ONLINE BLOOD BANK MANAGEMENT SYSTEM

CASE STUDY: MBALE REGIONAL REFERAL HOSPITAL

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A PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF COMPUTER STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A BACHELORS DEGREE IN INFORMATION TECHNOLOGY OF BUSITEMA UNIVERSITY FACULTY OF SCIENCE AND EDUCATION

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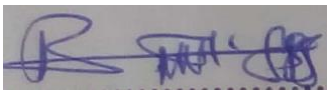
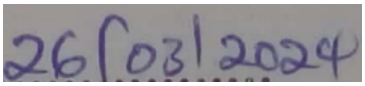
OCTOBER, 2023.

DECLARATION

I **BWIRE FREDRICK**, Reg No. **BU/UP/2020/1092**, here by declare that the information prepared and presented in this report is as a result of my efforts.

STUDENT

BWIRE FREDRICK

Signature  **Date** 

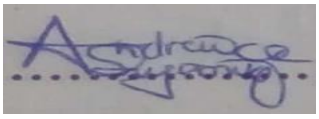
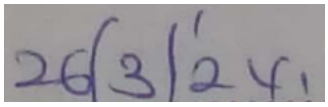
APPROVAL

This Project report titled "**ONLINE BLOOD BANK MANAGEMENT SYSTEM**" is to certify that **BWIRE FREDRICK**, Reg No **BU/UP/2020/1092** did his research.

This report has been approved for submission.

SUPERVISOR

DR. LUKYAMUZI ANDREW

Signature  **Date** 

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DEDICATION

I dedicate this report to my dearly and beloved parents Mr. Wandera Ernest Obuyu and Mrs. Taaka Silvia Wandera, my siblings more especially Juma David Evans, my uncles Masiga Geofrey Ogambo, Wabudi family, Ouma Emmanuel and my auntie Kisakye Moreen for their social, financial support and guidance offered to me, BIT Class, BUSSA fraternity at large and the management of Busitema University for the skills given to me throughout the journey of my Education.

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May the Almighty God award you abundantly.

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In the first place, I would like to thank the almighty GOD for taking me through the period of my Education especially the final year project successfully.

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LIST OF ABBREVATIONS AND ACRONYMS.

OBBMS	Online Bank Management System
MRRH	Mbale Regional Referral Hospital
MoH	Ministry of Healthy
UBTS	Uganda Blood Transfusion Services
IS	Information System
RAD	Rapid Application Development
DFD	Data Flow Diagram
ERD	Entity Relationship Diagram
DBMS	Database Management System
HTML	Hyper Text Markup Language
CSS	Cascading Style Sheets
PHP	Hypertext Preprocessor
SQL	Structured Query Language
MySQL	My Structured Query Language
XAMPP	Cross-Platform Apache server, MySQL, PHP

ABSTRACT

This report is a representation of the Blood Bank Management System (BBMS) with the case study of Mbale Regional Referral Hospital. The major aim of the project was to develop a blood bank management system which the Hospital can use to facilitate the smooth, efficient, and safe management of blood products and related processes.

The Blood Bank Management System (BBMS) is a comprehensive software solution designed to address the challenges faced by blood banks in efficiently managing blood inventory, donor information management, Blood request and distribution, Search and reporting, User management and security, Notifications. In the context of healthcare, timely access to safe and compatible blood is critical for patient care. This project aims to enhance the overall blood bank operations by streamlining the processes involved in donation, storage, and distribution of blood units.

The BBMS was developed using modern programming languages and web technologies, incorporating a user-friendly interface that facilitates seamless navigation and interaction. The system was developed using PHP for server-side scripting, HTML for designing data entry forms, other tools included CSS, JavaScript, Bootstrap, and MySQL for building the database management system. Key features of the system include donor registration, real-time blood inventory tracking, Blood request and distribution monitoring. The system's architecture ensures strong data management, enabling quick retrieval and analysis of crucial information.

Expected results from the implementation of the BBMS include optimized blood inventory management, reduced wastage of blood, enhanced donor participation, and streamlined distribution workflows. These outcomes are anticipated to significantly improve patient care and overall public health outcomes.

The simple user interface allows blood bank personnel to efficiently track blood units, match donor details, and manage distribution requests. The contributions of this project lie in the innovative approach to blood bank management, utilizing technology to address critical operational challenges. The BBMS holds the potential to revolutionize healthcare services by ensuring the availability of safe and compatible blood units, ultimately contributing to enhanced patient care

and improved public health outcomes.

The target audience for the Blood Bank Management System includes blood bank administrators, healthcare providers, donors, and recipients. The system caters to the diverse needs of these stakeholders, ensuring efficient blood bank operations and ultimately contributing to better healthcare delivery.

Conclusively, the Blood Bank Management System project holds huge potential to transform blood bank operations, improve donor engagement, and enhance patient care. Its comprehensive scope, innovative methodology, and expected outcomes underscore its significance in addressing critical challenges faced by blood banks.

Keywords: Blood Bank, Management System, Donor Management, Inventory Tracking, Healthcare Delivery, Patient Care.

CHAPTER ONE

Introduction.

Blood banks play a critical role in healthcare systems by ensuring a steady supply of safe and compatible blood products for various medical procedures, surgeries, and emergencies. Timely access to blood units that match the specific needs of patients is essential for successful treatments and patient care. However, the management of blood inventory, donor interactions, and distribution processes presents complex challenges that demand efficient and technology-driven solutions.

The Blood Bank Management System (BBMS), the subject of this research project, is a technological endeavor aimed at addressing these challenges and optimizing blood bank operations. The BBMS is imagined as a comprehensive software solution designed to streamline the collection, testing, storage, and distribution of blood products within a hospital or healthcare institution. By using modern programming languages and advanced technologies, the BBMS seeks to enhance the efficiency, accuracy, and effectiveness of blood bank management.

Background of the study.

Mbale Regional Referral Hospital (MRRH) is a government-owned and funded hospital located in Mbale, Eastern Uganda. It is one of the thirteen "Regional Referral Hospitals" in Uganda. It is also designated as one of the three public clinical paramedical teaching hospitals and as one of the fifteen "Internship Hospitals" in Uganda, where graduates of Ugandan medical schools can serve a one-year internship under the supervision of qualified specialists and consultants. The hospital is the teaching hospital of Busitema University School of Medicine.

MRRH was founded in 1924 as a health center and has since grown to a 450-bed capacity hospital. It serves a population of over 4.6 million people in 16 districts of Busia, Tororo, Butaleja, Pallisa, Budaka, Mbale, Bududa, Sironko, Manafwa, Namisindwa, Butebo, Kapchorwa, Kibuku, Bukwo, Kween and Bulambuli.

MRRH faces a number of challenges in its blood bank management, including:

Lack of a centralized blood bank management system: MRRH does not have a centralized

blood bank management system. This means that there is no single database that tracks blood inventory, blood donations, and blood requests. This can lead to problems such as blood shortages, inaccurate blood records, and difficulty in tracking blood usage.

Lack of enough staff: MRRH has a shortage of staff in its blood bank department. This means that there is not enough staff to manage the blood bank effectively. This can lead to problems such as delays in processing blood donations, inaccurate blood records, and difficulty in tracking blood usage.

Therefore, drawing from this background, the researcher developed and tested a blood bank management system that can help MRRH to address these challenges and improve the efficiency and effectiveness of its blood bank operations.

A blood bank management system can provide the following benefits:

Centralized blood bank management: A blood bank management system can provide a centralized database that tracks blood inventory, blood donations, and blood requests. This can help to ensure that blood is available when it is needed and that blood is not wasted.

Improved staff efficiency: A blood bank management system can help to improve the efficiency of staff in the blood bank department. This can be done by automating many of the manual tasks that are currently performed by staff.

Problem Statement

Mbale Regional Referral Hospital (MRRH) plays a vital role in providing healthcare services to a large and diverse population in the Mbale City and Eastern region of Uganda. As a prominent regional healthcare facility, MRRH offers a wide range of medical services, including surgeries, treatments, and emergency care, often requiring timely access to compatible blood units for successful patient outcomes. However, the existing blood bank management practices within MRRH face challenges that impact the hospital's ability to efficiently and effectively manage its blood inventory and distribution processes.

The central problem lies in the manual and paper-based systems currently employed for blood bank management. These practices can result in errors, delays, and poor resource utilization,

leading to potential complications in patient care. Delays in matching blood types, tracking blood inventory, and responding to emergency blood transfusion needs can have critical consequences for patients' health and treatment outcomes. In addition, it seems that there is lack of proper documentation about blood donors and its medical history. This may lead to blood bag contamination and may affect the blood transfusion safety.
Moreover, the reliance on outdated methods hinders donor engagement efforts and contributes to inefficiencies in scheduling and coordinating blood donations.

In light of these challenges, there was a pressing need to modernize blood bank management practices at MRRH. Implementing an efficient and technology-driven Blood Bank Management System has the potential to streamline processes, enhance donor engagement, optimize blood inventory, and ensure the availability of safe and compatible blood units for patients. Addressing these issues is paramount to improving patient care, enhancing emergency response capabilities, and fostering a more sustainable blood supply for the hospital.

Main Objective.
The main objective of the study was to develop and implement an efficient and technology-driven Blood Bank Management System in a real-world blood bank and evaluate its effectiveness in order to optimize blood inventory management, enhance donor engagement, and ensure timely and safe access to compatible blood units for patients in need.

Specific Objectives

- ✓ Review literature, determine and analyze the requirements gathered for developing the system.
- ✓ To design a new blood bank management system (BBMS) that is based on the latest technologies.
- ✓ To implement the system in a real-world blood bank.
- ✓ To evaluate the system's effectiveness.
- ✓ To document the findings of the study and make recommendations for future research.

Significancy of the study.

The implementation of this Blood Bank Management system in a real-world blood bank brought

out various benefits as explained below.

1. The Hospital's Blood Bank realized the following benefits from the system.
   - ✓ Blood bank's staff were able to find and manage the donor details on the system easily since they were able to register, store and edit different donor details in the system.
   - ✓ Managing the blood bags in the blood bank was much easier because each blood bag has an information about the donor and donation activity details.
   - ✓ The expiration date of the blood bags was viewed in the system and this helped the Administrator to recommend for early distribution of those blood bags before their actual date of expiry.

2. This project report, a documentation of this study findings will enable further research for the development of similar projects.

3. Furthermore, this project can be adopted and implemented by many different blood banks looking for a technology driven Blood Bank Management system which is based on the latest technologies. It is not only limited to Mbale Regional Referral Hospital Blood Bank however much it was this project's case study.

Scope of the study

This research study covers the three (3) basic operations of blood banks, namely: donor registration, monitoring of blood inventories, and monitoring of blood issuance. Also, due to time-constraint, respondents were from hospitals. In addition, the study considered three (3) possible users of the system, namely: hospital administrator, doctors, and blood receptionists.

Limitations:

This research study did not cover the actual blood collection activity, and actual blood transfusion operation. Blood donors and patients or recipients of blood donation are not system users, their registration or information was encoded by the blood bank receptionists.

Definition of terms

Blood bags are designed for the collection, processing and storage of whole blood and

blood components They help in providing aseptic conditions for the separation of blood components. It acts as a closed system for reducing the chances of contamination.

Blood bank is a place where blood bag that is collected from blood donation events is stored in one place. Which refers to a division of a hospital laboratory where the storage of blood product occurs and where proper testing is performed to reduce the risk of transfusion related events.

Donor is someone who gives a part of their body or some of their blood to be used by doctors to help a person who is ill.

CHARPTER TWO:

LITERATURE REVIEW

2.1 Introduction:

In order to understand the concepts associated with Blood Bank Management systems, it is imperative to examine and analyze published materials from experts regarding the field.

Literature review is the assessment of previous work carried out on the same or related projects and extracts relevant points to serve as milestone in the project at hand and for this reason various works were studied and analyzed. The purpose of this review therefore was to examine, analyze and obtain experience regarding the creation and archival processing of electronic records.

2.2 A System.

According to **(Webster & Watson, 2002),** A system is a group of components (people, objects and processes) that work together to achieve a common goal, or multiple goals, by accepting input, processing it and producing output in an organized manner.

