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Web-based Blood Donor Management Information System using Waterfall Method

Reza Silvia Andriani[1)*], Deci Irmayani[2)], Ali Akbar Ritonga[3)]
[1)2)3)]Universitas Labuhanbatu, Indonesia
[1)]rezasilviaandriani@gmail.com, [2)]deacyirmayani@gmail.com, [3)]aliakbarritonga@gmail.com

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Abstract: As the implementing unit for blood donation activities, the Labuhanbatu Red Cross must always be ready to provide the services needed. One of the problems is related to the availability of blood stocks which are always lacking when needed. The current blood donor management system is still conventional, when people need blood, blood donation activities are also carried out at that time. This is not effective because the current system is not able to provide optimal blood availability. For this reason, a blood donor management system is needed that is able to take into account the amount of blood stock needed. This study aims to build a blood donor management information system by taking into account the availability of blood stock. Web-based application framework development. The system development method uses the Waterall model by going through the stages: requirements, design, implementation, verification, and maintenance. After designing, implementing and testing, the research results show that a web-based framework can be applied to a blood donor management information system quickly and easily. So from these results it can be concluded that this blood donor management information system has been able to provide convenience to the Red Cross in Labuhanbatu Regency regarding blood management by taking into account the amount of blood stock.

Keywords: Blood; Information System; PMI; Waterfall; Web.

INTRODUCTION

Blood is an important element for the human body, where blood is produced from what is consumed by humans every day. Blood is a liquid that is divided into blood plasma, red blood cells, white blood cells that flow through the blood vessels of humans and animals (Bahasa, 2021).

PMI Labuhanbatu Regency is a branch of the Central PMI which has a Blood Transfusion Unit (UTD) division whose job is to take blood from people who donate to be donated back to those who need blood. Prior to the blood donation process, laboratory tests and examinations have been carried out to ensure that the blood is free from infectious diseases. UTD PMI Labuhanbatu Regency is in charge of serving blood donation activities and providing blood stocks for people in need. As an institution that provides blood donors, UTD PMI Labuhanbatu must always be ready to provide excellent service. One of the things of concern is the issue of blood availability. If many parties need blood, then UTD must be ready to serve. If the condition of the blood stock runs out, it will be difficult for people to get blood. For this reason, the issue of blood stock availability must always be a major concern.

The current mechanism for recording blood donors at UTD PMI Labuhanbatu Regency has a weakness, namely that complete blood donor report data is not found. Blood goes in and blood goes out just like that without recording how much blood comes out per month and per year. In addition, it was also found that there was no recording of the grouping of blood data based on group and HB. This condition results in the absence of data on how much blood stock is and how much blood should be needed per month and per year. Based on these problems, all blood bank management systems are needed that are able to record blood data properly.

A number of researchers have provided solutions through the creation of a blood donor information system. The creation of a blood donor information system at UTD Sumedang Regency has made it easier for users to process data and minimize costs, and is easy to access (Rachman, 2019). The design of the blood donor information system at UTD PMI Dumai has succeeded in making it easier for the public to find voluntary donors (Khairatunnisa & Sari, 2021). With the blood stock information system at the UTD PMI Musirawas Branch, it can make it easier for the public to see the existing blood stock information (Zulfauzi & Rizki, 2018).

*name of corresponding author

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This study aims to build a blood management information system in the Red Cross, Labuhanbatu Regency. The information system developed is web-based by utilizing the codeigniter framework. As for the formulation of the problem in this study, is this information system able to provide convenience to the Red Cross in Labuhanbatu Regency in managing blood donations.

LITERATURE REVIEW

Blood Donation is a voluntary blood transfusion activity carried out by the Indonesian Red Cross with the aim of meeting the blood needs of the community (Putra, Akbar, & Arimbawa, 2018). Blood donation can also be said as an activity to give blood where the blood will be accommodated by the Indonesian Red Cross (Santoso, Sundari, & Kristiani, 2018). The benefit of blood donation is to reduce lipid profile levels (Nurhayati & Nugraha, 2018).

