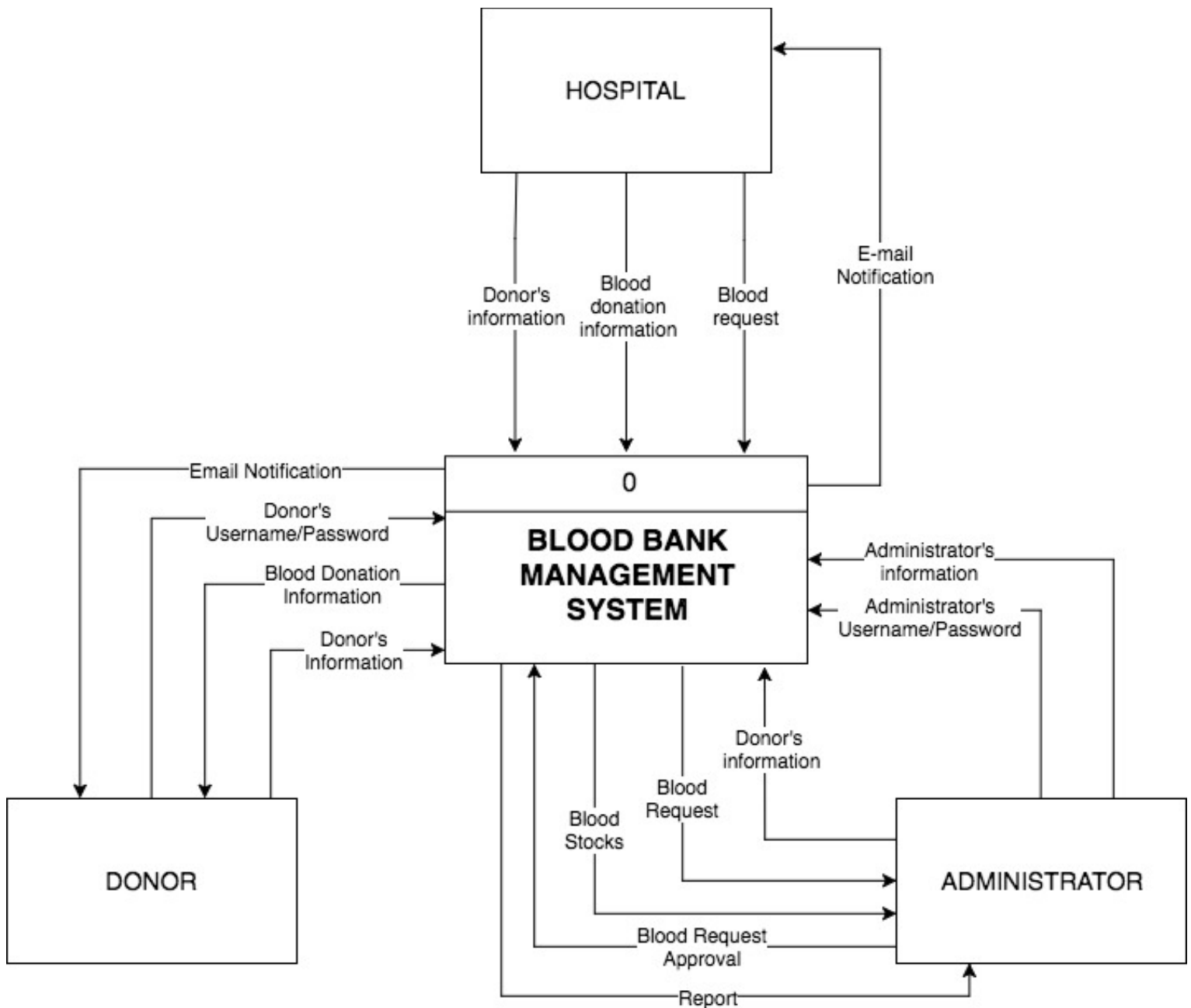


Figure 10.1: Context diagram of Blood Bank Management System

10.2 Data Flow Diagram - Level 0

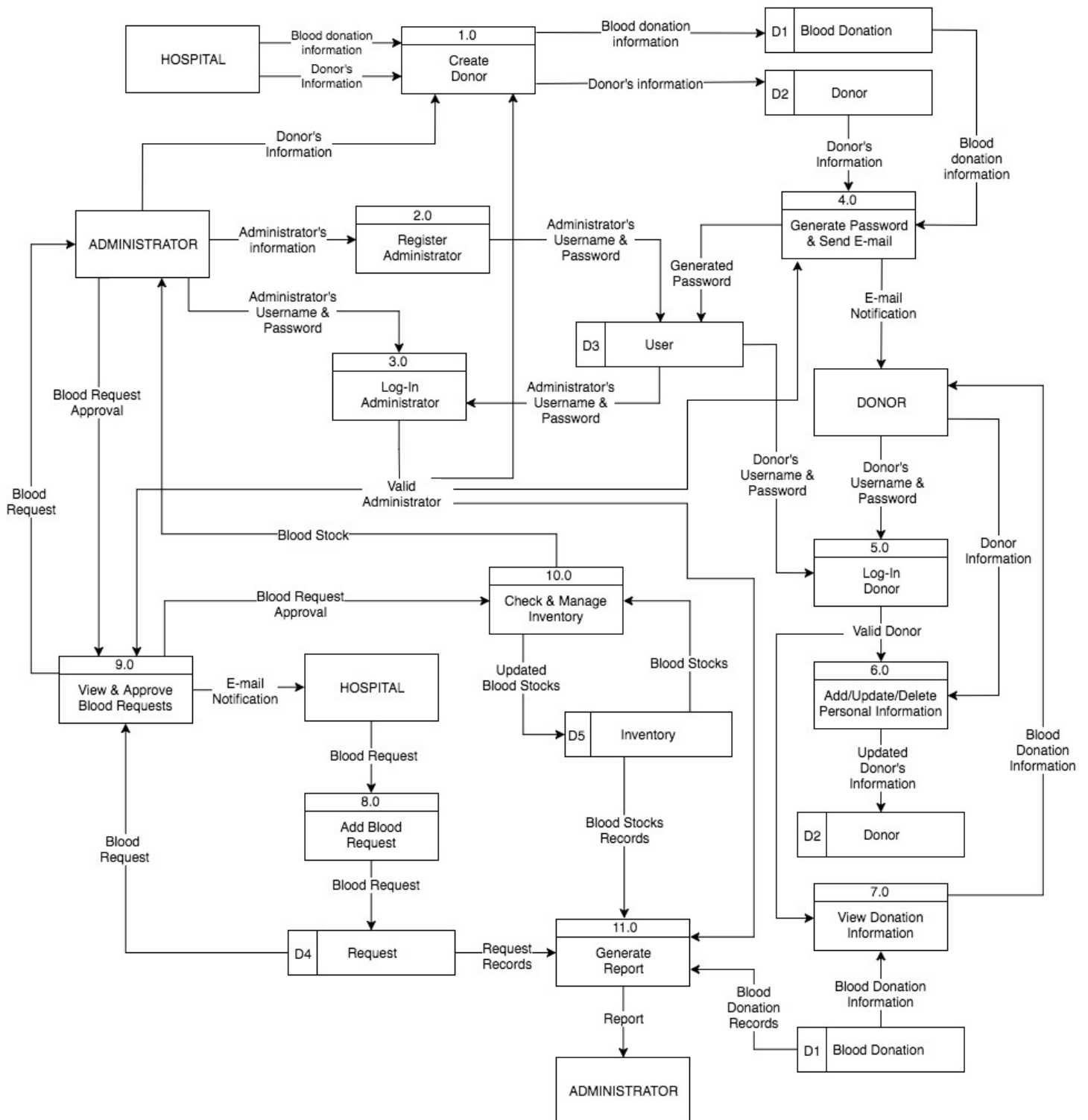


Figure 10.2: Level 0 of Blood Bank Management System

10.3 Data Flow Diagram - Level 1

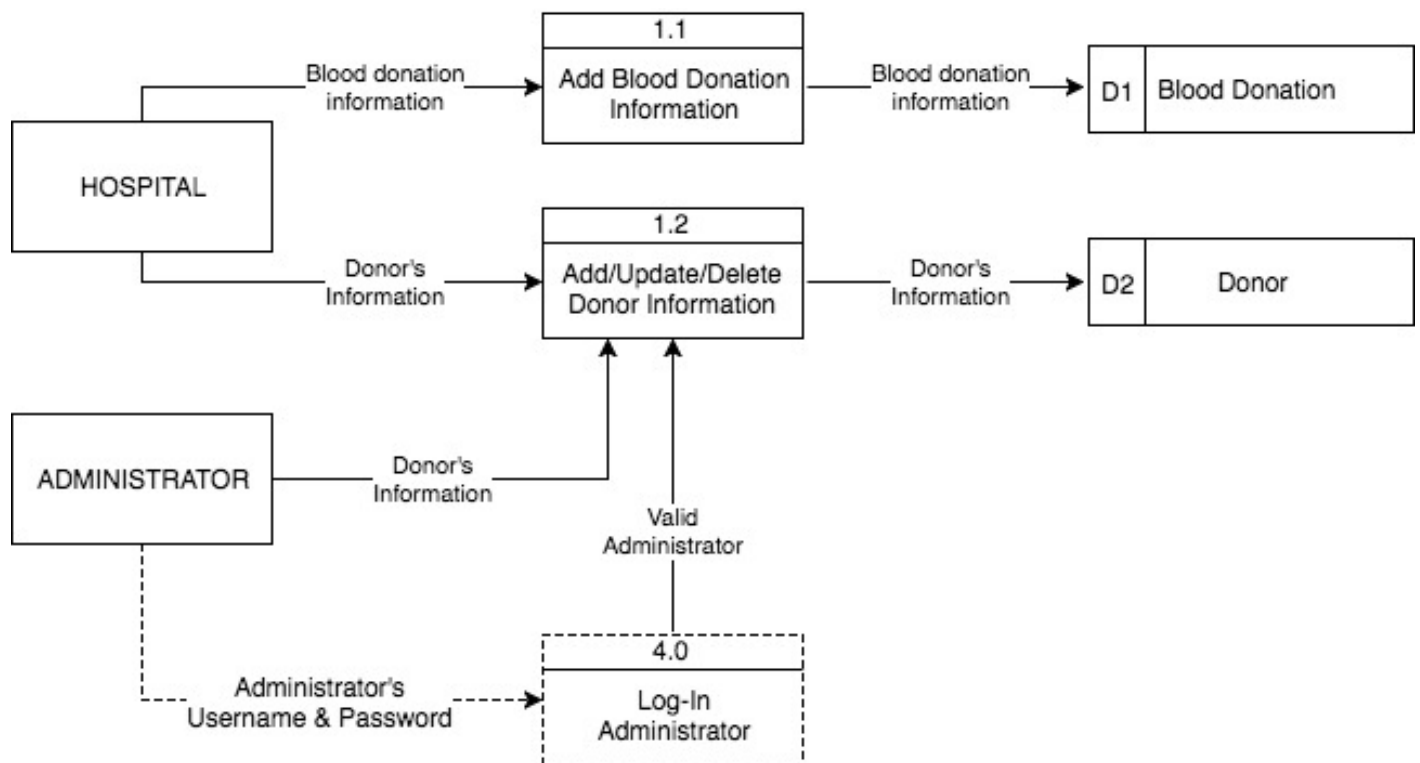


Figure 10.3: Level 1 of Blood Bank Management System

10.4 Data Flow Diagram - Level 4

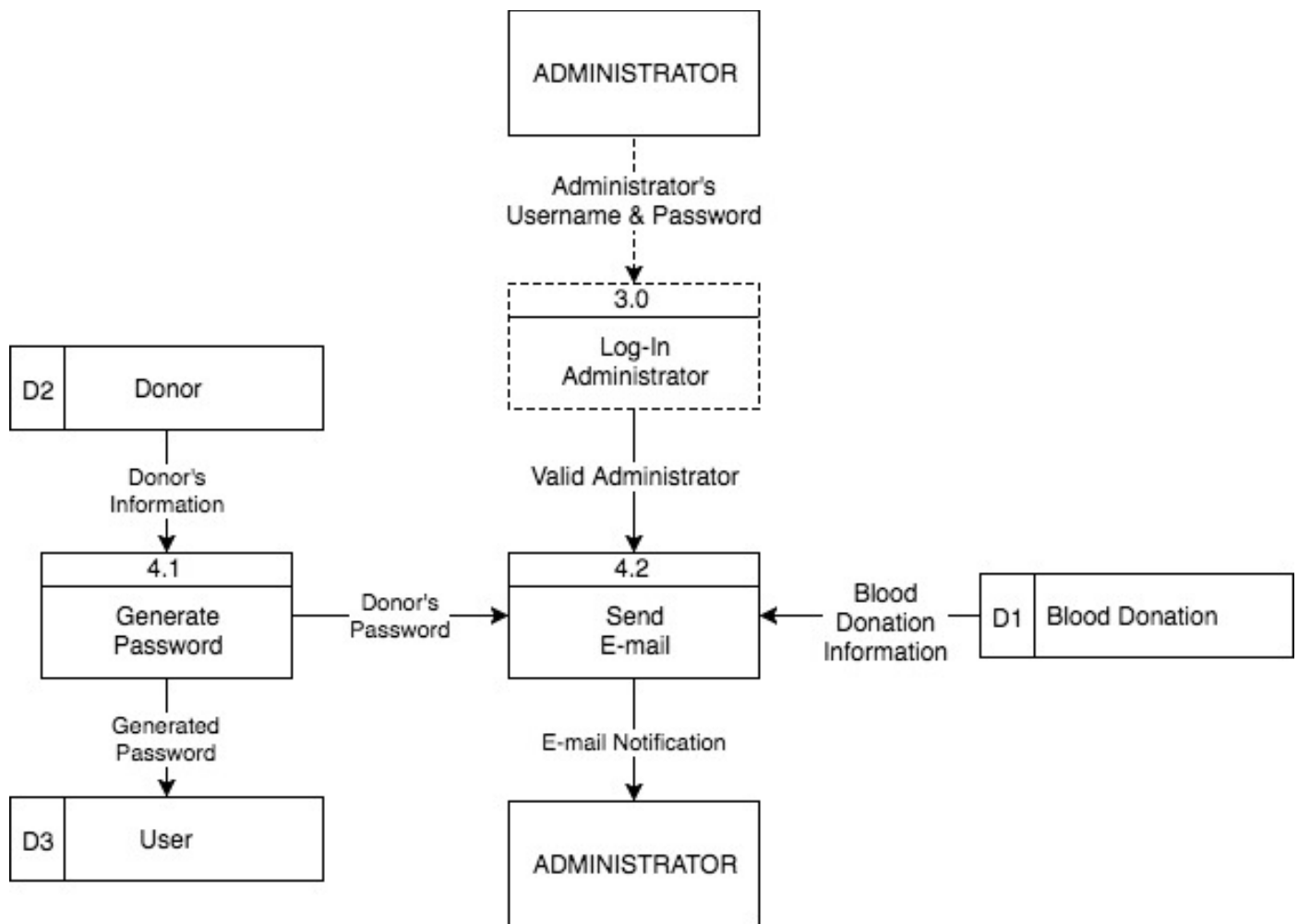


Figure 10.4: Level 4 of Blood Bank Management System

10.5 Data Flow Diagram - Level 9

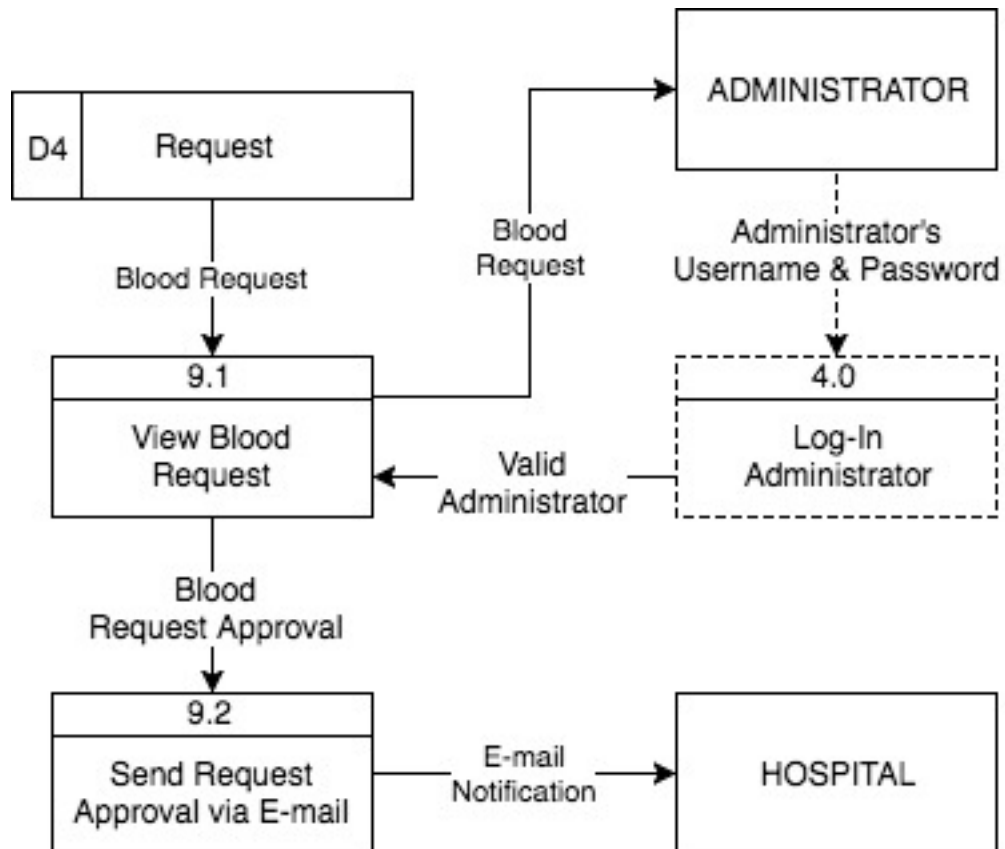


Figure 10.5: Level 9 of Blood Bank Management System

10.6 Data Flow Diagram - Level 10

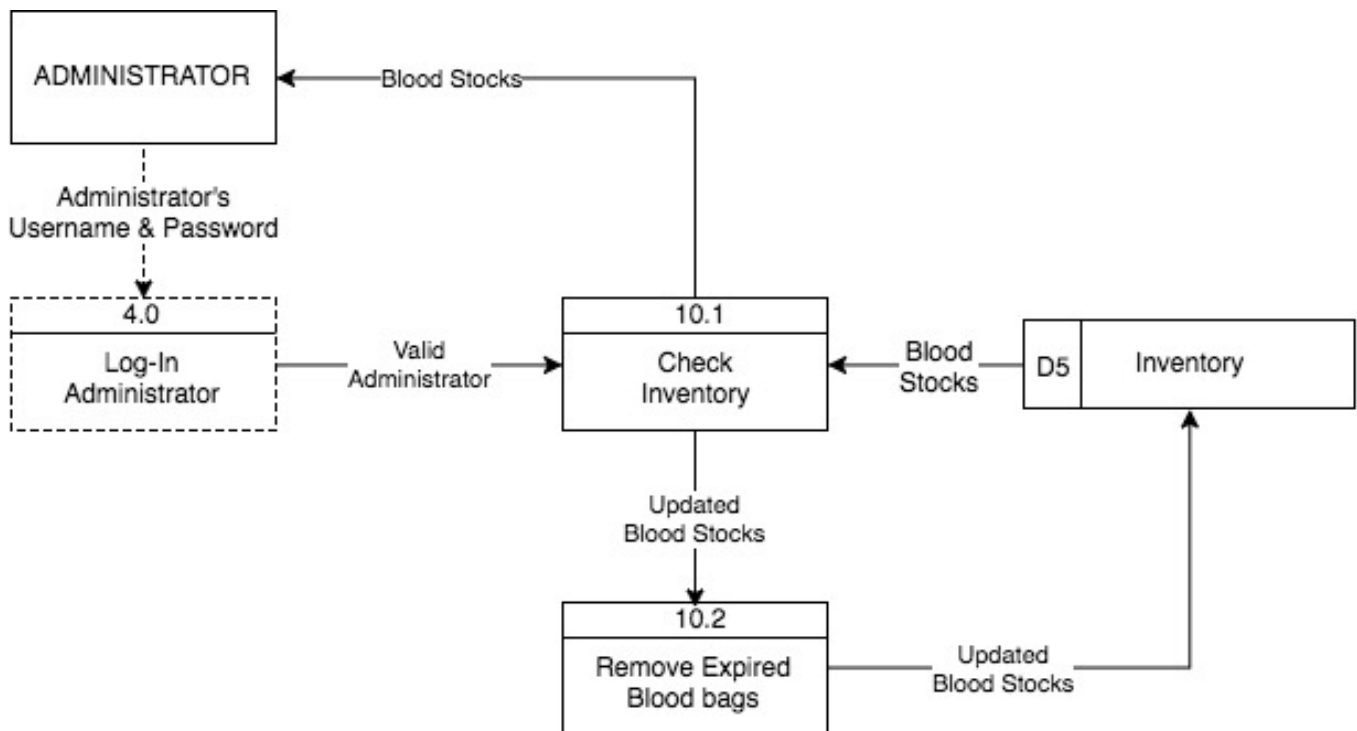


Figure 10.6: Level 10 of Blood Bank Management System

10.7 Entity Relationship Diagram