2.2.1 Information Systems

An Information system is an integrated set of components for collecting, storing, and processing data and for providing information, knowledge, and digital products. Business firms and other organizations rely on information systems to carry out and manage their operations, interact with their customers and suppliers, and compete in the marketplace. Information systems are used to run inter-organizational supply chains and electronic markets **(Zwass, Vladimir, 24 Aug 2022).**

2.2.2 Online Blood Bank Management System.

According to **(Teena C.A Sankar, (2014))**in their study entitled "**A Study on Blood Bank Management**", they defined Blood Bank Information System as an information management system that contributes to the management of donor records and blood bank. Their system allowed an authorized blood bank administrator to sign in with a password to manage easily the records of donors and patients who need blood.

The system provided many features including the central database, quick access to the system content through the login, includes the search code to find donors on a given basis, and the ease of adding and updating donor data. The main aim of the system was to complete the process of the blood bank. This system was designed to suit all types of blood banks.

Once successful in the implementation of the application, it can be applied and rolled out in several blood banks. This application contains User Login Screen, Blood Management, Menu Form, Blood Stock, Donor Management, Donor Registration, Recipient Management and Blood Reservation. In similar manner, the researchers planned in their application to have hospital administrator, doctors, and blood bank receptionists as users.

The authors did not mention the research method they used, and failed to provide screenshots of the system prototypes, making difficult for the researchers to visualize their application. No discussion also for their respondents, samples and sampling techniques used. Subsequently, the researchers planned to provide figures to explain the system, screenshots of system prototypes, and other diagrams that can help other researchers to visualize the development of web-based blood bank management system. Also, the researchers will explicitly discuss its research methods, sampling procedures, and statistical treatment to be used for analyzing the gathered data.

On the other hand, study entitled "**Blood Bank Management System**" done by **(Kumar R,Singh, S. and Ragavi, V.A. , (2017))** the researchers developed a web-based blood management which assists the blood donor records management, and provides ease of control in the distribution of blood products in various parts of the country considering demands of hospitals. The developed system was scalable and adaptable to meet the complex needs usually of a blood bank. Based on this study, since entering the details about the blood donors and related records were done manually, thus, tracking of blood donation activities was difficult and complicated, and even led to erroneous information.

Subsequently, the researchers mentioned that manual-based system can be waste of time, lead to the error-prone results, consumes a lot of manpower, lacks data security, data retrieval requires a lot of time, reports consume a long time to produce, and there is less precise accuracy on the results. As such, by developing and implementing a web-based blood management information system, there was a quick and timely access to donor records, and the system provided management timely, confidential and secured medical reports. There were three (3) users in the system, namely: Administrator, Donor, and Acceptor. Each user has been given user ID and password to identify

their identity. The said application was developed using ASP.NET, C#.NET, and using SQL Server 2000/2005 for the database. The research paper failed to mention the methods of research used.

In this study, the researchers learnt the importance of implementing a web-based blood bank management system in handling records for blood donors and blood donation activities to ensure accurate and readily available information for blood transfusion services. Indeed, the impact of using Information Technology on hospitals provides better healthcare services for the public. Likewise, the researchers learnt that there are programming languages suitable for web-based applications such as ASP.NET, PHP, to name a few.

In the study entitled "**Blood Bank Management System Using Rule-Based Method**" undertaken by **(Liyana, F. , (2017))**it found out that it is important for every hospital to use an information system to manage data in blood bank. Also, it observed that the manual system has disadvantages for the user and the hospital. One of the disadvantages identified was the blood bank staff should enter the donor details in each time he/she donate blood in which led to duplicate data of the donor and also the data may be lost or missing after period of time. Thus,
the author developed a web-based system to help the blood bank to record the donor details fast and easy. The system used rule-based decisions to ensure to have a right decision on right time. Also, system can send messages to donors if any particular blood type is needed. She developed blood bank system based on incremental model. She had chosen this model because the system can be developed through cycle of phase and also because of the advantages of this model such as:

i. Easy to understand to flow of the phases.
ii. Changes possible in the middle of any phases.
iii. The system can be developed even if there is an error in the middle and it can be corrected in testing phase.

In this study, the researchers observed that the developer failed to include in the system the function to check the availability of blood bags, and to check the shelf life or expiration of blood bags or products. As such, the researchers will include these in their developed system to enhance safety for blood transfusion.

2.3 Conclusion

The purpose of these literature reviews was to collect information on how an information system helped the management of blood banks. Based on the reviews, it was found out that web-based blood bank systems provide convenience, efficiency and security to the system users and hospitals compared to the manual systems.

It was found out that manual systems have many disadvantages that disappoint and dissatisfy users. Indeed, online blood bank applications make work easy, and ensures fast retrieval of data when needed.

CHARPTER THREE:

3.0 METHODOLGY

3.1 Introduction

This chapter explains the methodology employed in the development and implementation of the

online Blood Bank Management system. It outlines the systematic approach taken to collect, analyze, and interpret data, as well as the steps involved in the system's deployment. The methodology serves as the backbone of this project, providing a clear framework for achieving the objectives.

The chapter presents the research design, the area of study, study population and sampling, Data collection, Validity and Reliability Issues, Data Analysis and presentation and Ethical considerations.

Research Design

According to the nature and purpose of the study, case study research design was found to fit the research. **(Bond, Morrison-Saunders, & Pope , 2012)**defines research design as a general plan to answer a research question. As a systematic approach to conducting a scientific inquiry, it brings together several components, strategies, and methods to collect data and analyze it. Also Researcher **(Yin, 1994)**defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence is used. One can use case study in order to focus a business enterprise and in this case is Mbale Regional Referral Hospital.

The case in this research is the development of Online Blood Bank Management System prototype at Mbale Regional Referral Hospital. The case study method is not only suitable for conducting evaluation research, but is also appropriate for a descriptive question, such as what or how.

3.2 Area of Study

This study was conducted at Mbale Regional Referral Hospital (MRRH) Blood Bank which is located within Mbale city, along Pallisa road in Eastern Uganda.

The Hospital is government-owned and funded and was founded in 1924 as a health center and has since grown to a 450-bed capacity hospital.

It serves a population of over 4.6 million people in 16 districts of Busia, Tororo, Butaleja, Pallisa, Budaka, Mbale, Bududa, Sironko, Manafwa, Namisindwa, Butebo, Kapchorwa, Kibuku, Bukwo, Kween and Bulambuli.

3.3 Population and Sampling

3.3.1 Study population:

The study population were the Hospital Medics and administrators of Mbale Regional Blood Bank. This population was assumed to have adequate knowledge of the subject to be investigated and the research variables for investigation.

3.3.2 Sampling technique:

A sample is the subset of the population that is used for investigation, the process of selecting the sample is referred to as sampling. There are various sampling techniques that one can use depending on the situation, in this project the researcher used Simple Random Sampling to select the Hospital Medics who have experience with the current system to extract information from them whereas Purposive Sampling was used on the Blood Bank staff to select the staff who would provide the information that best suit the purpose of the study.

3.4 Rapid Application Development (RAD) method

In systems development, a prototype is a rudimentary working model of a system usually built for demonstration purposes or as part of the system development process. In this particular study, a prototype was developed which was the primary object having the salient features of the complex system that was in consideration to be eventually developed. It was tested and reworked until an acceptable system was achieved, developed, and implemented.

The researcher used prototyping because of the following reasons

i. To encourage client feedback as a client interacts with various prototypes.
ii. To decrease costly mistakes in the early stages
iii. To decrease development time by correcting mistakes early when they are still inexpensive
iv. To extend product lifetime by adding necessary features and eliminating redundant features early in the design. However, this method has some drawbacks such as requiring a lot of user involvement at each stage and it is suitable for the projects with shorter development time.

3.5 Data Collection.

Data collection is very crucial in determining the success or failure of any research. There are two types of data that is, primary data and secondary data. Primary data is the first-hand data extracted by the researcher from its original source and in its original form whereas secondary data is the data that the researcher accesses and uses but which was collected and analyzed by other people or researchers. Different elicitation techniques were used to get primary data and secondary data.

3.5.1 Interviews.

The researcher conducted face-to-face interviews to get primary data from both the selected Hospital Medics, selected Blood Bank staff and administrators. This tool was powerful in getting first-hand information which is more accurate than other techniques as well as saving time. Appointments were made on specified days to conduct interviews with some Hospital Medics, staff and administrators of the Blood Bank, the interviews included open-ended that gave the interviewee freedom to explain their views in details and closed-ended questions with restricted responses. Find samples of interviews in appendices. The interview technique has got some advantages such as;

i. Clarity can be made on the questions.
ii. Good relationship with the client can be developed.
iii. Can suit both the literates and the illiterates.
iv. It can be flexible with both the interviewer and the client.

However, there are also some disadvantages of this technique;

i. Can be time consuming when interviewing large population
ii. Interviewee may give false information unlike observation
iii. Interviewing large population may be costly in terms of training and hiring interviewers
iv. Relies heavily on interviewer's knowledge to draw conclusion which may be wrong at times

3.5.2 Observation

This method was used to get first-hand information by observing the current system operations. The researcher observed how the information about Donors that is their names, Blood group, and addresses were being entered into the current system, how the information about the donated blood was captured and recorded and how the blood requisitions were processed.

The method was very helpful in understanding the operations of the current system so as to guide the development of the improved system.

3.5.3 Document review.

This technique uses data that is already available which was gathered and analyzed by someone else. In this study, the Researcher reviewed documentations of similar projects which aided in depth understanding of the system to inform the development of the improved system.

The main advantage of this technique is that data is already available hence inexpensive, it also doesn't disrupt the current systems operations during review.

The researcher also used Busitema University, Nagongera campus library resources including e-resources to review text books which helped him to acquire information and knowledge about system design, information systems, and database management system and so on, another source of information was the internet.

3.6 Data analysis and presentation.

Collected data from interviews, observation, and document review were analyzed by consensus, and then reported or presented descriptively verbally. Users, system, data, functional and non-functional requirements were identified and defined. The system's strength and limitations were noted and then the operators of the new system were be defined.

3.7 System Design.

The researcher studied the system requirements that were gathered during the analysis stage and based on the knowledge acquired to design that system that addressed those requirements.

3.7.1 Data modelling.

In the database design, data are represented using a certain data model. The data model is a collection of concepts or notations for describing data, data relationships, data semantics and data constraints. Most data models also include a set of basic operations for manipulating data in the database.

Data modeling is in simple terms the process of diagramming data flows. In this study, the researcher used the context diagram to gather high level requirements about how the system interacts with the environment, Data Flow Diagram was used to show the processes and the flow

of information within the system, and the Entity Relationship Diagram (ERD) was used to show the entities and the relationship between them.

3.7.2 Context Diagram.

A context diagram is a high-level view of a system also known as Level 0 Data Flow Diagram. It's a basic sketch meant to define an entity based on its scope, boundaries, and relation to the components that are external to the system, that is to say it provides a general overview of a process, focusing on its interaction with outside elements rather than its internal sub-processes. The researcher used the context diagram to gather high level requirements to ensure that the system developed is relevant to the project's requirements and restrictions, thereby reducing the potential risks.

3.7.3 Data Flow Diagram.

A Data Flow Diagram (DFD) is a visual representation of the information flows within a system. It is a graphical representation of the movement of data between the external entities and the data processes and stores within the system. The DFD aided in offering more in detail and depth on how the system works in terms of the inputs, outputs and the processes.

3.7.4 Entity-Relationship-Model.

Entity Relationship Model is a high-level conceptual data model diagram. This Model represents real-world entities and the relationships between them therefore it helps the researcher to systematically analyze data requirements to produce a well-designed database. In this study, the Entity-Relationship-Diagram was used to show the relations that exist among various processes and also, how different Entities are related in the system. The Entity Relationship Diagram was used to design the back-end database.

3.7.4 The Conceptual data model.

This data model defines what the system contains. It is an organized view of database concepts and their relations. This data model was used to determine the entities, their attributes and the relations among them.

3.7.5 The logical model.

The Logical Data Model is used to define the structure of data elements and to set relationships between them. The model defines how the system should be implemented regardless of the Database Management System (DMS). The purpose of using this model was to develop a technical map of rules and data structures.

3.7.6 The physical model.

This Data Model describes how the system will be implemented using a specific Database Management System. A physical database model shows all table structures, including column name, column data type, column constraints, primary key, foreign key, and relationships between tables. This model aided in representing the actual structure of a database-tables and columns, or the messages sent between the processes in the system.

3.8 System Implementation.

While implementing the Online Blood Bank Management System, various tools were used as follows;

3.8.1 HTML, CSS.

The Hypertext markup language, cascading stylesheets and bootstrap were used to design the interface of the system. HTML was used for front-end development of the webpages as it helps to build structure of a website and is a widely used Markup language, it was preferred because it is easy to learn, every browser supports it and it is light weighted and fast to load. CSS defines how the content of the website is displayed in the browser, adding beauty, and it also saves time since one file can be linked to many html documents.

