98_Cloud-computing based data integration for non-profit organization: web design and implementation

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Cloud-computing based data integration for non-profit organization: web design and implementation

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Abstract*—Data is a very important part of our lives nowadays, but it requires a neat and systematic acquisition. This good and systematics data acquisition also required by non-profit institutions. Non-profit institutions in Indonesia are found within various fields, including health, arts, natural environment, agriculture, etc. One of the most needed data recording is the Indonesian Red Cross (PMI). PMI is engaged in the humanitarian field and has branches throughout Indonesia, including the districts. Donor data logging is one of the problems faced by PMI. Each time a donor does a blood donation, they need to rewrite their personal data on a piece of paper. This data will then be recapitulated into a computer which sometimes takes time and is not being inputted in real time. This system requires a change that makes data able to be inputted in real time and be stored properly and neatly. The data can then be stored in the cloud as well and be accessed in real time. For non-profit organizations such as PMI, this allows inputting and data processing to become more efficient and flexible. In this study, the System Development Life Cycle (SDLC) method was used, while the website uses the CodeIgniter (CI) framework. In this research, a website application is produced with features that are in accordance with the expected needs.

Keywords : PMI, non-profit organization, codeigniter, SDLC.

I. INTRODUCTION

Nowadays, there are plenty of different non-profit organizations found in Indonesia. Non-profit organizations are defined as institutions that has multiple active public activities which are not based on profit. These organizations are there to help ease suffering, reduce poverty, contribute to the environment, get involved in social activities or to help develop communities. Therefore, non-profit organizations have a mission to become the cornerstone in societal changes. As such, it is hoped that members of a community will grow to care for one another (Wiratnadi et al., 2019). Non-profit organizations as an institution or a group of individuals has specific goals and works together to achieve them, where their activities are not solely oriented on building up profit or riches (Maradesa & Massie, 2019).

When a non-profit organization undergoes a process, the *Good Corporate Governance* (GCG) is needed. The Indonesian Red Cross, known as *Palang Merah Indonesia* (PMI), is a non-profit organization in the social and humanities field, working to help people through providing much needed blood donations. As such, the blood unit becomes the main priority for PMI. The blood unit is managed by the blood donation units which are placed in multiple regions across Indonesia (Maradesa & Massie, 2019). The five criteria found in GCG, according to National Policy Governance Committee, known as *Komite Nasional Kebijakan Governance* (KNKG) 2006, are transparency, accountability, responsibility, independence and justice (Maradesa & Massie, 2019). One of the ways to comply with GCG is through reorganising the existing process of recording data. Data entry that takes a long time or is repetitive in nature when registering to donate blood often makes people frustrated. The process is either still being completed manually or not being properly computerized, which leads to multiple data entries and creates a data problem for the future (Gotama et al., 2016; Lestari & Mirchandini, 2019; Rachman, 2019). Therefore, a proper and reliable data system that can process data in real time is needed, being organised neatly and being easily accessible everywhere by the managers (Gotama et al., 2016; Lestari & Mirchandini, 2019).

The system existing today is heading towards the direction of using *cloud computing*. One of the most common definition used comes from the National Institute of Standards and Technology (NIST) which states: "*cloud computing* is a model that allows for network access to be easily completed everywhere, using the requests received and sending them to a group of computational resources which can be further configured. This can then be released and provided quickly with minimal effort or interaction by management or the service provider (Bildosola et al., 2015). *Cloud computing* has also been used in planning the information system architecture of the medical recoding and monitoring of Gizi Buruk Based on *Cloud Computing*. This is applied by the health agency of West Java, who still struggles heavily with managing information, especially in the process of medical recording, noting down and making reports on malnutrition. The data collection process can be completed in stages, starting from collecting data from the village doctor, public health center (*puskesmas*), health agencies of the cities and provinces, then finally to a central system (Putra, 2017). Cloud computing application is used on the cloud sql application in order to centralize the data. This means that the administrator can easily manage the database. This application makes use of the software as a service architecture, being accessed by using node js through the use of *json API* (Sulistyo et al., 2017).