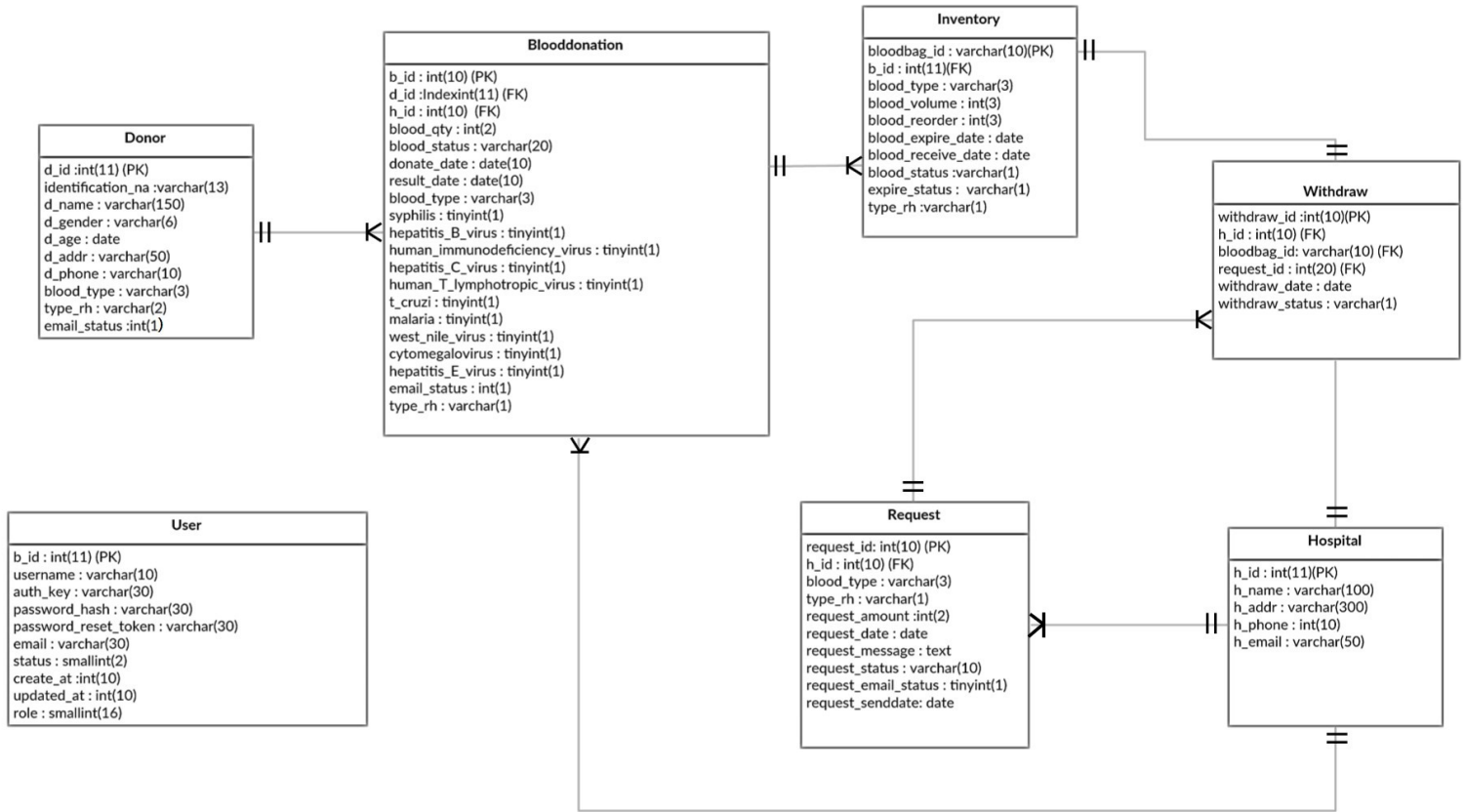


Figure 10.7: Entity Relationship Diagram of Blood Bank Management

10.8 Data Dictionary

User : Contains general information of a User

Column	Type	Description	Example
id(PK)	Int(11)	Unique key to identify each user	1876534279
username	Varchar(10)	username for log in to system	john0802
auth_key	Varchar(32)	key to remember username and password	PdNfV2HWtL5efmYKS wN3kWnF97Bz2rEI
password_hash	Varchar(60)	generate hash for password	\$2y \$13\$QtBx5UYoH3Fg9S lp2X8d7eHpxswuy4zZ/ VWfHgs2kXDnr8HXhZo BC
password_reset_token	Varchar(43)	token for user to reset password	S_f7X10B83mpMaL- BYz7H_TNv7q- Ta6j_1497180423
email	Varchar(30)	email address that user use for register to system	abc@gmail.com
status	Smallint(2)	status use to identify whether user is being actived	10 = active 20 = deactive
