



# Integrated Web-based Palu City Blood Donor Service Application Model Using ReactJS and ExpressJS

Muhammad Jindan<sup>1</sup>, Hajra Rasmita Ngemba<sup>2\*</sup>, Syaiful Hendra<sup>1</sup>, Rahmah Laila<sup>1</sup>, Syahrullah<sup>2</sup>

<sup>1</sup>Information Technology Department, Faculty of Engineering, Tadulako University, Jl. Soekarno Hatta No KM 9 Palu 94148, Central Sulawesi, Indonesia

<sup>2</sup>Information System Department, Faculty of Engineering, Tadulako University, Jl. Soekarno Hatta No KM 9 Palu 94148, Central Sulawesi, Indonesia

\*[hajra.rasmita@gmail.com](mailto:hajra.rasmita@gmail.com)

**Abstract.** Blood donation is an important activity in the medical world that requires efficient coordination between donors and recipients to fulfill the need for blood. However, the blood donation process is often still constrained by the lack of donors and the difficulty of blood recipients to find donors. Based on this problem, researchers designed and developed a web application that utilizes ReactJS as a frontend Library, ExpressJS as a backend framework. This application will allow donors to register, make donor appointments, and access information related to blood donor activities. In addition, Admin can use this application to manage information on the application and send notifications to donors. The development method used in this research includes requirements analysis, system design, application implementation, and testing and evaluation. This research uses two tests, namely blackbox and questionnaire. In testing the questionnaire using the end-user computing satisfaction (EUCS) measurement model with a quantitative approach and data distribution involving 31 respondents with 32 questions. The results obtained are EUCS variables (content, accuracy, format, ease of use, and timeliness) get results with a Mean value of 4.123. The result of this research is an application system named Badonordarah that can improve the efficiency and effectiveness of the blood donor service process in Palu City, and make it easier for blood donors and recipients to interact.

**Keywords:** Blood Donation, ReactJS, ExpressJS, Website, Palu City

(Received 2023-10-15, Accepted 2023-10-26, Available Online by 2023-10-31)

## 1. Introduction

Blood donation services are an important aspect of a city's health system. Blood donation is the act of taking blood from individuals voluntarily, then stored in a blood bank for later use in the blood transfusion process. Blood transfusion is basically the delivery of blood from a healthy donor to a recipient who needs it [1], [2]. Therefore, management in the blood donation process needs to be organized and improved efficiently and effectively. Palu City, as one of the cities located in Central Sulawesi province, also needs a blood donor service system that can support the community's need for adequate blood supply. In the era of growing digitalization, the use of information technology is an appropriate solution in improving the efficiency and quality of blood donor services. Web-based applications have become an effective tool to facilitate various social activities, including blood donation[3]. Therefore, this research aims to design and build a web-based blood donor service application that will facilitate donors and parties involved in the blood donation process in Palu City.



According to the Data Center of the PMI Blood Transfusion Unit of Central Sulawesi Province, currently developed countries need transfusion blood above 5% of their population, while in Indonesia it is estimated that the national need for transfusion blood is in the range of 4%. In Central Sulawesi, the need for transfused blood is still below 2%, while Palu City and its surroundings are still at 1.8% or around 1,000 bags per month[4]. Although blood donation efforts have been in place for many years in Palu City, the current state of the process is fragmented, and the required information is often scattered across different platforms and entities. This can result in uncertainty in blood availability, delays in response in emergency situations, and difficulties for individuals who wish to participate in blood donation. The designed application will use ReactJS technology to develop an interactive and responsive user interface, and ExpressJS as a server that will manage data and function as a link between the application and the database. ReactJs is an open source JavaScript library that can make the process of developing interactive user interfaces easier [5]-[7]. ExpressJs is a framework built on NodeJs[8], [9]. This framework provides a simplified Application Programming Interface (API) for some core NodeJs functions[10]. In addition, researchers will also implement JSON Web Token (JWT) technology to improve security in user access and authentication [11].

Through this research, it is expected to obtain a blood donor service application that is adequate, easy to use, and safe for its users. This application is expected to increase community participation in blood donation activities, facilitate the management of blood stocks, and provide accurate and up-to-date information about blood donor services in Palu City.

