Information on The Distribution Of Blood Donors Using GIS In Jayapura City (Case Study: UTD PMI Jayapura City)

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Abstract - The existence of UTD PMI Jayapura City is very helpful for the surrounding community in terms of health. People can also donate blood through the PMI clinic and get blood donors. Donors often have to queue to get their turn to register if they will donate blood at a blood donation event due to constraints in the health service process which is still carried out conventionally, namely by direct recording of potential donors. In addition, the absence of a computerized system to provide information regarding donor data remains a major problem, hampering blood donation services at PMI. The current system cannot produce clear and accurate data to help people assist. Quickly in case of an emergency. The PIECES method is used for reference in building several features in the system by conducting information, economic, security, efficiency, and service performance analysis to find weaknesses in the current system and offer suggestions for improvements to be made on newly built systems and using GIS as it can assist in the presentation of more interactive map information. The expected result of this research is to produce a system that can map the location of donors who have been divided based on their blood type so that the search process will be more efficient and can help search activities at PMI. Donor mapping in this system is also equipped with complete data from donors so that officers can find out the location of donors and can contact donors through existing data.

Keywords : PMI, Blood Donor, SIG, Jayapura.

I. INTRODUCTION

PMI was established to help others, for whatever reason, and provide a variety of activity services, including a Blood Transfusion Unit, a health service facility that organizes donor lists, selects donors, collects donor blood, undergoes donor blood screening tests, makes blood components, and stores them until giving blood for transfusion to patients who need it in hospitals or clinics [1]. Blood is urgently needed because The only source of human blood is the human itself until now with no alternative. After all, human blood cannot be reversed or recycled like most products and can only be obtained from voluntary donations [2]. The existence of UTD PMI Jayapura City is very helpful for the surrounding community in terms of health. People can also donate blood through the PMI clinic and get blood donors. In obtaining blood, there are 3 criteria for donors: replacement donors, voluntary donors, and autologous donors. In other words, it is collecting and re-entering someone's blood. However, the health service process is still carried out in a conventional way, namely by direct recording by prospective donors, especially in the donor registration process. Constraints in this process often make donors queue to get their turn to register if they will donate blood at a blood donor activity event. In addition, the absence of a computerized system to provide information regarding donor data remains a major problem, hampering blood donation services at PMI. The current system has not been able to produce clear and accurate information to assist the public in providing first aid quickly if a patient is in an emergency because the information obtained beforehand often occurs using mobile phones to share information via social media or broadcasts and in addition to sharing information directly from person to person. However, this will be an obstacle because there is no clear data or information directly from PMI. For this reason, it is necessary to have an information system that can provide information to PMI and patients who need blood donors about the location of donors who are willing to donate blood in an up-to-date manner.

It is hoped that the system created will make it easier for PMI officers to find donor locations. In

this system, groupings based on blood type and grouping based on district area have been made and equipped with coordinate points, making the search easier and more efficient. Geographic Information System Technology is used for resource management, development planning, cartography, and route planning. For example, planners can use GIS to help them locate areas they wish to review [3]. The reason for using GIS in making this system is because this geography can help present more interactive map information, where users can access complete geographic information using only a computer, web browser, and internet network. [4]. This study used the PIECES method to carry out the analysis and design. The PIECES method is used as a reference in building several features in the system by analyzing information performance, economy, security, efficiency, and service to identify weaknesses in the current system so that improvements can be recommended for the new system. [5].

Based on the background and problems above, a solution will be made with the title Web-Based Geographic Information System for Mapping Blood Donor Locations in Jayapura City to make it easier for PMI and patients to find blood donors. With a system that can map the location of donors who have been divided based on their blood type, the search process will be more efficient and can help search activities at PMI. Donor mapping in this system is also equipped with complete data and routes from donors so that officers can find out the location of donors and can contact donors through existing data.