created_at	Date	date of new username is created	01/03/2017
updated_at	Date	date of user update username or password	23/12/2017
role	Smallint(2)	role to distinguish user type	10 = donor 20 = admin

Table 10.2: Data Dictionary – User

Donor: Contains general information of a Donor

Column	Type	Description	Example
d_id(PK)	Int(11)	unique key to identify donor	1

identification_no	Varchar(13)	identification number	1101800344496
d_name	Varchar(50)	name and surname of donor	Alexander Washington
d_age	Date	donor's date of birth	02/10/1997
d_addr	Varchar(70)	address of donor	424 trapha bkk 12000
d_gender	Varchar(6)	gender of donor	Male, Female
d_phone	Int(10)	contact number of donor	093999999
blood_type	Text(3)	blood type of donor	AB
email_status	Int(1)	status of donor's blood test	1 = sent 0 = pending
type_rh	Varchar(10)	identify special type of blood	Rh Positive, Rh Negative

Table 10.3: Data Dictionary – Donor

Blood Donation: Contains blood donation information of each donor

Column	Type	Description	Example
b_id(PK)	Int(10)	Unique key to identify each donation	12434567890
d_id(FK)	Int(11)	auto-incrementation number	1
h_id(FK)	Int(10)	Unique key to identify hospital	3257865235
stock_id(FK)	Int(10)	Unique key to identify each blood bag	128
blood_qty	Int(2)	a unit of blood donate per time	1 (units)
blood_status	VarChar(20)	record whether blood is qualified	qualified, disqualified
donate_date	Date	donation date	17/04/2017
result_date	Date	blood result date	23/04/2017
blood_type	Varchar(3)	blood type of donor	AB
sysphilis	Tinyint(1)	identify transfusion disease	1 = yes 0 = no

hepatitis_B_virus	Tinyint(1)	identify transfusion disease	1 = yes 0 = no
human_immunodeficiency_virus	Tinyint(1)	identify transfusion disease	1 = yes 0 = no
hepatitis_C_virus	Tinyint(1)	identify transfusion disease	1 = yes 0 = no
t_cruzi	Tinyint(1)	identify transfusion disease	1 = yes 0 = no
malaria	Tinyint(1)	identify transfusion disease	1 = yes 0 = no
human_T_lymphotropic_virus	Tinyint(1)	identify transfusion disease	1 = yes 0 = no
west_nile_virus	Tinyint(1)	identify transfusion disease	1 = yes 0 = no
cytomegalovirus	Tinyint(1)	identify transfusion disease	1 = yes 0 = no
hepatitis_E_virus	Tinyint(1)	identify transfusion disease	1 = yes 0 = no
email_status	Int(1)	Identify whether the email is sent to donor	1 = sent 0 = pending
type_rh	Varchar(10)	identify special type of blood	Rh Positive, Rh Negative