3.8.2 PHP (Hypertext Preprocessor).

PHP is a server scripting language, and a powerful tool for making dynamic and interactive Web pages.

PHP is a widely-used, free, cross-platform, efficient tool for web development and it has excellent combinability with HTML. It is highly compatible with MySQL database and it can also connect the user to the Apache server and the database.

3.8.3 MySQL.

MySQL is a widely used relational database management system (RDBMS). It is free and open-source and it is ideal for both small and large applications. It was used to create the database system that manages the Blood Bank's Information.

3.8.4 JavaScript.

In implementing the system, JavaScript was used as a validation tool to check and report errors whenever data is collected into the form starting from login to entering data, creating dynamic pages as well as adding functionality to the system.

3.9 Testing.

The system was tested using two techniques;

3.9.1 Unit testing

Unit tests are a set of tests which are written by a developer at the time of software development process. Unit Testing involves the testing of units in isolation. This test was performed during the system development process and ensured no bugs in the system at every stage.

3.9.2 Module testing

Module testing is defined as a software testing type, which checks individual subprograms, subroutines, classes, or procedures in a program that is to say the smaller building blocks of the program instead of testing whole software program at once. Different modules of the system were tested individually to ensure there are no bugs.

Each component was tested and the overall system was also tested, then a user was taken through the system and their view (opinion) checked using questionnaire as a method of verification.

3.9.3 Validation

Real data regarding the Donor's information were entered in the system in the validation process to ensure that it was meeting the client's needs and it did so.

Ethical considerations

Ethical considerations in research are a set of principles that guide your research designs and

practices. These principles make sure that participation in studies is voluntary, informed, and safe for research subjects.

This study adhered to the following ethical issues;

I got permission from the Blood Bank head and other relevant authorities in the Hospital in form of consent and assent (where it required) to extract information from the Blood Bank staff and the Hospital Medics and this information was voluntarily given without any pressure or influence which ensured voluntary participation. There was no research bias in the way of asking questions and selecting participants and I avoided making decisions on irrelevant grounds such as sex, race, religion and others which ensured equity.

Potential for harm, the researcher considered all possible sources of harm to participants that would be psychological, social, physical or legal.

Public perspicuity was observed in which the researcher was open to the participants concerning research procedures, their purposes and their results and they were fully aware of what was taking place.

Legality was observed by understanding and obeying the Hospital's rules and regulations as well as the government policies on research studies. The researcher also ensured respect for intellectual property that is honoring patents, copyrights and other forms of intellectual property.

Honestly reported data, methods, procedures and results involved in the research. There was high level of confidentiality where by no information about the Blood Bank and the entire Hospital was disclosed to the outside environment.

CHAPTER FOUR:

4.0 SYSTEM ANALYSIS AND DESIGN.

4.1 Introduction

This chapter presents the collected data, work flow and processes. It is about analysis of the requirements of the old system in order to derive requirements of the new system, and it is discussed using tools like context diagram, data flow diagram and Entity Relationship diagram.

The chapter also presents the design and implementation of the Online Blood Bank Management system.

4.2 System study

The purpose of this section was to study the existing system and determine the nature of the activities concerning Blood donation and management.

In the interview held, five (5) people, including the Blood bank manager (Doctor in charge of the Blood bank and who is responsible for the day-to-day operations of the blood bank), A blood bank technician (who is responsible for collecting, processing, testing and storing blood), a general duty doctor (the one who is responsible for ordering blood transfusions for the patients), a nurse (the one responsible for administering blood transfusions to the patients) and one patient (who had received blood from the hospital) were interviewed face-to-face to learn their experience with the current system in the aspect of time, accuracy, and the level of dissatisfaction and the results were as follows;

Table 1.0 Results of interviews with Hospital Staff and the Patient

Aspect	**Strongly Agree**	**Agree**	**Disagree**
Time taking	2	2	1
Hardship in retrieving donor's information	2	2	1
Hardship in detecting the expired blood bags	1	2	2
Dissatisfaction	2	1	2

From the results above, four respondents out of five agreed with the fact that the process of acquiring blood from the Hospital is time taking, and they also agreed with the idea that with the current system, blood bank staff finds it hard to retrieve donor's information during time of serving blood. while three respondents out of five agreed with the idea that it is hard to detect blood bags which are about to expire or have expired and they generally expressed dissatisfaction with the current manual blood bank management system.

The doctor in charge of the blood bank, and the blood bank technicians all expressed dissatisfaction with the current system saying the same thing that the system was very

slow to match their schedules of programs and that sometimes they could decide to give out blood to patients as long as someone presents a blood donation card with out cross checking their files.

4.3 Current System Study.

Mbale Regional Referral Hospital uses a paper-based blood bank management system which is a system in which all of the blood bank's records are kept on paper. This includes donor records, blood inventory records, and blood transfusion records.

When carrying out blood donation process, the donor's information is recorded on a paper donor registration form, the form includes the donor's name, address, date of birth, blood type and other relevant information after which the donor's blood is collected, tested and screened for diseases. The blood bag containing the donor's blood is then labeled and stored in a blood bank refrigerator. Whereas, when a patient needs a blood transfusion, the blood bank staff will select a compatible blood bag from the inventory depending on the information on the blood request form filled by a doctor and the blood bag will be transported to the patient's room and administered by a nurse. The blood bank staff will then record the blood transfusion on a paper blood transfusion record. This record includes the patient's name, date of birth, blood type and the date and time of transfusion.

4.3.1 Strengths of the current system

- ✓ The current paper-based blood bank management system is relatively cheap to implement and maintain.
- ✓ It is also easy to use and understand, even for staff with limited computer skills.
- ✓ The system is not dependent on electricity or other technology, so it can continue to function during power outages or other disruptions.
- ✓ The system is also less vulnerable to cyberattacks than the electronic system.

4.3.2 Weakness of the current system.

Basing on the interviewee's responses and the focused group discussion held, most of the blood bank administrators expressed dissatisfaction for the current blood bank management system used by the Hospital, and the weaknesses were as follows;

- ✓ Time is spent in efforts to fill the blood donation forms, blood requestion forms, process them and deliver blood transfusion to the patients.
- ✓ With the current system, it is hard to retrieve donor's information before serving blood incase that person had donated blood before.
- ✓ It is also difficult to track blood inventory levels accurately. This could lead to shortages of blood products or the use of expired blood products.
- ✓ Lastly, it is difficult to generate reports on donor demographics, donation history, and other factors.

4.4 System Analysis

The system analysis involved identification of the entities, their properties and relationship between them. The requirements of the new system were categorized into user requirements, functional requirements, non-functional requirements and system requirements.

4.4.1 Requirements Analysis

4.4.1.1 User requirements

User requirements refer to what the users expects the system to be able to do. They also include those characteristics that the system should have so as to function fully and effectively.

The system has the following specified user requirements;

1. The system should have a user-friendly interface with easily understandable icons.
2. The system should be secure that is, should authenticate users by requiring a username and password before accessing and using it.
3. The system administrator should be able to register, update, and delete donors' information.
4. The system administrator should be able to add, view, and update blood donations.
5. The system should be able to generate the report print outs of the list of donors, blood donation activities, the lists of blood requested and also the handed over blood.

4.4.1.2 Functional requirements

The functional requirements are the tasks that the system is intended to perform without which the system becomes meaningless. Functional requirements describe the functionality or services

the system is expected to provide and in this case are the following;

The system should;

1. Register a user
2. Capture and store donors' and donation details
3. Capture and store blood requests and handed over details
4. Allow the user to view, update or delete the donors', donation, and blood request's information stored in it.
5. Generate the reports about different system activities and save the results for future retrieval.
6. Delete the user.

4.4.1.3 Non-functional requirements

The non-functional requirements are not directly concerned with specific functions delivered by the system but they aid in the functioning of the system. They pertain the system properties such as accuracy, usability, performance, security among others. The following are the non-functional requirements for the system;

1. The system should validate the user's login credentials that is, the username and password
2. so as to ensure only authorized access. The system should be efficient so as not to waste system resources such as CPU and memory.
3. The system output should be accurate provided valid input is entered
4. The system should run on most operating systems
5. The system should be easy to maintain and should allow updates/changes to be made when need arises.

4.4.2 System requirements specification

In order for the system to perform as expected, there are some minimum requirements that are supposed to be put in place first so as to achieve the desired objectives and functions.

4.4.2.1 Hardware requirements

These are given in the table below;

Table 2.0 Hardware requirements for the system

Hardware	Properties
Computer brand	Dell, Hp, Acer or Lenovo
Generation	Duo core or higher
Architecture	64-bit
Processor speed	1.6 GHz or higher
RAM	2GB or higher
Disk space	250GB or higher
Hp laser jet, Epson or Canon printer	Printing speed of 10 pages per minute or more

4.4.2.2 Software requirements

The software provides the facilities for manipulating data through an interface between the users of the system and the hardware on Microsoft Windows platform, and these requirements are in the table below;

Table 3.0 Software requirements for the system

Software	Requirements
Operating system	Windows 8, 8.1, 10 or 11
Server	XAMPP or Apache HTTP web browser
Database Management system	MySQL
Web browser	Chrome, Mozilla Fire Fox, Internet explore

4.4.3 System Limitations

The system has the following limitations and constraints in its operations;

1. The system runs only in Windows environment and not other platforms.
2. The system can only be accessed by authorized users who have provided valid login credentials
3. When installed and running on local server such as XAMPP, occurrences such as hard disk failure or lose of the computer leads to loss of information
4. The system is computer based hence prone to virus attack that may lead to failure or malfunction.

4.5 System Design

The system design defines the architecture, interfaces, components and modules of the system that satisfy its operations. It is concerned with how the system functionalities are provided by different components of the system.

4.5.1 System Architecture

This gives a high-level view of the system with the main components and the services they provide. It also shows the subsystems that make up the system and how they interact with each other.

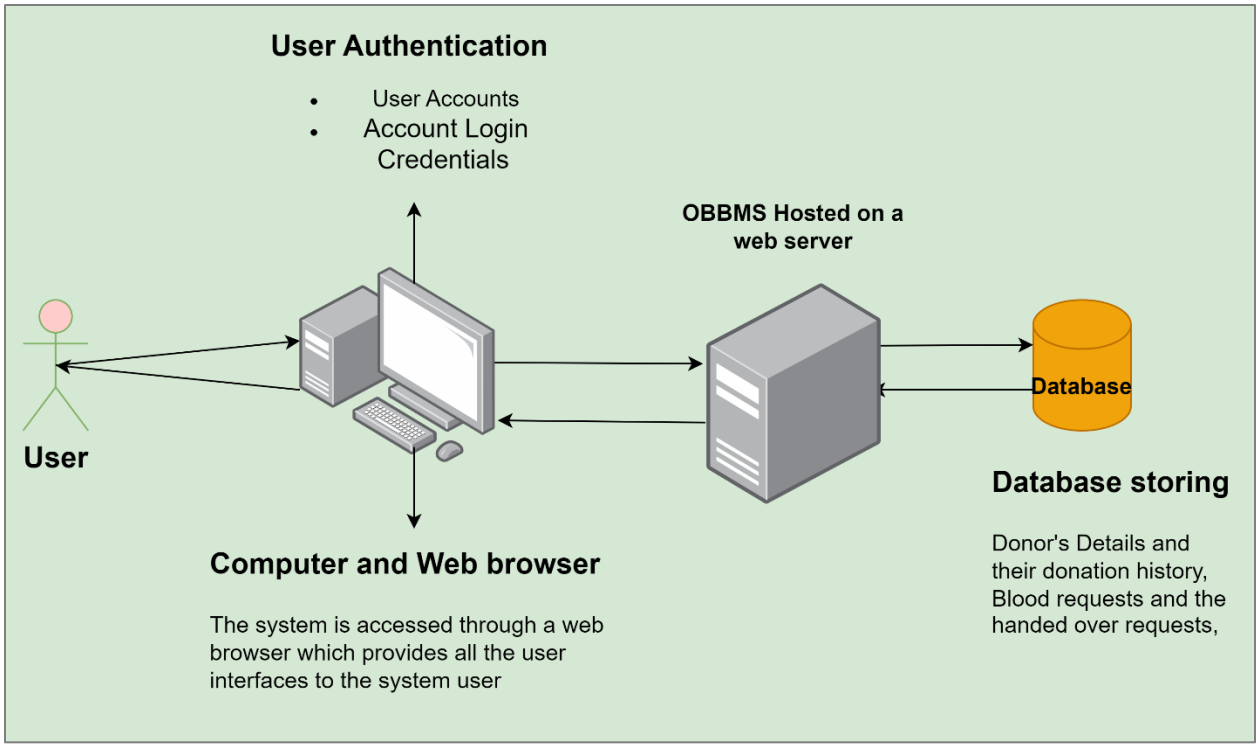


Figure 1.0 The architectural design of the system

4.5.2 Context diagram

The context diagram helps to define the boundary between the system or parts of the system with the environment. It shows the data flow between generalized application within the domain, the other entities and the abstraction with which they communicate.