An information system is a system that has a collection of elements that are interconnected and collectively work together to achieve a certain goal (Fatma & Devitra, 2019). This information system contains information about important things such as, people, places, or in the surrounding environment (Laudon & Laudon, 2012). An information system is a component that consists of input, processing, storing, and disseminating output data that can provide corrective reactions (feedback mechanisms) to meet goals. (Stair & Reynolds, 2012). Information systems can also be said as a collection of elements in an organization that are interconnected with the process of flowing information (Saputra, Mulyadi, & Martono, 2014).

Unifield Modeling Language (UML) is a visual modeling method used in the design and manufacture of object-oriented software. UML is a writing standard or some kind of blueprint that covers business processes, writing classes in a particular language (Prihandoyo, 2018). UML was created to provide software developers with the tools needed to analyze, design, and implement software-based systems (Kurniawan, 2018). There are several UML diagrams that are often used in the development of a system, namely: use case diagrams, activity diagrams, sequence diagrams, and class diagrams. (Primadasa & Juliansa, 2020).

METHOD

This study collects data through observation, interviews, and document analysis as follows:

1. Observation. In this activity, direct observation of the UTD PMI activities in Labuhanbatu Regency was carried out. This aims to see the conditions and also observe how the form of activities and business processes that are currently running at UTD PMI Labuhanbatu Regency.
2. Interview. In this activity, a question and answer session was conducted with the leadership and staff of UTD PMI Labuhanbatu Regency regarding the current blood bank management system. This is done to get information or direct explanations from the leadership and staff of UTD PMI Labuhanbatu about ongoing business activities and processes.
3. Document Analysis. At this stage, blood reports are collected at the UTD PMI Labuhanbatu Regency.

To design and develop a blood bank management information system, the waterfall method is applied (Indriani, Dar, & Irmayanti, 2022) which includes several stages of activities as illustrated in Figure 1 below.

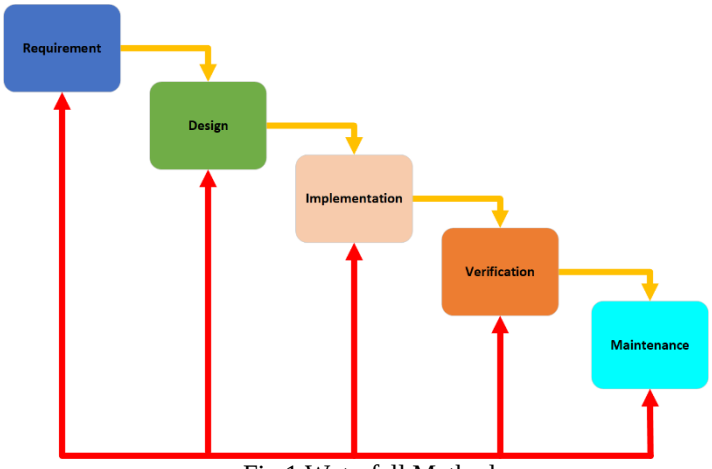

Fig.1 Waterfall Method

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Requirement

At this stage, the needs analysis of the system to be designed is carried out. The trick is to understand the system that is running to identify existing problems, understand the existing business processes, and after that only a system requirements analysis can be carried out to determine the needs of the system to be designed both functional and non-functional requirements.

Design

Based on the needs analysis that has been done. So, the system design is carried out using the unified modeling language modeling language. As for the interface design, mockup design is carried out.

Implementation

At this stage, the program code is made using the PHP framework codeigniter programming language and for the database using the MySQL DBMS.

Verification

At this stage, the system that has been built is tested. Testing using the Blackbox Testing method.

Maintenance

At this stage, maintenance is carried out on the system that has been created. If there are functions that have not been seen before, improvements will be made. For further system maintenance.

RESULT

In this research, a context diagram of a blood donor information system has been designed. The context diagram provides an outline of the procedure for the application of the blood donor information system at UTD PMI Labuhanbatu Regency. The context diagram of this system consists of 4 entities, namely, Donors, UTD Parties, Leaders, and Doctors. Figure 2 shows the context diagram of the resulting system.