## **2. Methods**

### *2.1. Type of Research*

The research used is descriptive research. Descriptive research is a type of research that aims to explain or describe phenomena or events in a specific, transparent, and in-depth manner regarding the circumstances observed in the field [12].

### *2.2. System development*

Application system development is carried out using the Prototype method. In the development process, the Javascript programming language is used, MySQL is used as a database because MySQL is one of the fast and reliable relational database management systems, especially the need to store and manage complex data, while ReactJS and ExpressJS are used as frameworks because javascript flexibility is a very flexible programming language, easy to find resources or documentation because it has a large community, and ease of integration is one of the factors why using ReactJS and ExpressJS. The purpose of using this method is to make it easier for programmers to develop.

## **3. Research and Discussion**

The design of the Palu city blood donor application (Badonordarah) using ReactJS and ExpressJS that has been made is then tested using the Black Box and Questionnaire testing methods.

### *3.1. Planning*

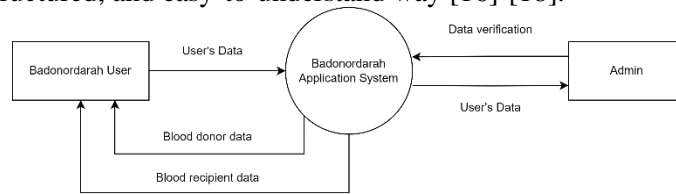
In this initial stage, there is an identification of problems that occur in the people of the city of Palu, namely the people of the city of Palu still seem to have difficulty in finding blood donors to donate to people who are in need of blood, therefore researchers are working with the Galang Bersama Kami foundation, a foundation engaged in the humanitarian field to create an application that can help donors and blood recipients to exchange information in order to communicate with each other and quickly get donors who can donate their blood.

### *3.2. Analysis*

In this analysis stage, the author analyzes what features are needed for the application later through observations and interviews with members of the Galang Bersama Kami foundation what is needed to help foundation members operate the application.

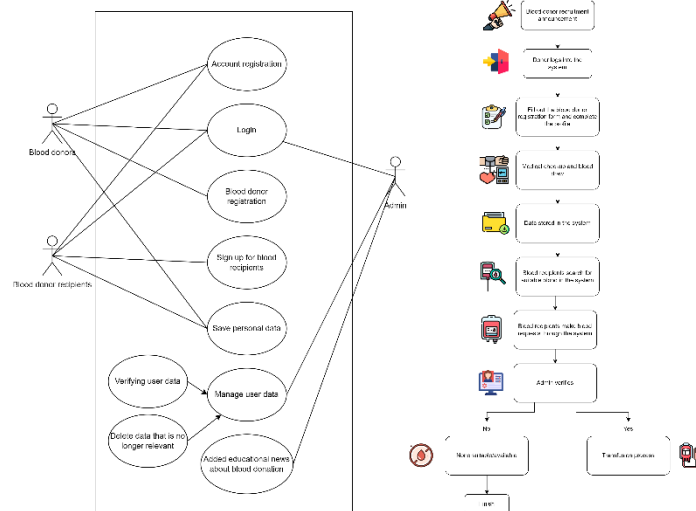
### *3.3. System design*

A context diagram is a visual representation used to show how an information system interacts with its environment in which it operates [13]-[15]. Data Flow Diagram is a visual representation that utilizes symbols to illustrate the movement of data in the system. Its use is very useful in understanding the system in a logical, structured, and easy-to-understand way [16]-[18].



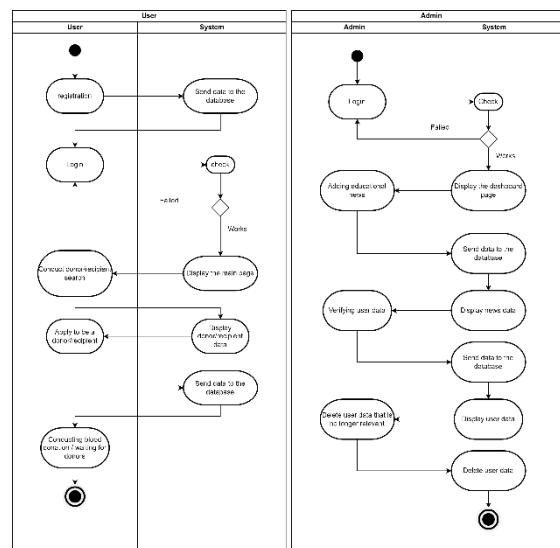
**Figure 1.** Data Flow Diagram

A use case is a visual representation that describes the relationship between actors and use cases[19]-[21].