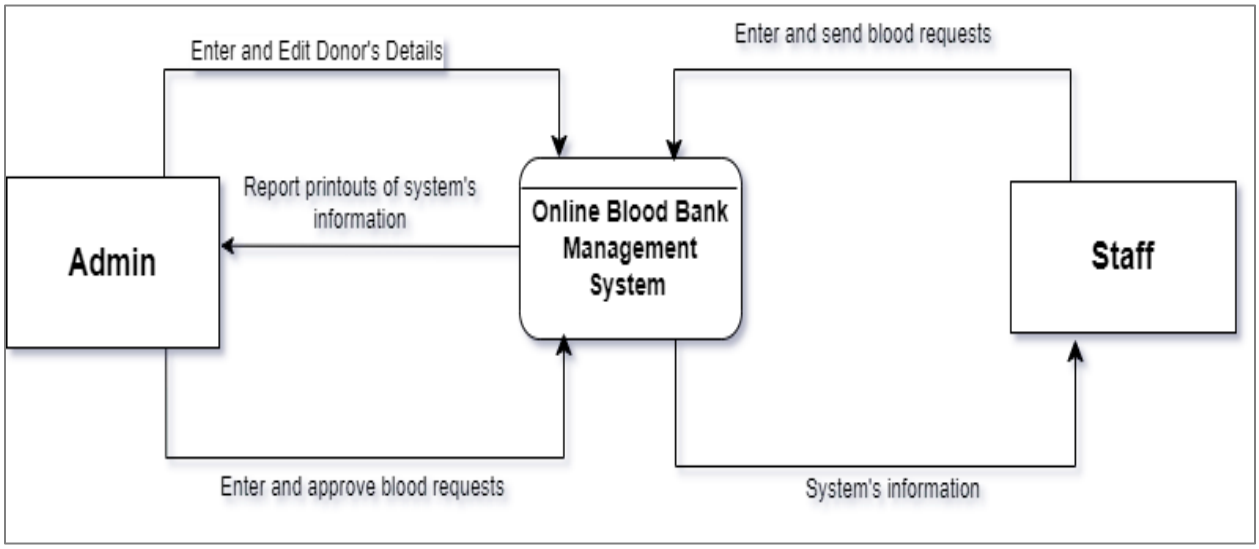


Figure 2.0 The Context Diagram

4.5.3 Data Flow Diagram (DFD)

The Data Flow Diagram shows the flow of information within the system and other processes in the system.

It helped to show how data moved and changed through the information system in a graphical format.

A data flow is the movement of information from one point to another within the system

A data store is point where data is kept temporarily or permanently.

A process is a changing of data from one form to another and an entity is an object outside the system under study that receives output.

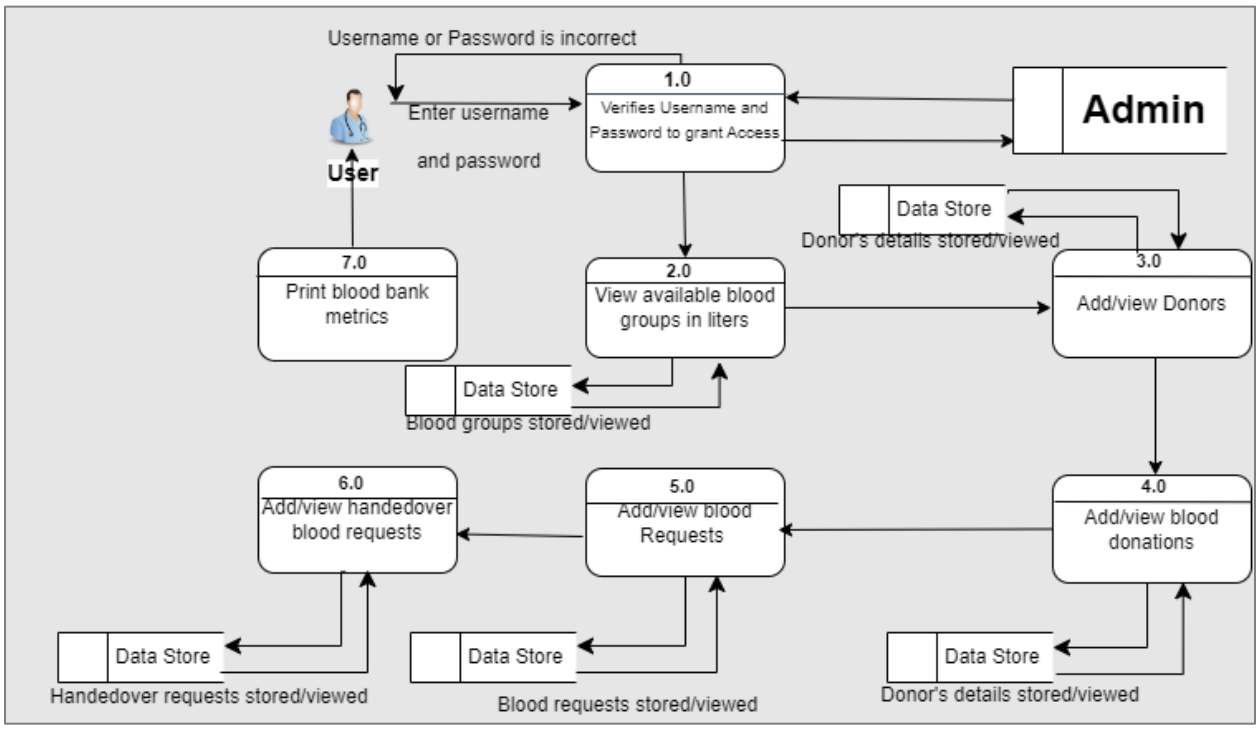


Figure 3.0 Data flow Diagram

4.5.4 User Case Diagram.

The User Case Diagram represents the activities of the users with special functionalities of the system. Use case diagram model is what the system is expected to do and to view externally the use of the system from the user's perspective rather than internally.

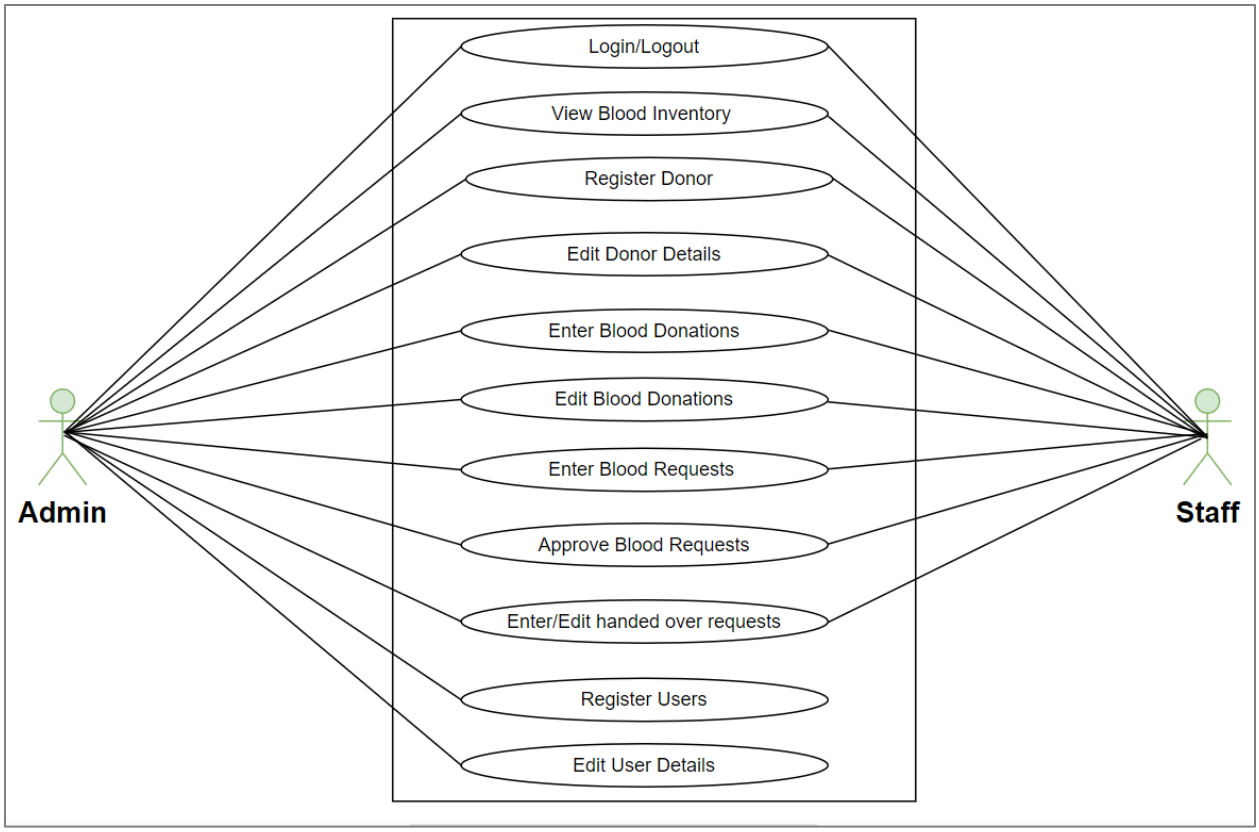


Figure 4.0 The User Case Diagram

4.5.5 Entity Relationship Diagram.

The Entity Relationship Diagram is a graphical representation of entities and their relationships to each other. ERDs are used in database design to visually organize and plan the structure of a database, including entities, attributes, and relationships. The symbols used in ERD diagrams include rectangles for entities, diamonds for relationships, and lines connecting the two to represent the relationship between them.

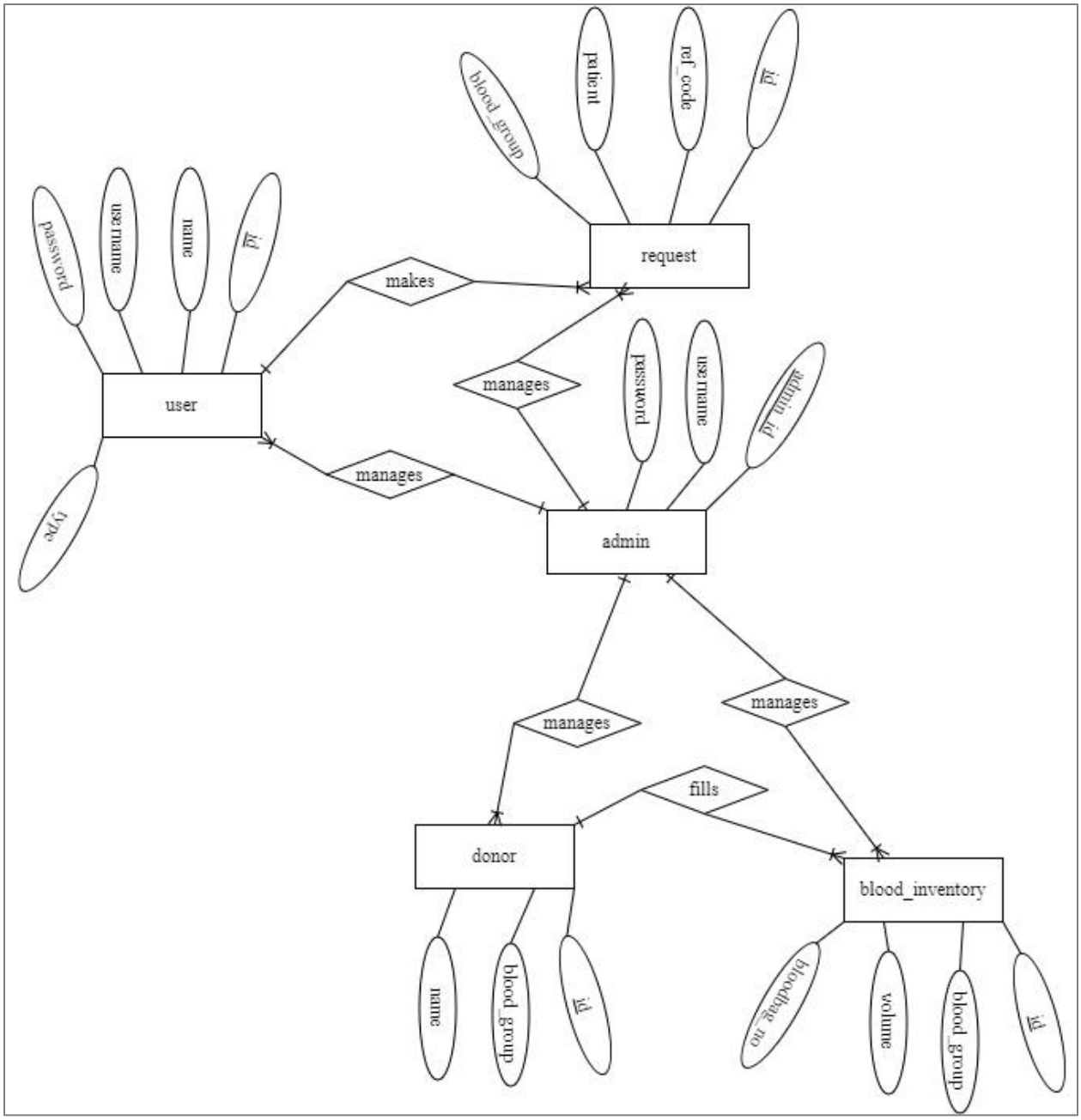


Figure 5.0 Entity Relationship Diagram.