Several previous studies related to PMI included PMI Information System Design By Integrating Donor Data and Blood Stocks Between PMI Branches in Region III Cirebon [6], The difference between this research and the research that will be developed is: the current research uses the UML design method while the previous research uses DFD. In this research, there has also been matching and distribution based on blood type. Furthermore, research on the GIS of Blood Donor Geographic Information System (SIGDORAH) Using the ADM Togaf Approach [7]. The difference in this study is the research object and the development method.
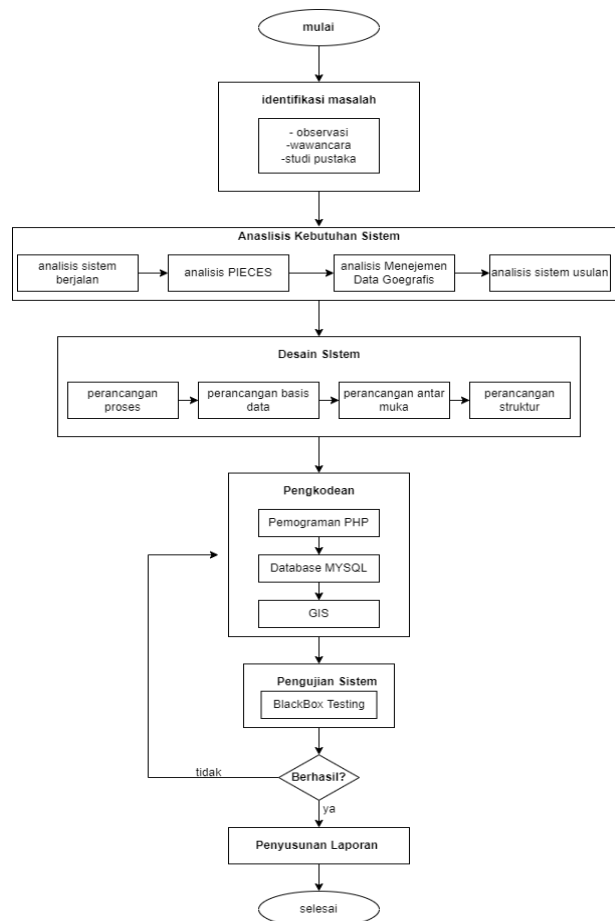
II. Research flow

Figure 1 Research flow

Figure 1 shows the flow of research conducted. The following are the stages of explanation.

1. Problem identification is carried out in 3 stages. First observation (observing the research location directly), second interview (conducting PMI interviews), third Library Study, carried out by collecting data by conducting a review study of books, notes, and reports that have a relationship with the problem at hand object of research [8].
2. Analysis of system requirements carried out in 3 stages. The first is an analysis of the problems in the current system, an analysis using the PIECES method, and a proposed system design.
3. System design is carried out in four stages. The first is the design of the Unified Modeling Language (UML), which uses use case diagrams, class diagrams, sequence diagrams, and activity diagrams.

The second system design is database design, and the next stage is interface design; the last stage of system design is menu structure design.

4. Implementation is the stage of making programs and databases using HTML, PHP, JAVA programming, MySQL databases, and GIS for mapping.

5. System testing using the black box method is carried out to reduce errors. If there are still errors, it will return to the design stage, but if there are no errors, it will continue to the report preparation stage.

6. The final stage is the preparation of a research report.

III. RESULT AND ANALYSIS

3.1   Problem Analysis

1. PIECES Analysis

To identify problems, an analysis of performance, information, economy, application security, efficiency, and customer service must be carried out. This guide is known as Performance, Information, Economy, Control, Efficiency, and Service (PIECES) analysis.[9].

The results from the PIECES analysis attachment, which have been analyzed using several variables, will later become a reference for building several features in the system as follows :

Tabel 1 PIECES Analysis

Analysis PIECES	Running System	Propose System
Performance	Information dissemination is still incomplete and inadequate	The system built is website-based so that data search and data processing by the admin becomes faster
Information	Information on donor areas is still lacking in detail	The system built displays the location along with the type of blood type so that the information	obtained is very accurate
Economic	The manual recording makes location search and data processing activities costly and time-consuming.	The system built is web-based, making it easier for officers to input data and use databases to make data safer.
Control	Manual systems are very vulnerable to damage and loss due to human error	The system that was built is very safe because only the admin has access rights
Efficiency	Searching for data takes a long time due to conventional records	The search menu in the built system makes it easier for users to search because users can search by location or by blood type
Services	The absence of fast-spreading information makes it difficult for the public to obtain information about the distribution area. The manual system makes service slow.	The area search process can be accessed easily with the help of a web browser and the internet. The computerized system makes service activities easier.