Table 10.4: Data Dictionary – Blood Donation

Inventory: Contains the inventory information

Column	Type	Description	Example
bloodbag_id (PK)	varchar(10)	generate id to identify blood bag	1109746001
blood_type	Varchar(3)	blood type of donor	AB
blood_volume	Int(3)	Amount of blood in each bag	150 (cc)
expire_date	Date	date of blood expire	24/04/2018
receive_date	Date	date of receive blood	28/4/2017
send_status	Varchar(1)	identify whether blood is sent	1 = yes 0 = no

expire_status	Varchar(1)	identify whether blood is sent	1 = yes 0 = no
type_rh	Varchar(10)	identify special type of blood	Rh Positive, Rh Negative

Table 10.5: Data Dictionary – Inventory

Request: Contains requests from the Hospital

Column	Type	Description	Example
request_id(PK)	Int(10)	Unique key to identify request	123456
h_id (FK)	Int(10)	Unique key to identify hospital	1234
blood_type	Varchar(3)	blood type	AB
request_amount	Int(2)	Amount of bags the hospital can request	20 (bags)
request_date	Date	Hospital request date	27/04/2017
request_message	Text	Additional notes	Urgent
type_rh	Varchar(10)	identify special type of blood	Rh Positive, Rh Negative
request_email_status	Tinyint(1)	identify whether email is sent	1 = yes 0 = no
request_sentdate	Date	date of making approval of request	17/07/2017
request_status	Varchar(10)	identify whether request is approved or disapproved	Pending, Approve, Disapprove

Table 10.6: Data Dictionary – Request

Withdraw: Contains information of withdrawals

Column	Type	Description	Example
withdraw_id (PK)	Int(10)	Unique key to identify withdrawal	1

h_id (FK)	Int(10)	Unique key to identify hospital	1
bloodbag_id (FK)	Varchar(10)	Unique key to identify blood bag after withdraw	3456792098
request_id (FK)	Int(10)	Unique key to identify request	1
withdraw_date	Date	date of withdraw blood bag	17/07/2017
withdraw_status	Varchar(1)	Blood bag withdrawing status	0

Table 10.7: Data Dictionary – Withdraw

Hospital: Contains general information of the Hospital

Column	Type	Description	Example
h_id (PK)	int(10)	Unique key to identify hospital	12343457
h_name	Varchar(20)	Hospital name	Payathai 3 hosipital
h_addr	Varchar(30)	address of hospital	111 Phet Kasem Rd Phasi Charoen Bangkok 10160 Thailand
h_phone	int(15)	contact number of hospital	029561335-3213
h_email	Varchar(30)	contact email to hospital	bangkokhospital@hotmail.com

Table 10.8: Data Dictionary – Hospital

10.4 Interface design

Donor

[Home](#) / [Login](#)

Login

Please fill out the following fields to login:

Username

Password

☒ Remember Me

Login

Figure 10.4: Donor's Log-in Page



Blood Types

Although all blood is made of the same basic elements, not all blood is alike. In fact, there are eight different common blood types, which are determined by the presence or absence of certain antigens – substances that can trigger an immune response if they are foreign to the body. Since some antigens can trigger a patient's immune system to attack the transfused blood, safe blood transfusions depend on careful blood typing and cross-matching.

The ABO Blood Group System

There are four major blood groups determined by the presence or absence of two antigens – A and B – on the surface of red blood cells:

- **Group A** – has only the A antigen on red cells (and B antibody in the plasma)
- **Group B** – has only the B antigen on red cells (and A antibody in the plasma)
- **Group AB** – has both A and B antigens on red cells (but neither A nor B antibody in the plasma)
- **Group O** – has neither A nor B antigens on red cells (but both A and B antibody are in the plasma)

There are very specific ways in which blood types must be matched for a safe transfusion. See the chart below:

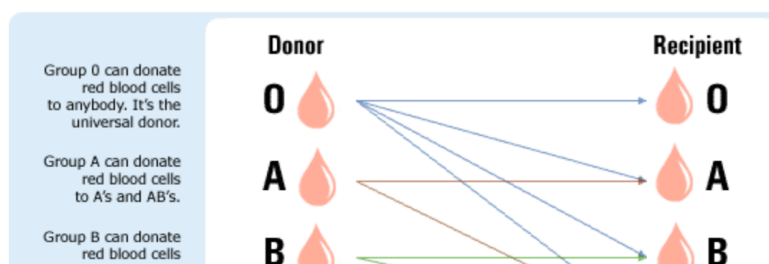


Figure: 10.5 Home Page

Welcome

HomeContactMeLogout (John)

Home / Donors /

Personal Profile

Donor No.	2
Full Name	John
Gender	Male
Date of Birth	19
Address	Inspire Place
Contact No.	0823838438
Blood Type	O

Edit profile

Figure: 10.6 View Personal Profile Page

Welcome

HomeContactMeLogout (John)

Home / Blooddonations

Blood Donation History

Showing 1-2 of 2 items.