**Figure 2.** Use Case Diagram and User Flow

Activity diagram is a graphical representation that visualizes the concept of data flow or control, structured action, and good design in the system [19], [22].



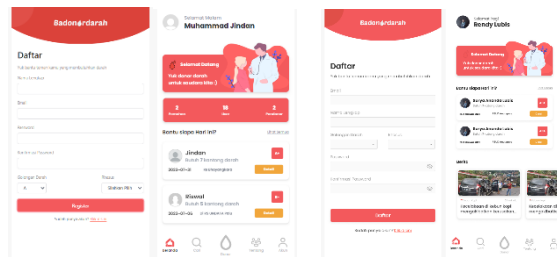
**Figure 3.** Activity Diagram User and Admin

### 3.4. Prototype

The prototype stage aims to build a user interface that shows the process or flow of the application and will later be implemented in the application. prototyping using the Figma application.

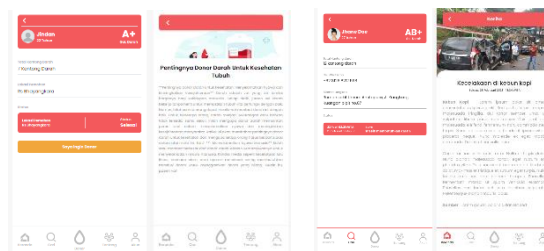
### 3.5. Implementation

At this stage the system will be built, which uses javascript programming language and MySQL database. javascript is divided into 2, there is a client side and a server side which are both developed using NodeJS [23]. on the client side using ReactJS to create a user interface and on the server side using ExpressJS to build the Enpoints API and routing system. The account registration process includes filling in your full name, email address, password, blood type and Rhesus factor. On the homepage, users can view statistics of registered users, a list of blood applicants, and educational news about the importance of blood donation. The following is a comparison between the application (left) and the prototype (right) in Figure 4:



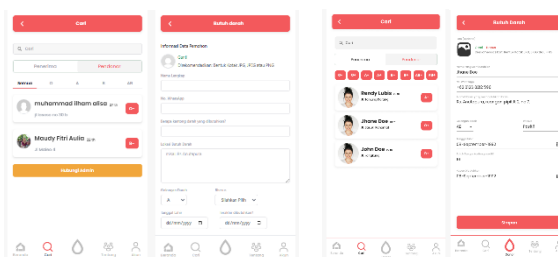
**Figure 4.** User Registration and User Home

On the Blood Recipient Details page, users can view blood recipient info including name, age, blood type, amount of blood needed, location, status (completed or not), and an "I want to donate" button that directs to the WhatsApp messaging service. On the Education News Detail page, users can get education about blood donation, blood types, and more. The following is a comparison between the application (left) and the prototype (right) in Figure 5:



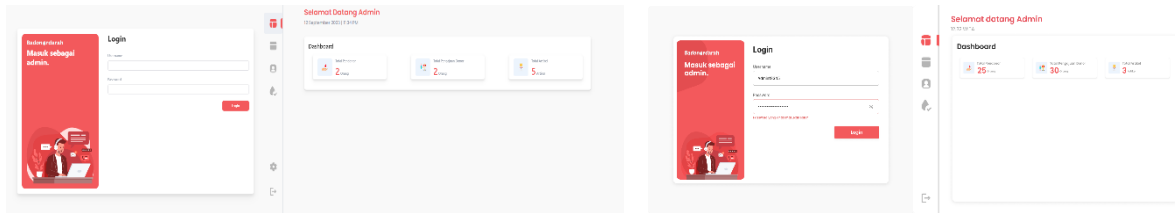
**Figure 5.** User Blood Recipient Details and Education News Details

On the Search page, users can search for blood donors or recipients based on blood type. Blood recipients need to fill in complete data, including name, WhatsApp number, amount of blood needed, transfusion location, blood type, rhesus, and date of birth. The following is a comparison between the application (left) and the prototype (right) in Figure 6:



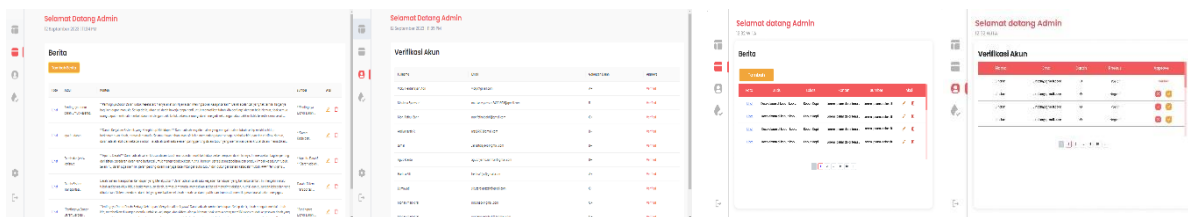
**Figure 6.** User Search and Register Form

On this admin dashboard page, the admin can see data such as total donors, total donor applications, and total educational news articles. The following is a comparison between the application (left) and the prototype (right) in Figure 7:



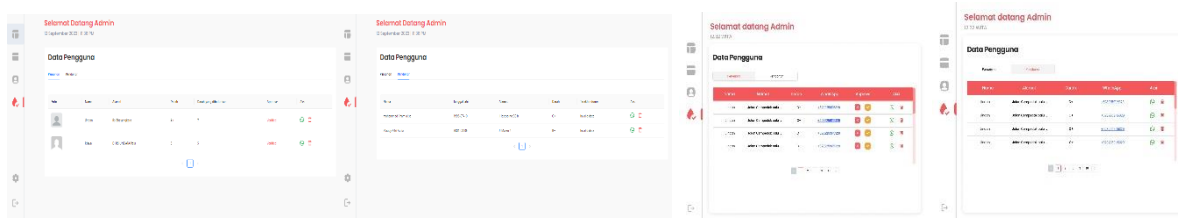
**Figure 7.** Admin Login and Admin Dashboard

On the Educational News page, the admin sees a table of educational news with photos, titles, content, and content sources. Admins can edit or delete content with the action button. On the Account Verification page, the admin decides whether the account is spam or not, can reject or verify suspicious accounts before verification. The following is a comparison between the application (left) and the prototype (right) in Figure 8:



**Figure 8.** Admin Education and Account Verification News Table

In the recipient table, the admin sees the photo data, name, address, blood type, amount of blood needed, and can contact or delete the user. The admin can also approve the request with the "Agree" button or mark it as "Verified". In the donor table, the admin sees data on name, date of birth, address, blood type, blood donor history, and can contact or delete users. The following is a comparison between the application (left) and the prototype (right) in Figure 9:



**Figure 9.** Blood Recipients and Blood Donors Table Admin

The challenges faced during development are data security because there is some sensitive data that needs to be encrypted and limited access, and the way to overcome it is to do Authentication using JWT (JSON Web Token). Another challenge is Testing and Debugging and how to overcome it by testing application functions using Postman.

### 3.6. System Testing

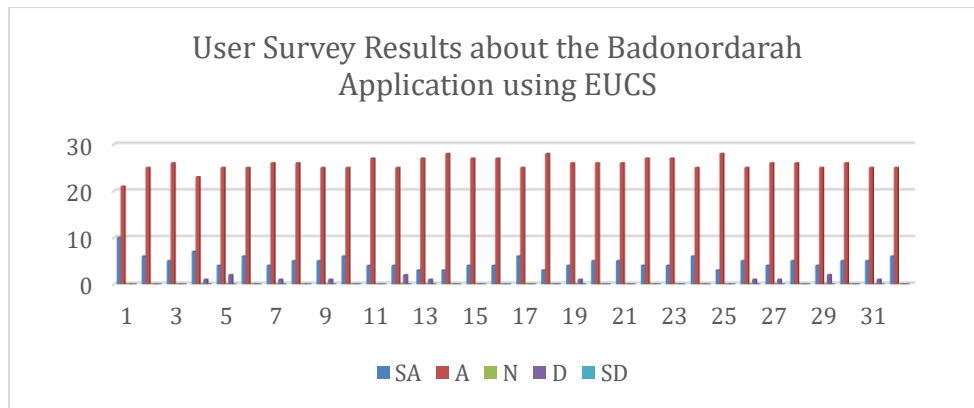
At this stage, system testing will be carried out which is carried out using the BlackBox method which is needed to find out the functions of the system running properly and reduce errors in the system. The challenge faced during blackbox testing is browser and device compatibility because it must ensure that the application works properly on various web browsers such as chrome, firefox, and safari and then check the application's performance on various devices, including computers, tablets, and cell

phones. The following are the results of system testing using the Blackbox method on the Badonordarah Application System can be seen in Table 1.