3.2   Database Design

Database design is a collection of interconnected data stored on a computer device and manipulated using the software. [10][11][12]. The design is as follows:

1. Use Case

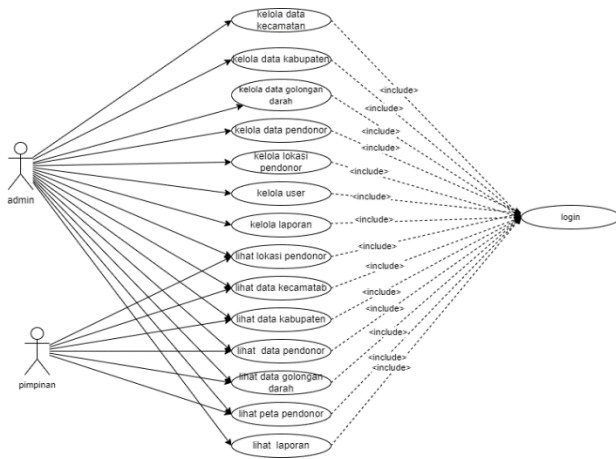Use case describes a relationship between one or more actors with the information system to be created [13].

Figure 2 Use Case

The use case in this system consists of two actors, the admin, and the leader.

2. Sequence Diagram

Figure 3 Sequence Diagram Add Blood Donor Data

Figure 3 is a Sequence Diagram plus blood donor data. The admin will add blood donor data by pressing the blood donor data menu first; after that, a blood donor data form will appear then the admin will press add donor data to add donor data. After that, the admin will fill in the donor data form. If you have finished filling in the news admin, press the submit button, and the system will check whether the donor data form has been filled in correctly. If the data filled in is declared valid, the system will save the data to the database; the system will then display the donor data page. The system will ask the admin to fill out the form completely.

3. Activity Diagram

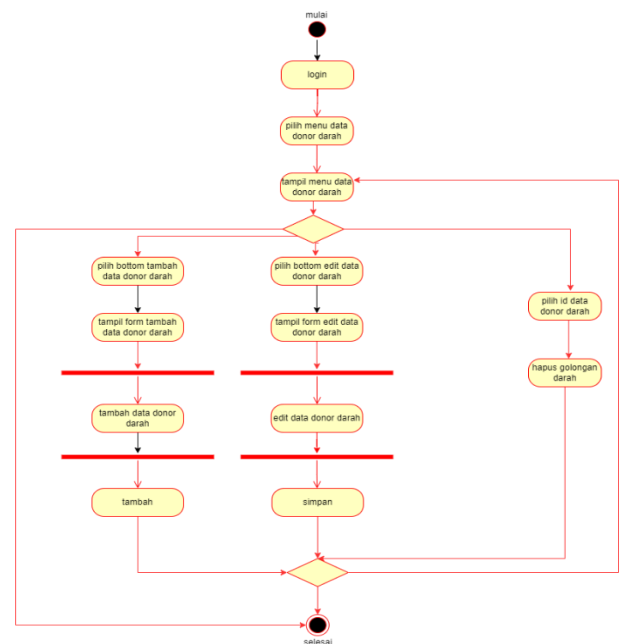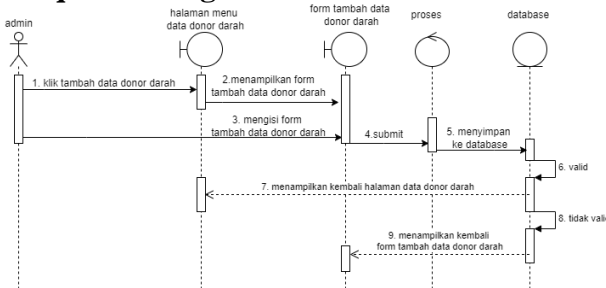Activity Diagram describes a system's workflow (work flow) or activity [14].