#	Blood Volume	Donate Date	Blood Type	Blood Status
1	150	May 14, 2017	A	disapproved
2	150	Jun 13, 2017	A	approved

Figure: 10.7 View Donation History Page

Administrator

Home / Login

Login

Please fill out the following fields to login:

Username

Password

☒ Remember Me

Login

Figure 10.8: Administrator's Log-in Page

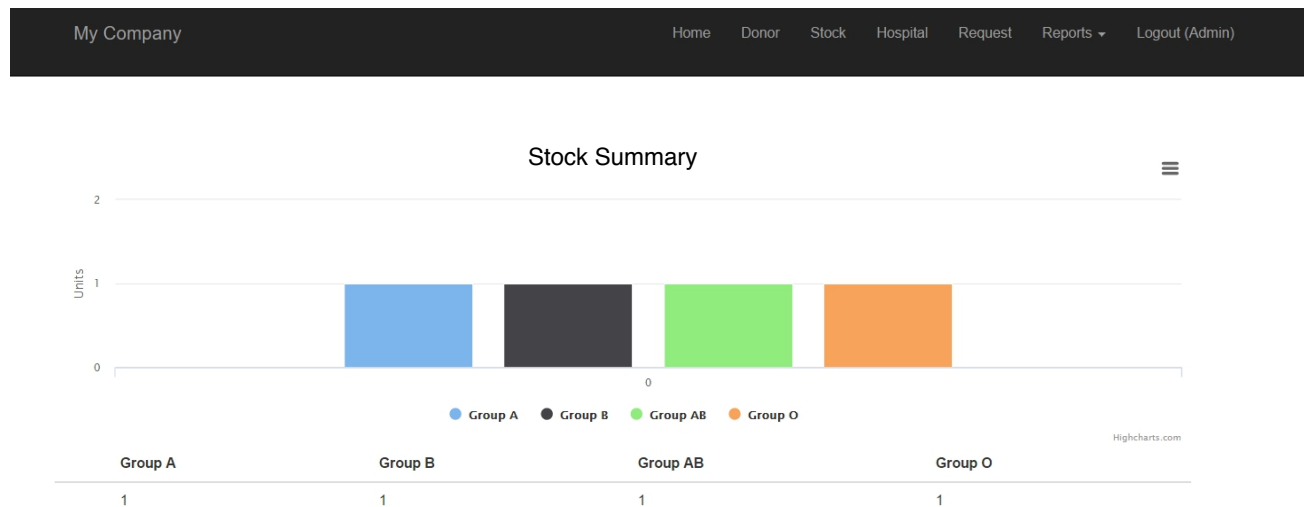


Figure 10.9: Home Page

My Company
Home
Donor
Stock
Hospital
Request
Reports
Logout (Admin)

Home / Donor Information

Please enter Identification Number or Name
Search
Create Donor

Showing 1-4 of 4 items.

Identification Number	Name	Blood Info	Option	
111111111111	John	View	Create	
73638768734	pay	View	Create	
7778889990000	gggg	View	Create	
5653757347667	eer	View	Create	

Figure 10.10: Manage Donor Page

My Company
Home
Donor
Stock
Hospital
Request
Reports
Logout (Admin)

Home / Donors /

New Donor

Full Name

Identification Number

Gender

☐ Male
☐ Female

Age

Address

Contact Number

Last Donate Date

Blood Type

A ▼

Generate Username and Password

Username

Email

Password

Create

Figure 10.11: Create New Donor Page

[Home](#) / [Blood donations](#)

Blood donations

Showing 1-2 of 2 items.

#	Qty	Donate Date	Result Date	Blood Status	
1	1	14-May-2017	17-May-2017	disapproved	View Edit Delete Mail
2	1	13-Jun-2017	16-Jun-2017	approved	View Edit Delete Mail

Figure 10.12: Manage Blood Donation Page

My Company

[Home](#)
[Donor](#)
[Stock](#)
[Hospital](#)
[Request](#)
[Reports ▾](#)
[Logout \(Admin\)](#)

Blood Quantity

Result Date

Hepatitis B Virus

☐ Yes
 ☐ No

Hepatitis C Virus

☐ Yes
 ☐ No

T Cruzi

☐ Yes
 ☐ No

West Nile Virus

☐ Yes
 ☐ No

Hepatitis E Virus

Donate Date

Syphilis

☐ Yes
 ☐ No

Human Immunodeficiency Virus

☐ Yes
 ☐ No

Human T Lymphotropic Virus

☐ Yes
 ☐ No

Malaria

☐ Yes
 ☐ No

Cytomegalovirus

☐ Yes
 ☐ No

Blood Status

Create Stock

Blood Bag ID

Blood Type

Blood Volume

Figure 10.13: Create New Donations and Stock

My Company

HomeDonorRequestHospitalStockLogin

Home / Requests

Requests

Create Request

PendingApproveDisapprove

Showing 1-4 of 4 items.

Request ID	Blood Type	H Name	Blood Quatity	Request Date	Withdrawal Status	
57	A	Bangkok Hospital	112	Dec 2, 2	Pending	   
58	A	Pim	3	Jun 4, 2017	Pending	   
59	B	Bangkok Hospital	400	Jun 4, 2017	Pending	   
56	B	Payathai	3	Jun 13, 2017	Pending	   

Figure 10.14: Request Approval Page

My Company

HomeDonorRequestHospitalStockLogin

Home / Requests / Create Request

Create Request

Hospital name

ramkamhang Hospital

+ Create Hospital

Blood Type

A (1 Units)

Blood Quantity

Request Date

06/04/2017

Create

Figure 10.15: Create New Request Page

Stocks

...

Showing 1-3 of 3 items.

☐	Blood Bag ID	Blood Type	Blood Volume	Expiry Date	Receive Date	Sent Date	
☒	111213	A	350	2017-06-01	2017-06-23	2017-06-16	  
☒	234234	B	400	2017-06-15	2017-06-23	2017-06-16	  
☐	1233	B	300	2017-06-15	2017-06-23	2017-06-16	  

Figure 10.16: Blood Bag Withdrawal Page

[Home](#) / [Stocks](#)

Stocks

...