Data processing for blood donation unit has been conducted multiple times in the Sumedang district. The district is one of the transfusion units that provides a supply of blood needed by two hospital blood banks. Information system is used in processing administration

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data of blood needs (Rachman, 2019). Another information system is used when recording new members for the Jakarta Red Cross (PMI). The old conventional system often leads to data becoming unorganized and not managed properly (Lestari & Mirchandini, 2019). Data planning for this blood donor unit is also conducted at a warehouse data scale to make a tidier system in the city of Bandung. This system is used to manage administration activities and makes sure it runs more effectively and efficiently (Gotama et al., 2016).

Palang Merah Indonesia (PMI) can run properly due to the Blood Donation Unit, or *Unit Donor Darah* (UDD), which are placed up to district levels. UDD in its operations works independently, where previous research shows that the opportunity to clean up data starting from the end user data is still wide open. Data which are initially still manual and conventional can be converted digitally by taking advantage of cloud computing to make processing more organized. As a result, this research focuses on the data collection of blood donors for non-profit organizations, where UDD applies it onto a cloud computing-based website. Cloud computing is utilized to store data as well as access information of the blood donor's data through the website.

II. RESEARCH METHODS

2.1 System Development Model - Waterfall

The method used in this research utilizes the Waterfall or linear sequential system development model. The Waterfall method is the simplest model done in developing a software. It starts by conducting data analysis and collection, designing the system, creating the program code, completing experiments, and implementation (Hasan et al., 2021; Lestari & Mirchandini, 2019; Rachman, 2019), as seen on Figure 1.

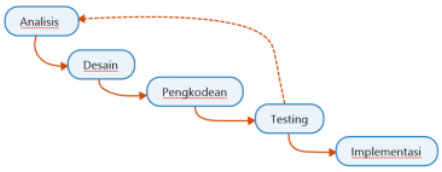

Figure 1. Waterfall Method used

2.1.1 Analysis

In this phase, qualitative research method is used to collect the necessary data. This qualitative data research is completed through interviews and observations. Observations are conducted by having the research team be physically present in the location, where they did an interview session with the spokesperson from PMI Banjar. This is completed to obtain relevant information for the research. Based on the interview results, several plot visualizations of the problem are found, as seen on figure 2. Figure 2 (a) and (b) shows these activities as being independent from one another. Figure 2 (a) shows when a donor has finished inputting their data in a form, the data is then transferred to a computer. There are often typing mistakes made which in the future leads to duplicate data. On the other hand, figure 2 (b) shows the admin facing difficulties processing the data, for instance, the part reminding people to donate their blood can't be done immediately as it requires for the data processing to be finished beforehand. This makes the data unable to be processed properly. The result of this field observation becomes the basis in planning the solution to fix the data inputting procedure and the system application development.

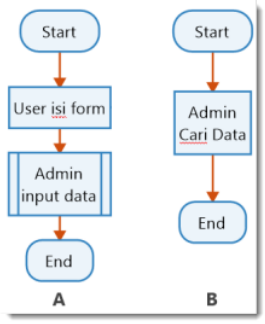

Figure 2: Before the system

2.1.2 System design

Based on the analysis, a solution is then planned related to the data input process and data processing to make the process in UDD more efficient. As the first step, the user right access in the system application is changed so that certain user can access certain data only. It is needed to avoid any mistakes in either data input or processing. The activity diagram for the user input data process become more organized, with the process before shown in figure 2(a) and the with the new system shown in figure 3. In that system there are two actors who are user (donor) and admin. The donors coming will be asked if they have been there before or not. If not, they will ask to enter their data. If they have been there previously, then admin will conduct verification if there are any new data change and allow the user to wait until they're called, and the admin will store the newest data from the user.