Figure 4 Blood Donor Data Management Activity Diagram

Figure 4 shows the activity flowchart for adding, modifying, and deleting blood donor data. After successfully entering the system, the admin will select the blood donor data menu. Then if the admin wants to add blood donor data, then the admin will select the add blood donor data button. After the form for adding blood donor data appears, the admin will fill in the form with the correct blood donor data. After submitting, the blood donor data has been successfully added to the database; likewise, if the admin wants to change blood donor data, the admin will select the edit button. After the blood donor data form appears, the admin will change the blood donor data that you want to change, and when finished changed, the admin will press the edit button then the blood donor data has been successfully changed. If you want to delete blood donor data, the admin will choose which blood donor data will be deleted. If you have chosen, the admin will

press the delete button, and the blood donor data will be deleted from the database and system.

4. Relation table

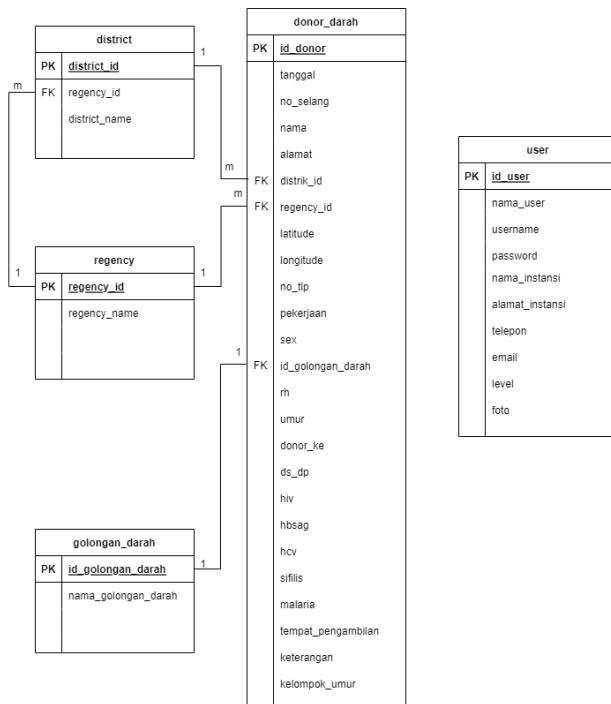Figure 5 Relation Table.

Figure 5 shows a table relationship where there is a relationship between the district_id table, which has district_id as the primary key, and the blood donor table, which has the district_id attribute as the foreign key because the blood donor table will display district data based on the input blood donors. The relationship between the blood group table, which has the blood group id as the primary key, and the blood donor table, which has the blood group id as the foreign key, is because each blood donor data collection always contains the blood group type. The regency table has regency id as the primary key, with the district table has regency_id as the foreign key because every regency data entry always contains district data as an indicator of the area. The relationship between the regency table with regency_id as the primary key and the blood donor table with regency_id as the foreign key is because every time you fill in the blood donor data, there is regency data indicating where to donate blood.