4.6 Database Design.

Database is a collection of entities with related information. In the design of an Online Blood bank Management system, the various related entities were blood inventory, Donors, Blood donations, Blood requests, Handed over requests and Users.

All these were implemented as tables in the database with Blood inventory table holding

information about the donations and the available blood per group in litters, Donors table holding the details of the Donors, Requests table holding the details about the requested blood, Handed over request table holding details of the handed over requests or blood, Users table holding the information about the system users and their login credentials and the system_settings table holding information about system changes.

4.6.1 The table structure.

The table structure describes the kind of data and its datatype that each table holds.

Table 4.0 The blood inventory table structure.

This table holds information about donated blood and the amount of blood available.

Field	**Data type**	**Null**
Id (PK)	Int (30)	No
Blood_group	Varchar (10)	No
Volume	float	No
Bloodbag_No	Varchar (30)	No
Status	Tinyint (1)	No
Donor_id	Int (30)	No
Request_id	Int (30)	No
Date_created	datetime	No
Expiry_date	date	Yes

Table 5.0 The Donors Table Structure.

This table holds information about blood Donors and their donation activities.

Field	**Datatype**	**Null**
Id (PK)	Int (30)	No
Blood_group	Varchar (10)	No
Name	Text	No
Address	Text	No
Contact	Varchar (20)	No
Email	Varchar (50)	No
Date_created	datetime	No

Expiry_date	datetime	No

Table 6.0 The Request's table Structure.

This table holds information about requested blood and the recipient's details.

Field	**Datatype**	**Null**
Id (PK)	Int (30)	No
Ref_code	Varchar (20)	No
Patient	text	No
Blood_group	Varchar (10)	No
Volume	float	No
Physician_name	text	No
status	Tinyint (1)	No
Date_created	datetime	No

Table 7.0 The Handed-over Request's table Structure.

This table holds information about the handed-over/served blood.

Field	**Datatype**	**Null**
Id (PK)	Int (30)	No
Request_id	Int (30)	No
Picked_up_by	text	No
Date_created	datetime	No

Table 8.0 The User's table Structure

This table holds information about user's details and their login Credentials.

Field	**datatype**	**Null**
Id (PK)	Int (30)	No
Name	text	No
Username	Varchar (50)	No
Password	text	No

Type	Tinyint (1)	No

CHAPTER FIVE

SYSTEM IMPLEMENTATION AND TESTING

5.0 Introduction:

This chapter emphasizes the actual system implementation. The system was transformed from user requirement into a workable product. The purpose of system implementation was to make sure that the correct application is delivered to the end users. Besides that, this chapter also emphasizes on how the testing is done to confirm whether it meets user requirements.

5.1 System Implementation:

At the implementation stage, all the system designs and paper concepts were translated into running computer programs using tools such as HTML, PHP, MySQL, CSS, Bootstrap, and JavaScript.

Each of this tool played a vital role in designing the interfaces of the system as well as implementing the system.

5.1.1 HTML

This was used for front-end development to create the data entry forms such as login form, registration form and others as well as creating web links within the system.

5.1.2 PHP

PHP is a server-side scripting language and was used to create dynamic and interactive webpages. PHP helps to convey commands to the users from the server and also sends commands from the users to the server for processing.

5.1.3 CSS

CSS is cascading style sheet and was a powerful tool in enhancing the look of the webpages that is by adding beauty such as formatting colors and style.

5.1.4 JavaScript

JavaScript is a powerful tool that helps to add functionality to the system. JavaScript is also used as a validation tool then the user login to gain access to the system.

5.1.5 MySQL

MySQL was the Database management system that was used while implementing the system. It was used to create the database system that manages the Blood Bank's information that is storing and allowing update and deletion of records.

5.2 Results/Outcomes

5.2.1 User interfaces

A user interface is a point of human-computer interaction and communication while using the system.

The system was designed with a number of user-friendly interfaces for easier interaction with the system.

5.2.1.1 Login panel

Any user who seeks to gain access to the system must first login by providing a valid username and password for an existing user account. The Login panel is the very first page that is shown to the user and it is used to collect the login credentials from the user. The user is granted access to the system upon confirmation that the provided credentials are correct for a certain existing account, otherwise the system responds with the message "Username or password is incorrect".

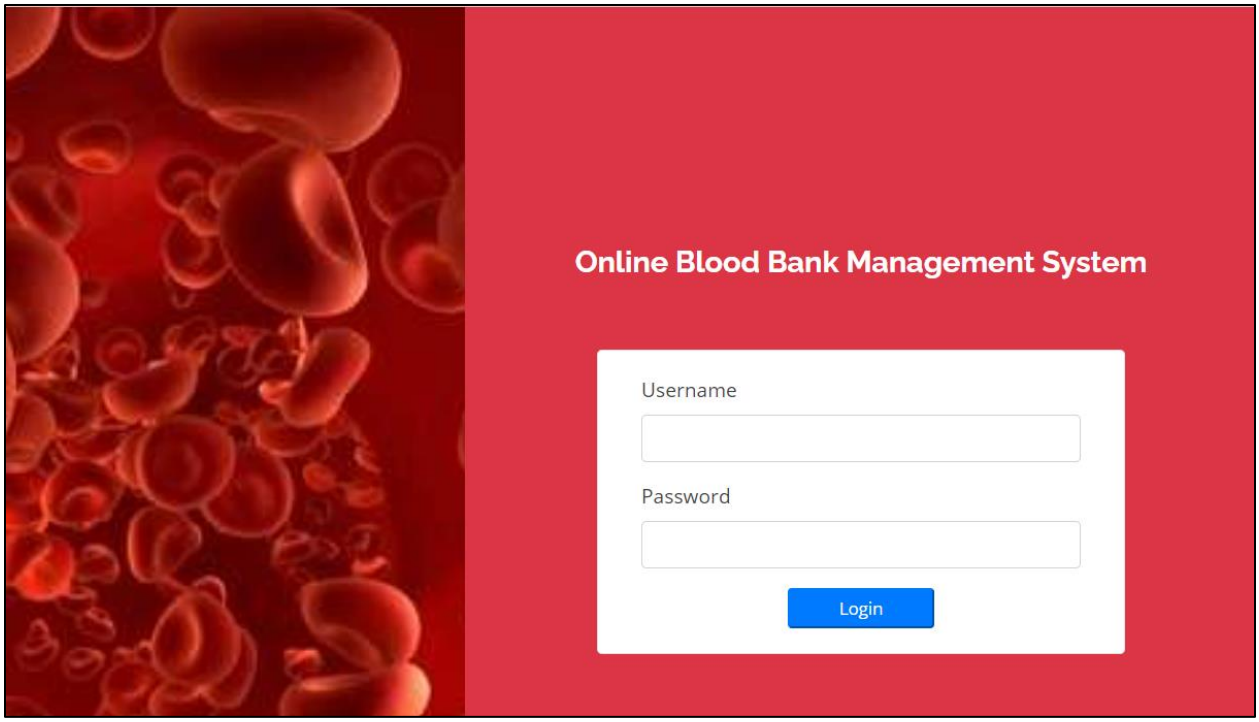


Figure 6.0 Login panel

5.2.1.2 The dashboard

The dashboard is the main page of the system that shows up first when the user logs in. It shows usually in graphical form the key modules of the system.

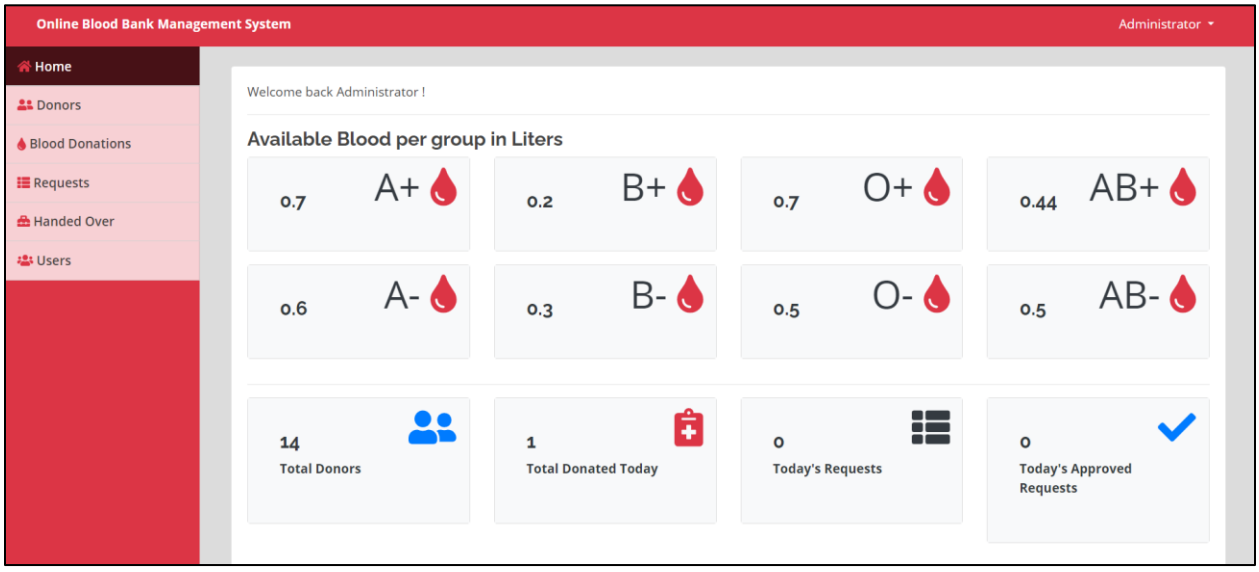


Figure 7.0 The dashboard

5.2.1.3 Register and Manage Donors.

This panel helps users to manage all aspects of the donor lifecycle, including Donor registration,

viewing and updating donor information, generating reports about the existing donors and also deleting donors from the system.