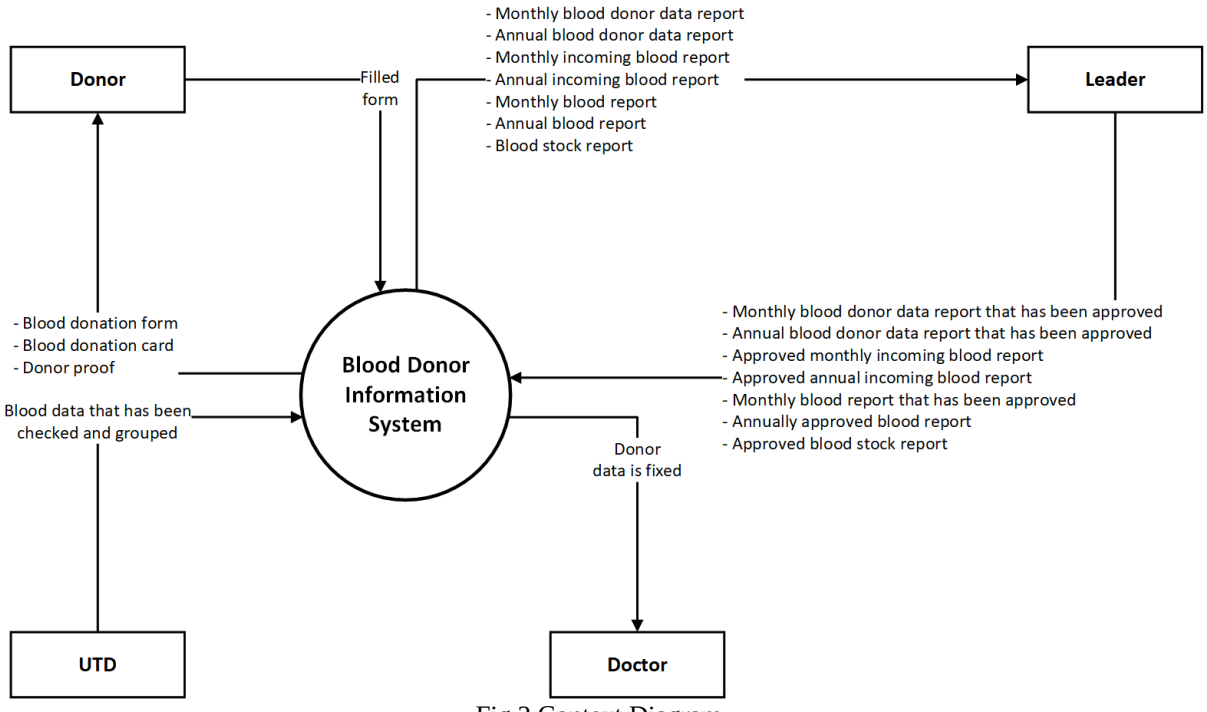

Fig.2 Context Diagram

In accordance with Figure 2 above, the proposed business process can be explained. The donor came to the PMI UTD in Labuhanbatu Regency, then the system will provide a donation form. The donor returns the completed form to the system. Then, the blood donation activity was carried out by the UTD. The blood from the donor is then checked in a laboratory to see the type of blood group and its HB. And the blood is also checked whether it contains an infectious disease or not by the doctor. If the blood is OK and does not contain infectious

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diseases, the blood will be stored in a blood bank based on its group. Then, the system will provide donor cards and proof of donors to donors who have donated blood. The process of the donor activity is submitted to the PMI leadership regarding monthly blood donor data reports, annual blood donor data reports, monthly incoming blood reports, yearly incoming blood reports, monthly outgoing blood reports, yearly blood reports, and reports on the amount of blood stock. Then, these reports are validated by the PMI leadership and returned to the system for file storage.