☐	Blood Bag ID	Blood Type	Blood Volume	Expiry Date	Receive Date	Sent Date	
☒	111213	A	350	2017-06-1	2017-05-10	2017-06-16	  

Figure 10.17: Manage Expired Blood Bag Page

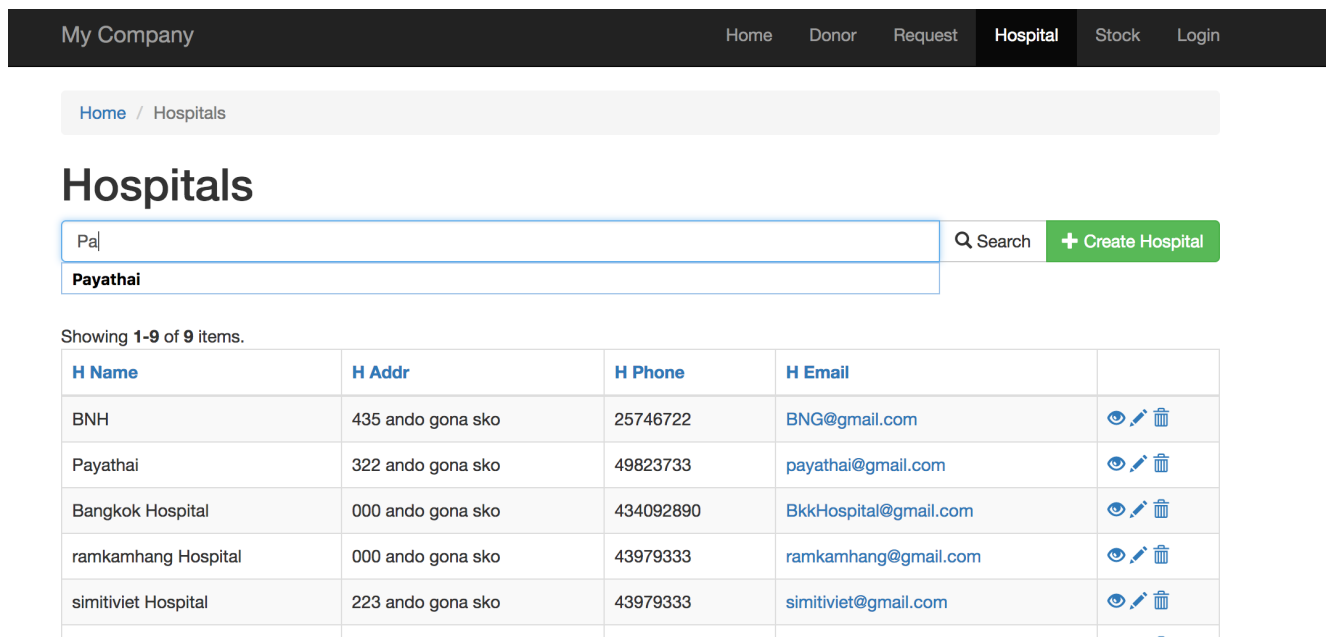


Figure 10.18: Hospital Contact Information Page

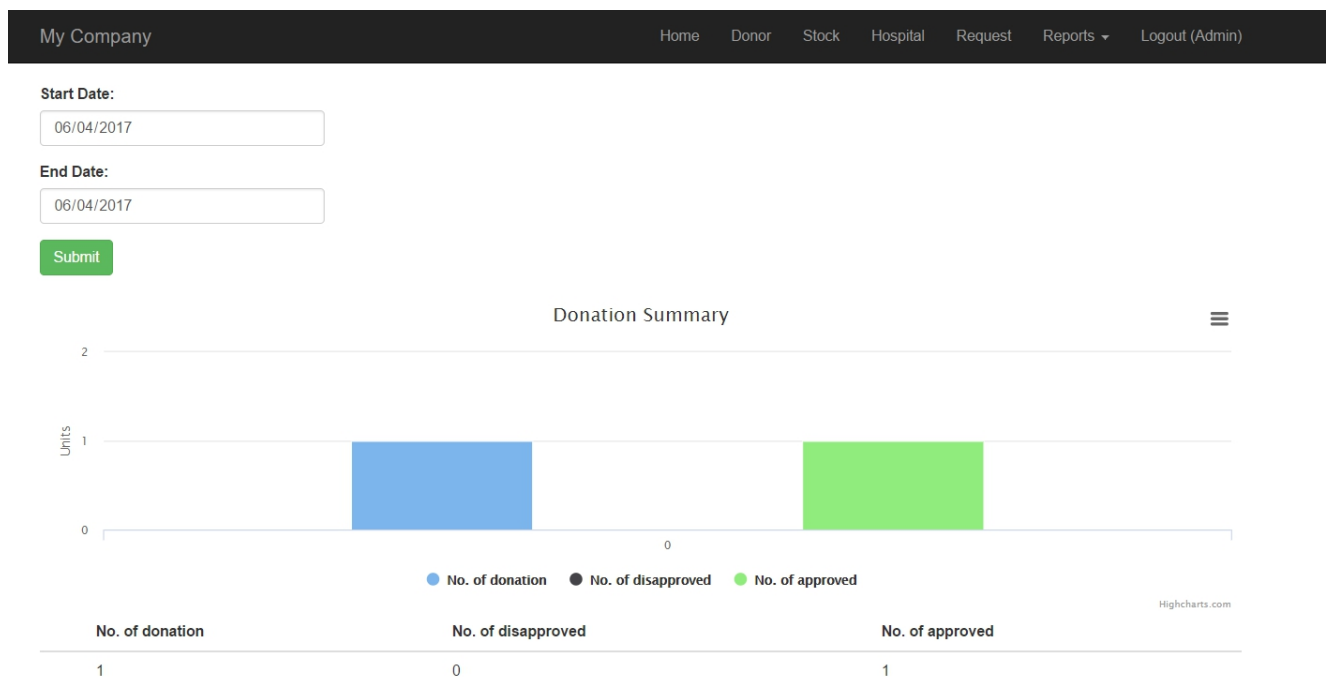


Figure 10.19: Report Page

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- [4] <https://www.redcross.or.th/forum/16095>
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