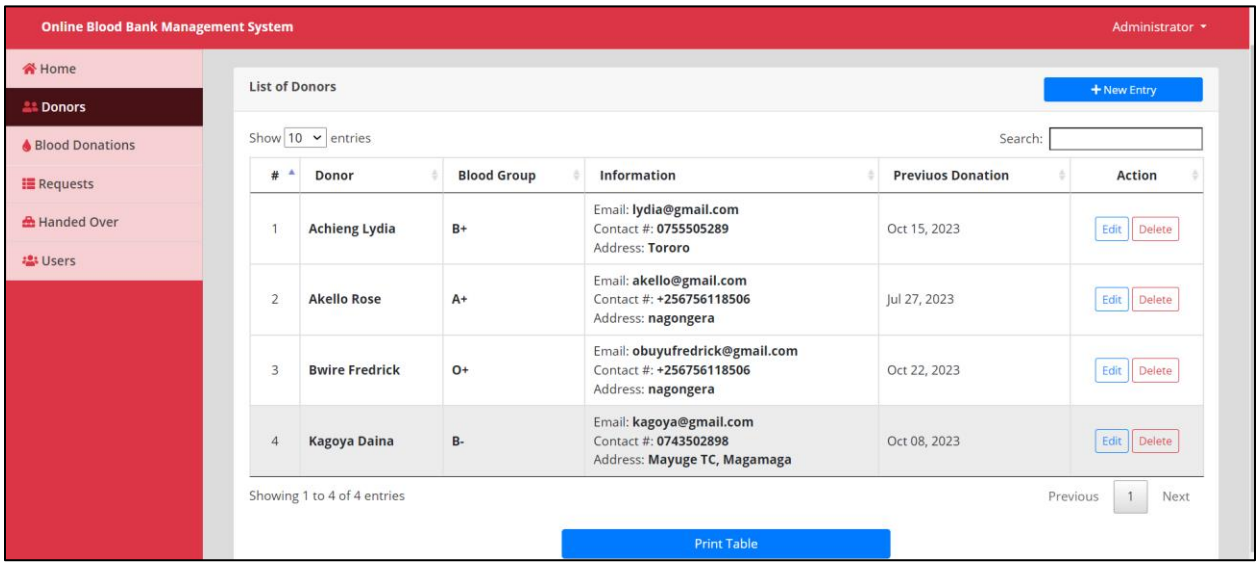


Figure 8.0 Register and Manage Donors.

5.2.1.4 Register and Manage Blood Donations.

This panel helps system users to register new blood donations, view and edit blood donations, delete donations and also print the reports about the existing blood donations.

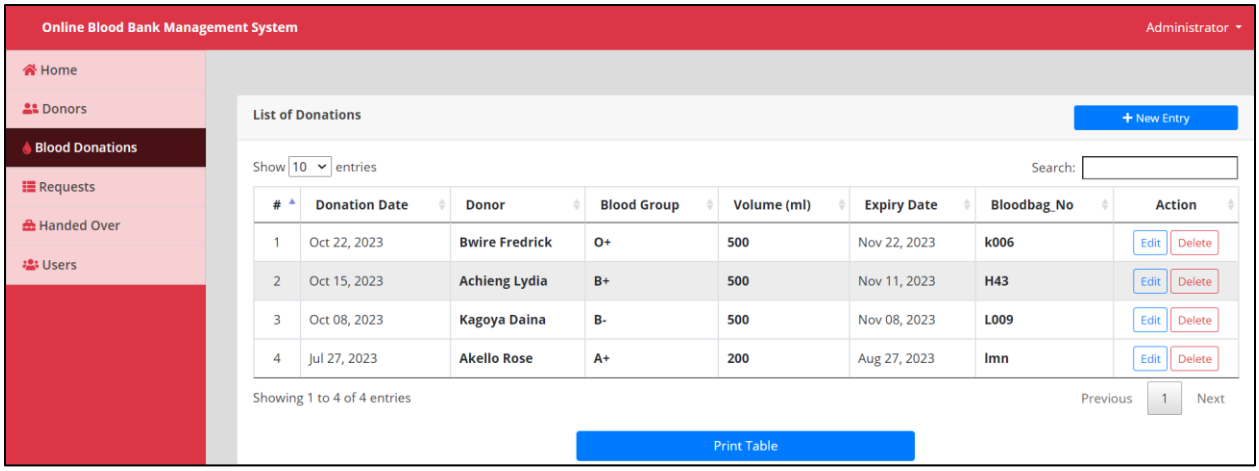


Figure 9.0 Register and Manage Blood Donations.

5.2.1.5 Register and manage Requests.

This panel helps users to generate and send blood requests, approve them, view and edit requests, delete requests and also print reports about the blood requests.

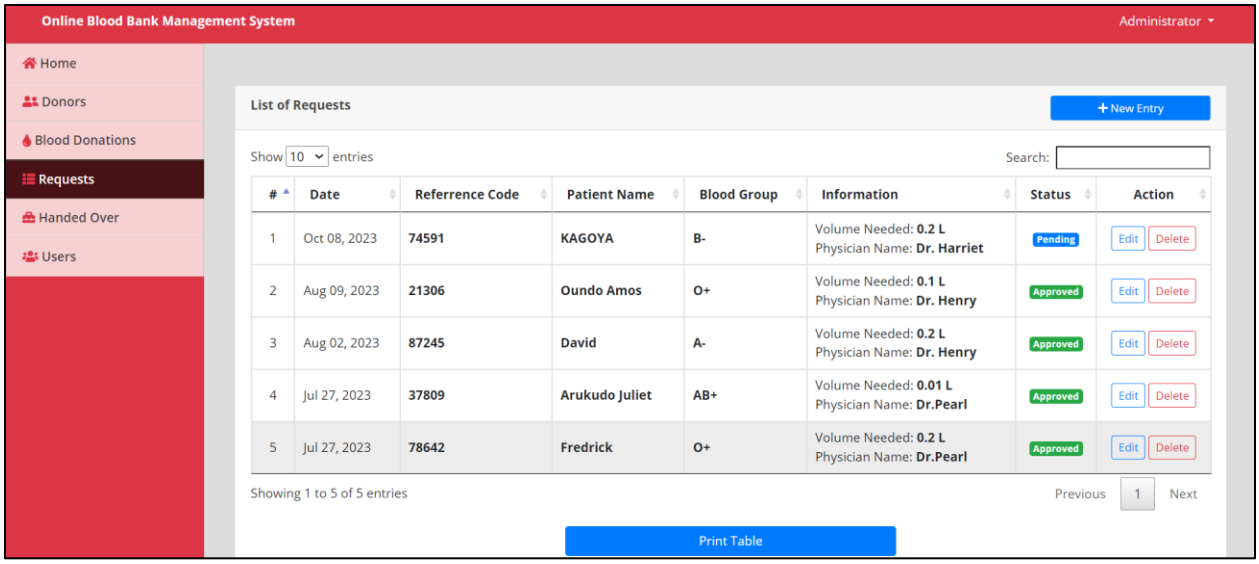


Figure 10.0 Register and manage Requests.

5.2.1.6 Register and manage Handed over Requests.

It is through this panel that system users are able to register a handed over blood request, view and edit handed over requests, delete them and also do their report print out.

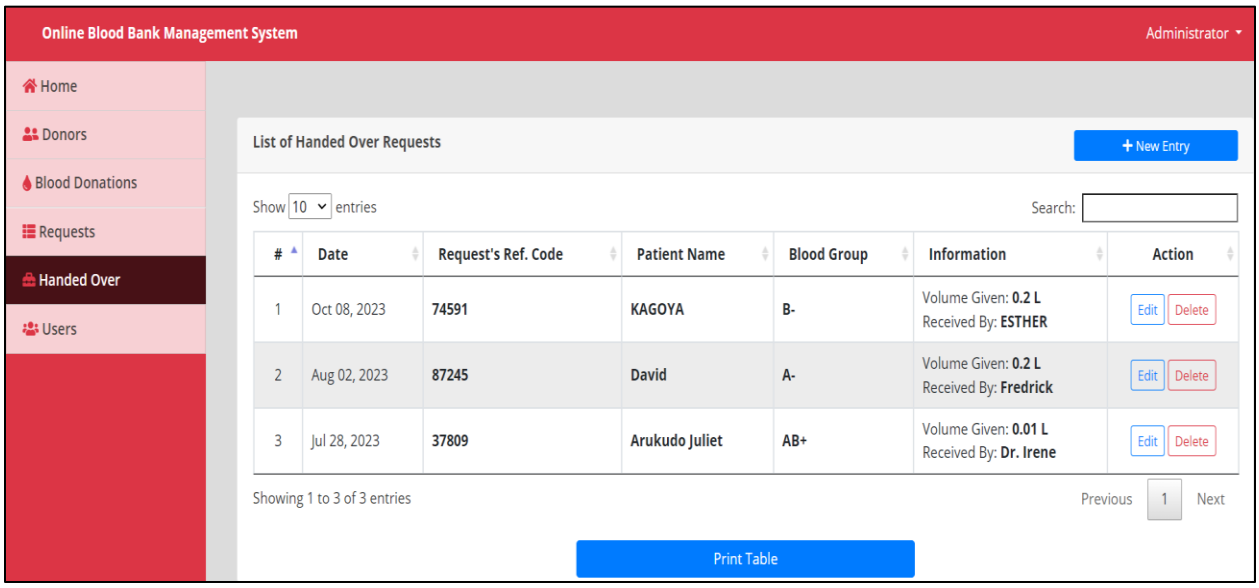


Figure 11 Register and manage Handed over Requests.

5.2.1.7 User account Management.

In this page, the administrator can manage user's accounts. The administrator can add new users into the system, update the details of the available users of OBBMS like, the username and the

password. Users are also deleted from the system from this page.

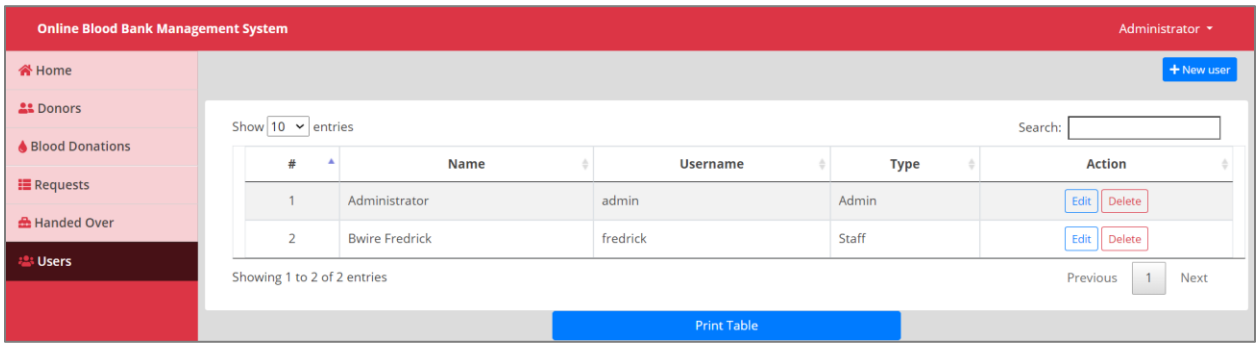


Figure 12 User account Management.