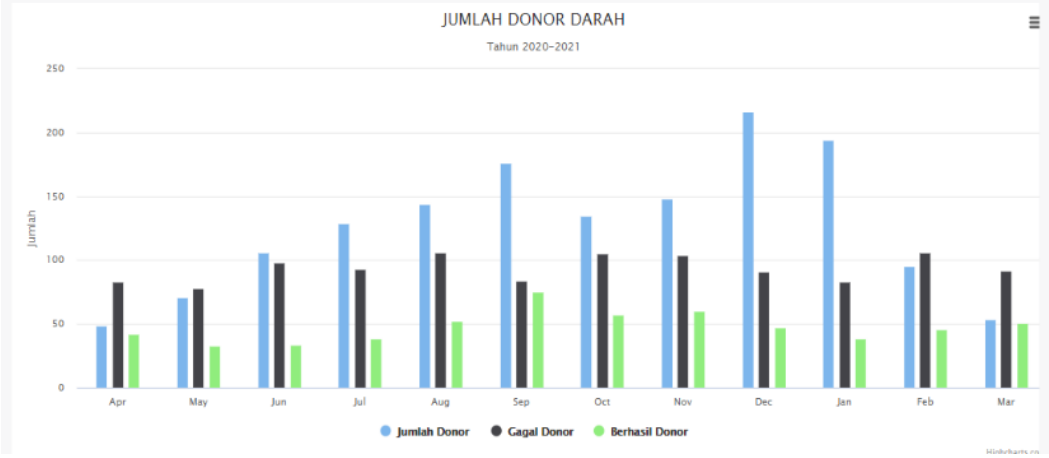

Fig 3. Blood Donation Chart

Figures 3 is UTD PMI blood donor data in Labuhanbatu Regency which has been successfully displayed by the blood donor information system. In Figure 3 it can be seen that the information system displays the results of blood production that has been carried out by UTD PMI Labuhanbatu Regency for 1 year from April 2020 to March 2021. The graph shows information on the number of donors, failed donors, and successful donors.

Table 1. Data Request Blood

Month	Year	A	B	O	AB
April	2020	409	422	548	151
May	2020	744	65	730	173
June	2020	411	440	472	122
July	2020	408	410	498	116
August	2020	599	537	657	181
September	2020	628	678	810	246
October	2020	512	446	498	158
November	2020	441	330	416	123
December	2020	440	490	532	178
January	2021	611	550	472	142
February	2021	431	393	468	132
March	2021	352	395	451	118

Table 1 is data on the demand for blood from the people of Labuhanbatu Regency in the period April 2020 to March 2021. The data is taken from the data on the blood request report that has been successfully displayed by the information system. The system has succeeded in recapitulating the data on blood requests within a period of one year based on blood group groups.

DISCUSSION

After the design and manufacture of a blood donor information system. Then the system testing is carried out using the blackbox testing method which is focused on testing the functions that exist on the registration button. The test scenario by inputting Name, User Name, Email, Phone Number and Password. The results obtained from the test are, the registration process has been successfully carried out and the system can authenticate the user who registers by directing to the login page.

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Table 3. Blackbox Testing Result

Testing Scenario	Expected Results	Test result	Description
Enter username and password	Show successful login notification	The user has successfully logged into the system with the account according to the access rights	Success
Click on the blood donation menu	Show blood donation page	The system displays the blood donation page	Success
Enter donor ID	Donor identity data is stored by the system	The system has successfully saved the donor's identity data	Success
Click the blood stock menu	Show blood stock page	The system displays the blood donation page	Success
Click the logout menu	Show successful logout notification	The user successfully exits the system and returns to the login page	Success

After testing the blood donor management application using the Blackbox testing method in Table 3, it was found that all test scenarios ran smoothly with significant results. From the results of the system evaluation, there are advantages, namely the blood donor transfusion unit can check blood donor data and blood stock data easily and quickly. The shortcomings of this system that need to be developed further are related to the prediction of blood needs. For this reason, it is necessary to develop a system by providing a menu for predicting blood needs.

CONCLUSION

This research has resulted in an application of a web-based blood donor information system at UTD PMI Labuhanbatu Regency. The blood donor information system at UTD PMI Labuhanbatu Regency is able to provide convenience for admins and users in managing blood banks. This system can be further developed in android and ios based platforms. This system can be developed by taking into account the aspects of data security.

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