3.3 Implementation System
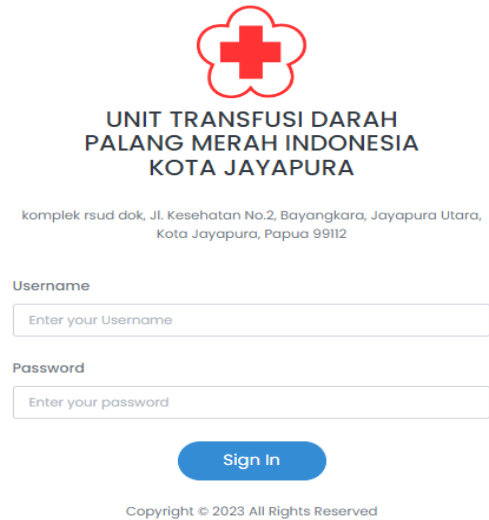### 1.   Login Form

Figure 6 Login Form

The login page display is the page that will appear after the admin opens the system. Then input the username and password first before entering the main page.
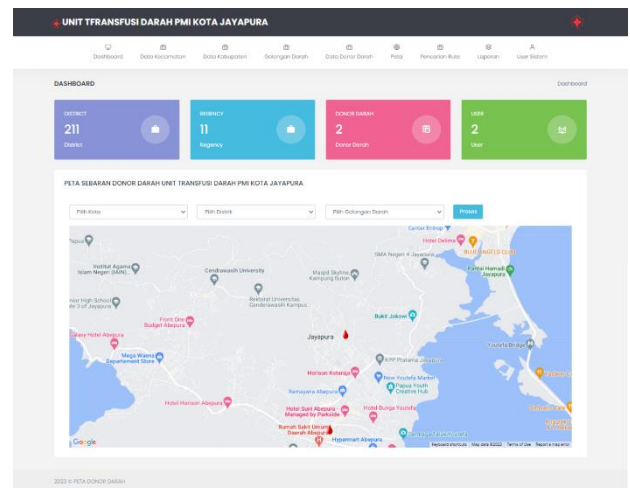
2.   Admin Dashboard

Figure 7 Admin Dashboard

The appearance of the main admin page is the page that appears after the admin has successfully logged in. On this page, there are menus and a map of the distribution of donors who have been recorded. The menus on the admin dashboard are the City/District Data Menu, District Data Menu, Blood Type Data Menu, Blood Donor Data Menu, Donor Map Menu, Donor Route Menu, Report Menu, and System User Menu.
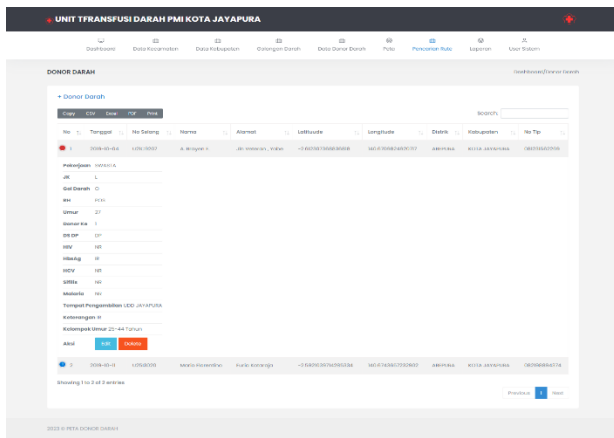
3.   Blood Donor Data Page

Figure 8 Blood Donor Data Page

Display of the Blood Donor Data Menu Page is a display page that contains complete data from donors who have been recorded. This page contains donor data so officers will contact the donor if their blood is needed one day. On this page, there are also actions to delete, change, and add donor data.
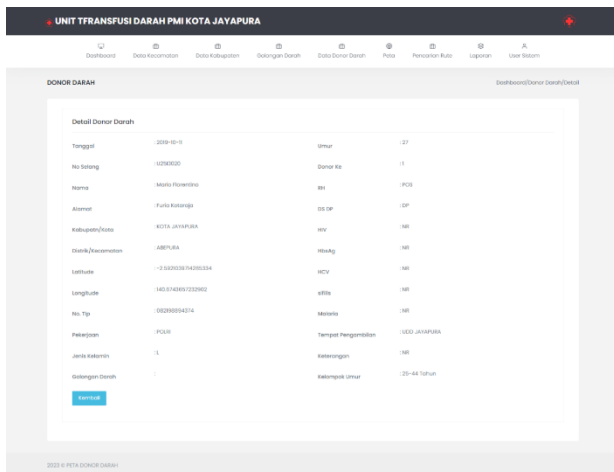
4.   Donor Detail Information Page