5.2.1.8 Sample of Donors list in system's view.

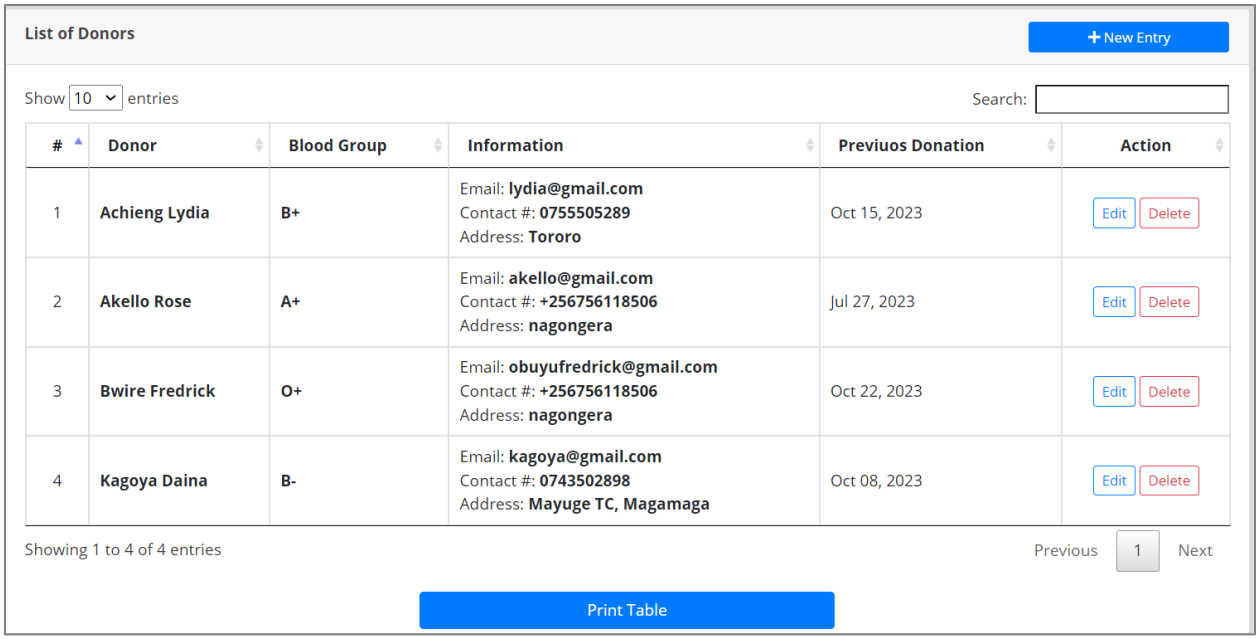
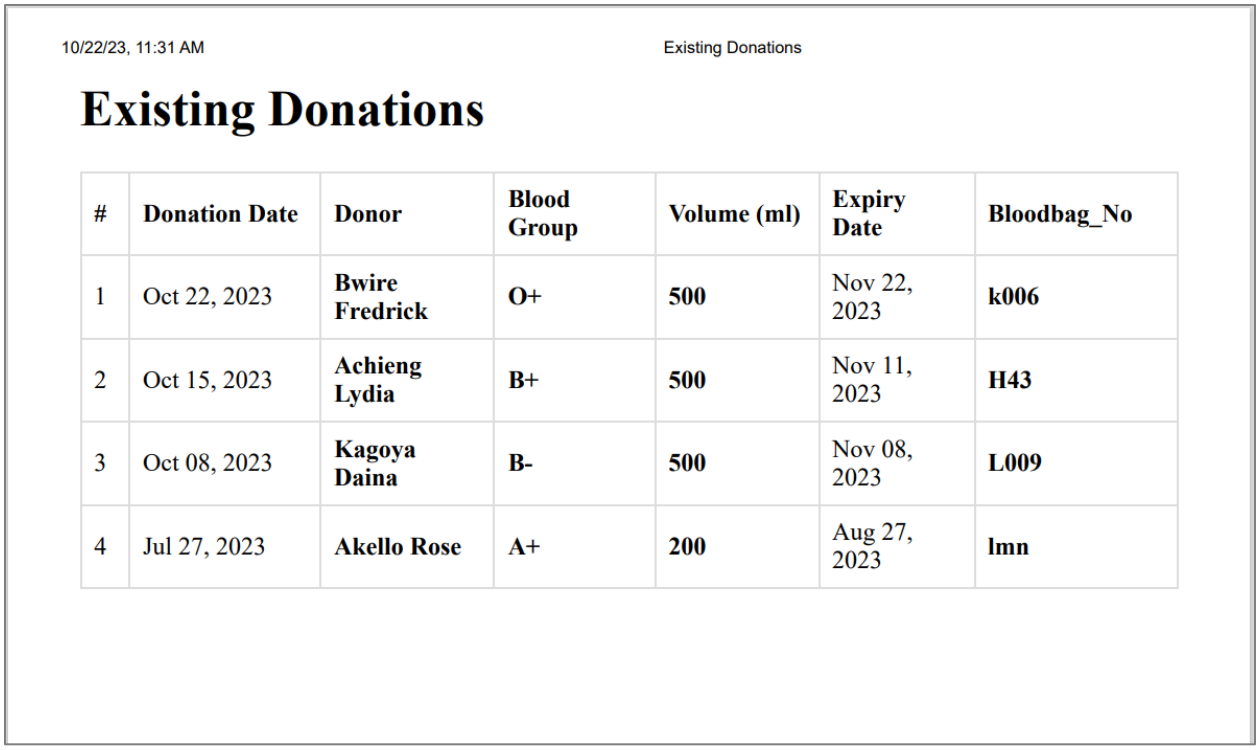


Figure 13 Sample of Donors list in system's view.

5.2.1.9 Sample print out of Blood donations in pdf form.



10/22/23, 11:31 AM Existing Donations

Existing Donations

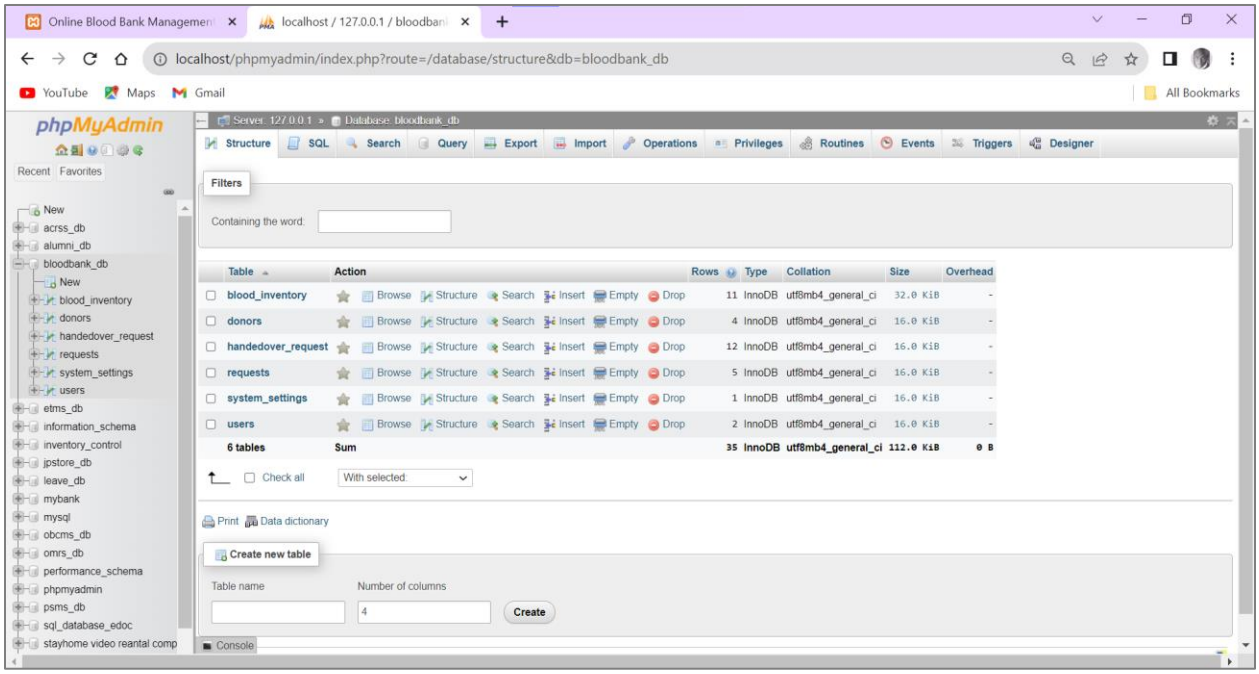
#	Donation Date	Donor	Blood Group	Volume (ml)	Expiry Date	Bloodbag_No
1	Oct 22, 2023	**Bwire Fredrick**	**O+**	**500**	Nov 22, 2023	**k006**
2	Oct 15, 2023	**Achieng Lydia**	**B+**	**500**	Nov 11, 2023	**H43**
3	Oct 08, 2023	**Kagoya Daina**	**B-**	**500**	Nov 08, 2023	**L009**
4	Jul 27, 2023	**Akello Rose**	**A+**	**200**	Aug 27, 2023	**lmn**

Figure 14 Sample print out of Blood donations in pdf form.

5.2.2 Database Design.

Database is a collection of entities with related information. In the design of an Online Blood bank Management system, the various related entities were blood inventory, Donors, Blood donations, Blood requests, Handed over requests and Users.

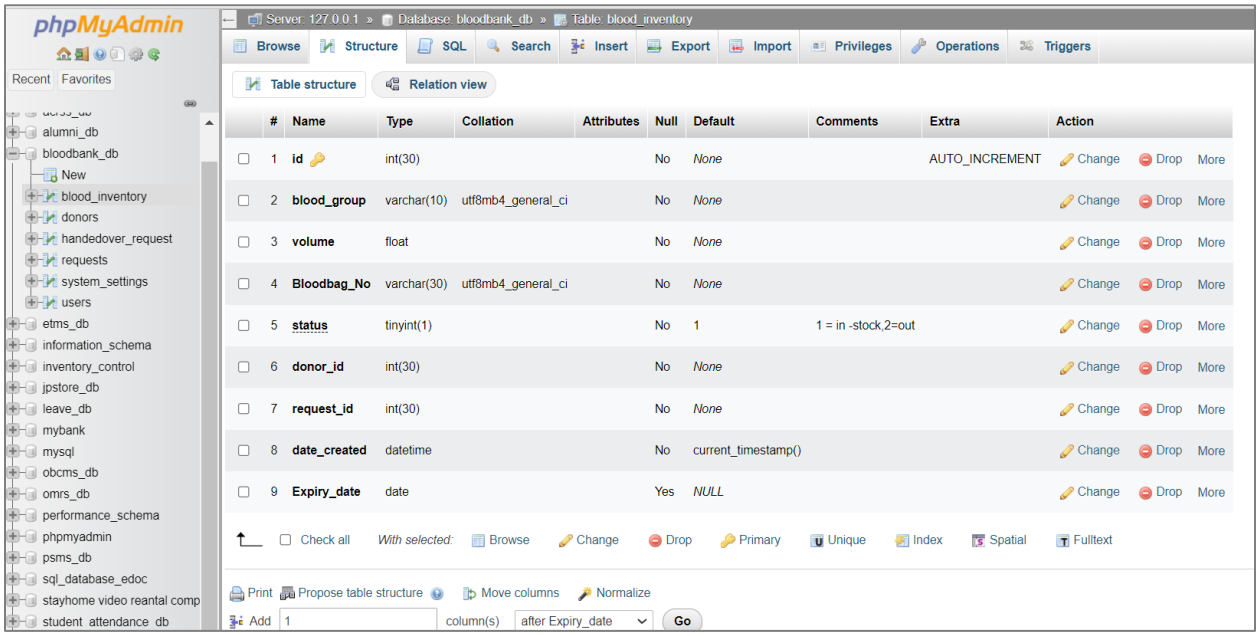
All these were implemented as tables in the database with Blood inventory table holding information about the donations and the available blood per group in litters, Donors table holding the details of the Donors, Requests table holding the details about the requested blood, Handed over request table holding details of the handed over requests or blood, Users table holding the information about the system users and their login credentials and the system_settings table holding information about system changes.



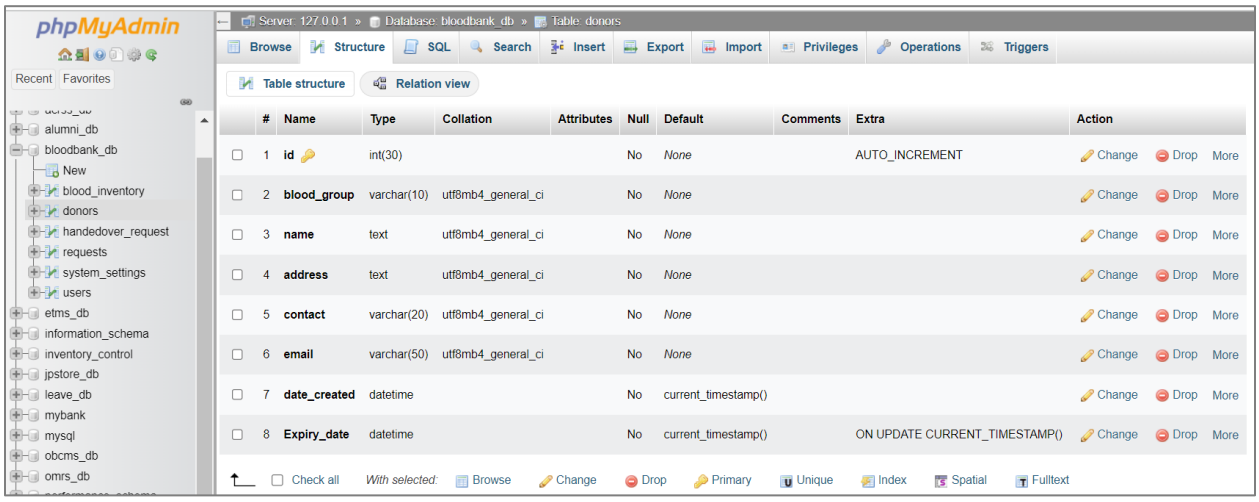
5.2.2.1 The table structure.

The table structure describes the kind of data and its datatype that each table holds.