**Table 1.** System Testing Results

<b>Features</b>	<b>Feature Funtion</b>	<b>Results</b>
Registration (User)	Register an account to log in	Valid
Login (User)	User login to access other features in the app	Valid
Blood donor and recipient search (User)	Perform searches to make it easier for users to find blood donors or recipients	Valid
Filling in the Registration Form (User)	Fill out the registration form to register as a blood recipient	Valid
Complete Profile Data (User)	Completing profile data to be able to donate blood needs to complete profile data	Valid
Login (Admin)	Admin login so that not just anyone can access admin features	Valid
Add, Edit and Delete Education News data (Admin)	This feature is useful so that Educational News can appear on the user's home page	Valid
Verifying Account (Admin)	Account verification to avoid spam accounts	Valid
Verifying Blood Recipients (Admin)	Recipient verification so that donors can help targeted blood recipients	Valid
Delete Recipient and Donor Data (Admin)	Delete data if there is data that is no longer relevant then the admin can delete the data	Valid
Change Password (Admin)	Change passwords to improve information security	Valid

Questionnaire testing was carried out by distributing online and offline questionnaires totaling 31 respondents. The questionnaire given to users (PMI employees, prospective donors, and prospective donor recipients) uses EUCS satisfaction measurements. This needs to be done to find out whether this system is classified as a successful system or not. The purpose of this study is to measure the level of end-user (fundraiser) satisfaction with the Badonordarah application based on content, accuracy, format, ease of use, and timeliness variables. The measurement model used by researchers is end-user computing satisfaction (EUCS) with a quantitative approach and dissemination of data. The questionnaire is conducted online to obtain the required data. The results obtained, namely the EUCS variable (content, accuracy, format, ease of use, and timeliness) get results with a Mean value of 4.123, which means that the majority of users agree that the Badonordarah application has good content, accuracy, format, ease of use and timeliness. The following are the results of system testing using the EUCS Model on the Badonordarah Application System can be seen in Table 2 and Figure 18.



Noted : (SA) strongly agree; agree (A), neutral (N), disagree (D) and strongly disagree (DS)

**Figure 18.** User Survei

Based on the graphic image of the survey results, it can be seen that the average respondent said they agreed with the statement that the Badonordarah Application provides accurate information and is in accordance with user needs, provides complete reports and the application really helps you in completing blood donations. Apart from that, from the format dimension, the average respondent agrees that the badonordarah application has an orderly menu structure, is easy to understand and understand. This also applies to the accuracy dimension, where respondents agree that the badonordarah application produces information that is reliable, trustworthy, precise and correct. The majority of respondents also agreed that it does not take a long time to learn the badonordarah application, and it is very easy to interact with the application.

#### 4. Conclusion

Based on the results of testing and discussion, it can be concluded that the application runs well which can help users to find donors and find blood recipients who are in need of blood. In this application system, users can register an account if they don't have an account, login if they already have an account, search for donors and recipients of blood donors who need blood, fill out the registration form so that they can be registered as blood recipients, and complete profile data to be able to donate blood, for admins can login, manage educational news in order to educate users about the importance of blood donation, verify user accounts so that no accounts are indicated as spam, verify blood recipients so that donors can help blood recipients according to targets, delete recipient and donor data if the recipient or donor is no longer relevant, and change the admin password to increase information security.

This Badonordarah application has limitations, namely if you want to communicate with users or admins, you need to do it via whatsapp because there is no chat feature in this application. This Badonordarah application has the potential to be sustainable in the long term, especially if good maintenance and development planning is implemented and can enable easier collaboration between various parties involved in blood donor services, such as hospitals, medical staff, and donors.

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