Figure 9 Donor Detail Information Page

The appearance of donor detail information page is the page that will appear when the admin presses the detail button from the existing donor data. This page contains details of donor data, from name, address, and telephone number so they are easily contacted, and other details needed to complete good donor data.
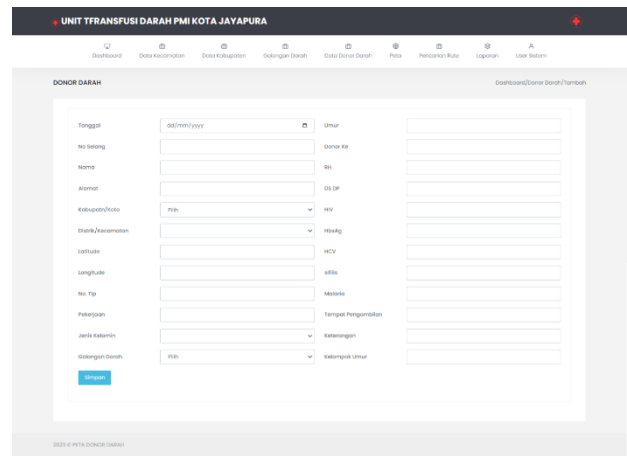
5.   Add Donor Form

Figure 10 Add Donor Form

The appearance of Add Donor Form page is the form that will appear when the admin fills in new donor data. This page contains all the data a donor needs to qualify as a donor in the future. There is a save button that the admin will choose when he has finished filling in the donor data form.

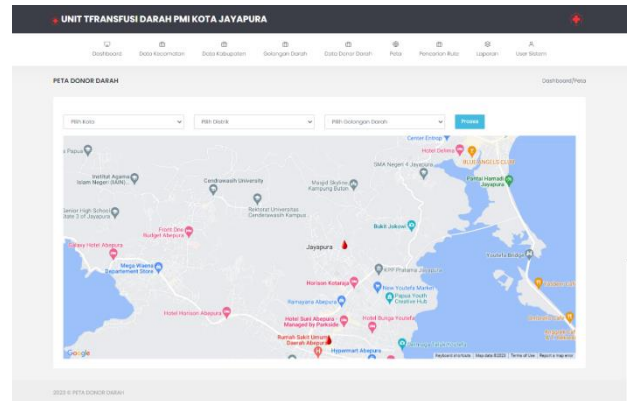### 6.   Donor Map

Figure 11 Donor Map

The Map Menu Page View is the page view that will appear when the admin selects the map menu. On this page, there is a map of the city of Jayapura and a distribution of donor points that have been recorded. There are city/district, sub-district, and blood group forms to fill in if the admin wants to find donors in detail according to location and blood type.

3.4 TESTING WITH THE BLACKBOX METHOD

Black box testing is done to know the functionality of the system. This method focuses on the software's functional requirements [15]. The test results can be seen in Table 2 below:

Tabel 2 black box testing

Action	Test scenario	Expected results	status
Testing the sign-in button	Admins and Leaders will enter on the main menu page	Admin and Leadership successfully enter the main page	Success
	Login will fail if you enter an incorrect username and password.	Admin and Leaders do not enter the main page	Success
Testing added donor data.	The system will process and display the donor data added form	The system successfully displays the form of adding donor data.	Success
Testing the sub-district data change button, changing donor data	The data that has been changed will be modified by the system and saved it back to the database.	The data has been changed and stored back into the database.	Sukses
Testing the donor data delete button.	The system will delete the data in the database.	The data has been deleted from the database	Success

Action	Test scenario	Expected results	status
Testing the donor data save button.	The system will process the stored data entered into the database.	The data that has been entered is successfully stored in the database.	Success
Test Report Print Button	The system will process which report to print.	The system prints the selected reports.	Success
Logout button	The admin will leave the admin page, and the login page will appear.	Admin exit from admin page.	Success

VI. CONCLUSION

From this study, it can be concluded that the built system can help PMI Jayapura City find donors because it is website-based and equipped with searches based on blood type and location to speed up the search process.

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