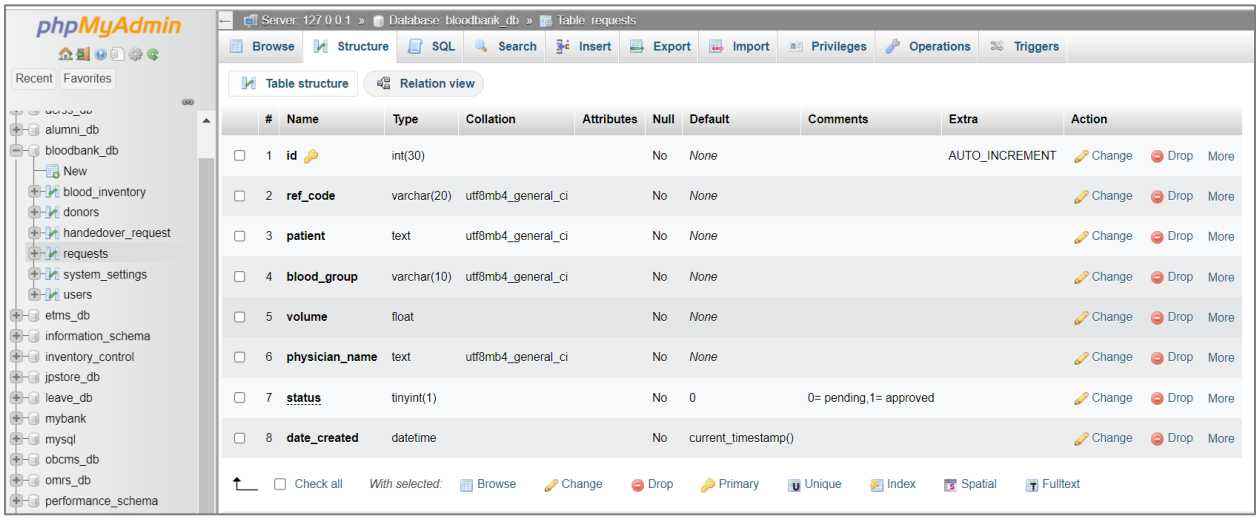
The blood inventory table structure.



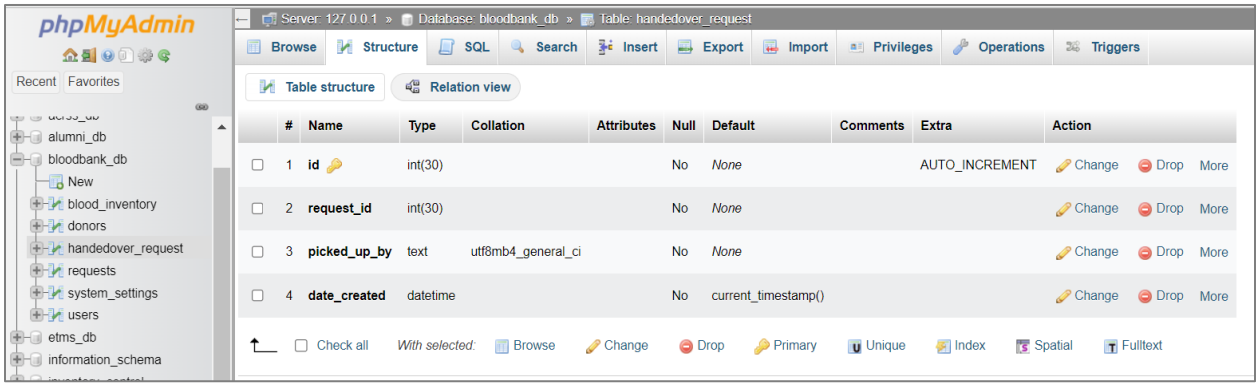
The Donors table structure.



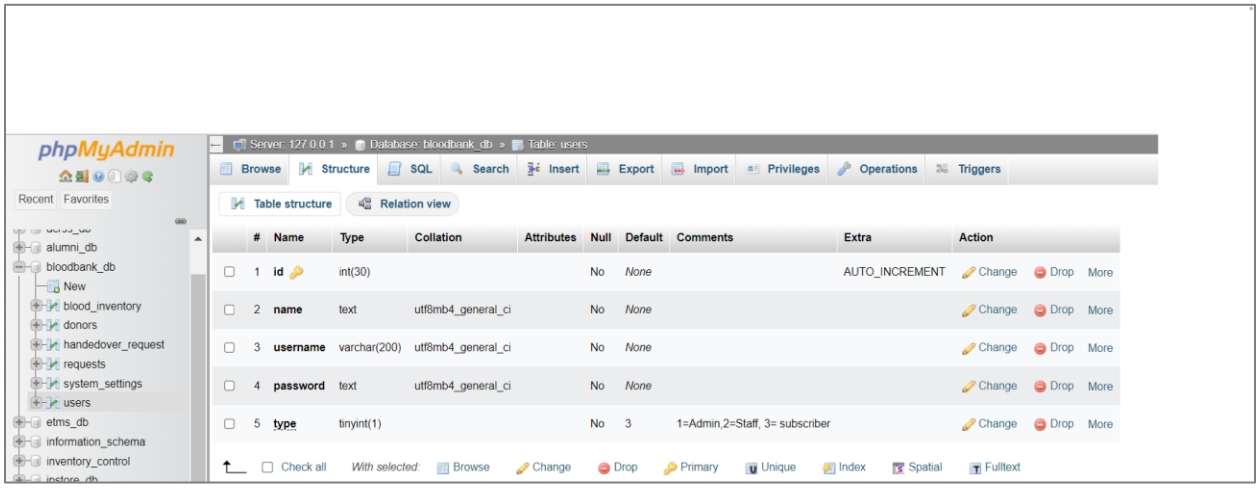
The Requests table structure.



The handed over requests table structure.



The users table structure.



5.3 System Testing

Unit testing and Modular testing were carried out during the development and after the development respectively to ensure that the system functions well. Individual units were tested in isolation while fixing bugs and then modules were also tested. The system was finally tested as a whole to ensure no errors in the codes, this was by entering sample data to check if the output is accurate.

5.4 System Validation

System validation was carried out to ensure that the system does the right job. I tested whether the system could register new donors, correctly track blood inventory, generate accurate reports on Blood Bank Metrics.

I also had a number of users test the system to ensure that it was easy to use and meet their needs.

The users were particularly impressed with the system's ability to automate many of the tasks involved in blood bank management. For these reasons therefore, I am confident that the online blood bank management system is reliable and meets the needs of its users.

CHAPTER SIX

6.0 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION:

In this concluding chapter, the researcher summarizes the journey of developing the Blood bank management system. the researcher reflects on the project's goals, discuss its outcomes, draw conclusions, and provide recommendations.

This chapter outlines the project's achievements, its impact on Blood bank operations, and offers actionable suggestions for future improvements.

6.2 DISCUSSION:

6.2.1 Summary of findings:

Throughout the course of this project, the researcher carefully designed, developed, and

implemented the Blood Bank Management System at Mbale Regional Referral Hospital.

The findings reveal a game-changing impact on the hospital's blood donation and distribution processes.

6.2.2 Achievement of Objectives:

The primary objectives were to enhance the efficiency of blood bank operations, ensure the safe and timely distribution of blood, and improve overall patient care.

The successful implementation of the system demonstrates that these objectives were indeed achieved.

6.2.3 Significance of the findings:

The Blood Bank Management system has streamlined the entire blood supply chain, reducing wastage, ensuring a steady blood supply, and enhancing the hospital's ability to respond to emergencies. This has, in turn, positively impacted patient outcomes and safety.

6.2.4 Comparison to initial goals:

The project's outcomes align closely with the initial goals outlined. The researcher witnessed a marked improvement of blood inventory, quicker response times for blood requests, and a reduction in manual error.

6.2.5 Challenges faced:

Despite the overall success, the researcher encountered some challenges during implementation.

- The integration of the system with existing hospital infrastructure posed operational challenges, requiring careful planning and cooperation.
- There was also a problem of time because the researcher was a student so he could get hard time to carry out research and develop the system alongside a busy schedule of academic programs
- Additionally, The Researcher also faced difficulties in collecting the right information during research since most of the Hospital administrators would hardly reveal the information.
- The researcher encountered difficulties in coding certain parts of the system which forced him to go for extra coding tutorials to improve on his coding skills

- Lastly, staff training was crucial to ensure the smooth adoption of the new system.

6.3 CONCLUSION:

Based on results, this study concluded that online blood bank management system is much better than the manual system.

The findings showed that respondents prefer to use online blood bank management system rather than the manual system because it offers many advantages and benefits that lead to its effectiveness, and efficiency.

Because of the increased confidence of the users on the system, it can be concluded that the online blood bank management system enhances blood transfusion safety because it provides better ways of handling the various processes in blood bank.

The hope is that this project will inspire further advancements in healthcare technology, ultimately benefiting patients and healthcare providers alike.

6.4 RECOMMENDATIONS:

In view of the findings, the researcher recommends the implementation of online blood bank management system.

Further, the researcher recommends that further studies on how online blood bank management system enhances blood transfusion safety can be undertaken to strengthen this study's findings. This requires actual implementation of the online system and evaluates how the users respond after implementation.

The researcher recommends the establishment of a dedicated technical support team, continuous training of the hospital staff, Regular system updates and maintenance to stay up-to-date with the latest technology and software advancements in blood bank management in order to ensure the system's long-term sustainability. The hospital must allocate resources for these purposes to prevent any potential disruptions.

Lastly, this study recommends that the system can be expanded by allowing donors to register online and be a system user, and these donors will be informed about the planned blood donation activities online.

References

Liyana, F. . ((2017)). *Blood Bank Management system using Rule-Based Method.*

Anthro Palomar. (2013). *system.html.* ABO publications.

Bond, Morrison-Saunders, & Pope . (2012). *Research Design.*

Creswell, J. W. (2018). *Research design: Qualitative, quantitative, and mixed methods approach. California, SAGE publications.*

Eloba., P. (1998). *Computer in Hospital record keeping technical education. Ikeja, Lagos State: Ekon Press.*

Hemn B.B. and Wu Fei . (2014). *Blood Bank Management Information System.* . International journal of Computer Engineering and Technology (IJCET), Vol. 5, Issue 2.

Kumar R,Singh, S. and Ragavi, V.A. . ((2017)). *Blood Bank Management System* .

Mayoclinic organization. (2016). *blood testing and procedures.*

Nickerson. (2008). *Database systems: Use, development, and administration with MySQL.*

Nickerson. . (2008). *Database systems: Use, development, and administration with oracle.*

Nmaju O., Nwachukwu E. O., and Ugwu C. . (2013). *A Novel Web-based Blood products Records Information System. West African Journal of Industrial and Academic Research, Vol. 7, No. 1*.

Redcross organization. (2011). *blood testing and eligability.*

Smallwood, R. F. . (2013). *Managing electronic records: Methods, best practices, and technologies. John Wiley and sons.*

Teena C.A Sankar, K. a. ((2014)). *A study on Blood Bank Management.*

Ukem, E, et al. (2012). *A software application for University students blood managemnet system. Journal of theoretical and Applied Information Technology, Vol. 35 No. 10.*

Webster & Watson. (2002). *A system.*

wikipedia.com. (n.d.). *blood groups.*

Yin. (1994). *Case study research method.*

Zwass, Vladimir. (24 Aug 2022). *Information system.* Encyclopedia Britannica.

APPENDICES.

Appendix 1. Interview Questions

1. What are the biggest challenges you face in your current blood bank management system?

……

2. How much time do you spend each day on manual tasks, such as updating donor records and tracking inventory?

……

3. How often do you experience errors in the current system?

……

4. How easy is it to access and share information with other blood banks and hospitals?

……

5. What features would you like to see in a new blood bank management system?

……

6. How do you collect and manage donor information?

……

7. How do you track blood inventory?

……

8. How do you facilitate blood requests and transfusions?

……

9. How do you ensure the safety and quality of blood products?

……

10. How do you generate reports about various blood bank activities?

……

Please rate the following aspects of your current blood bank management system by putting a circle around the correct answer.

1. The current blood bank management system is efficient.
    a. Strongly agree
    b. Agree
    c. Disagree

2. The current blood bank management system is accurate.

    a. Strongly agree
    b. Agree
    c. Disagree

3. The current blood bank management system ensures the safety and quality of the blood products.
    a. Strongly agree
    b. Agree
    c. Disagree

4. The current blood bank management system is Time consuming.
    a. Strongly agree
    b. Agree
    c. Disagree

5. The current blood bank management system has hardships in retrieving donor's information.
   a. Strongly agree
   b. Agree
   c. Disagree

6. With the current blood bank management system, there are hardships in detecting the expired blood bags.
   a. Strongly agree
   b. Agree
   c. Disagree

7. The current blood bank management system satisfies the needs of the users.
   a. Strongly agree
   b. Agree
   c. Disagree