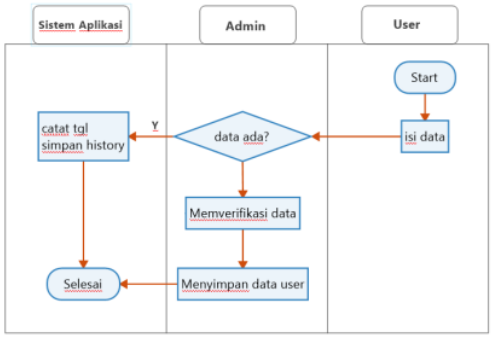

Figure 2. Activity Diagram: process for user input data

The new system for admin looks for information that changes figure 2(b) into figure 4. In this new system, admin can directly do new user input or to look up user/donor that is present already. By doing this, it reduces the possibility of repeated data and increase data efficiency. In addition to that, if previously data searching is still done manually, with this new system that can be done automatically and quickly. Data can be easily accessed in real time in the dashboard part. Other data access that can be conducted are adding new user, accessing previous users, adding pages for blood donor, and donor history.

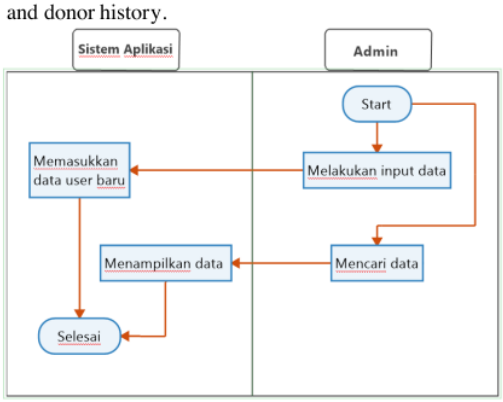

Figure 3. Activity Diagram: Finding data information.

2.1.3 Use Case Diagram

Use case diagram from this new system can be seen in figure 5. The feature of the application starting from login, adding user, checking user data, conducting data input, data edit, deleting data, searching data, looking up today's transaction history or to search donor data (as well as looking up their history). This use case illustrates the activity of the UDD administration managing admin.

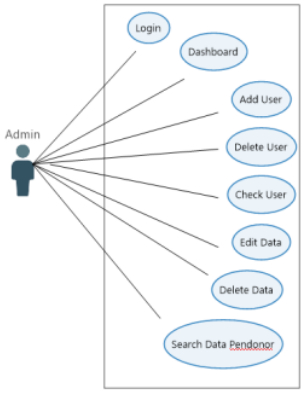

Figure 4. Use Case Diagram of the new system

2.1.4 System Architecture

Architecture of the system can be seen in figure 6. The admin can access information (retrieving or sending data) through PC/laptop that is connected to the internet network. Data will be retrieved directly from the Cloud. The cloud acts a s a place to store the data. The data will be shown on the website that is made previously. Through this cloud-based system, data can be accessed in real time by either the admin on duty or the UDD head when they're not present in the UDD.

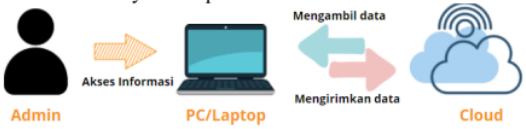

Figure 5. System Architecture

2.1.5 Mockup

Mockup design of the new system will start from the landing page and donor management. The landing page for showing the information about the website of blood donor data integration system can be seen on figure 7. On this landing page there are several information starting from the home menu, service, mobile, our team, testimonies, contact and enter system. The Home menu will show the home page. The service menu provides the information about the service given by UDD. The mobile menu provides information about the mobile device that will be released soon. Our team provides information about testimonies either from the staff or the blood donors. The contact menu provides information for visitors who wishes to contact or ask questions relating to donating blood. The Enter system menu is used by staff to get inside the system.

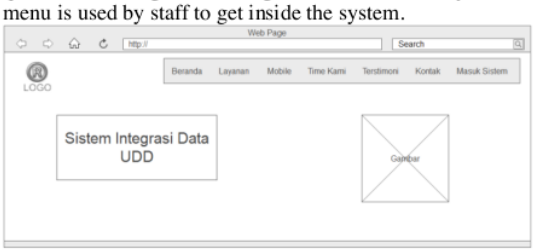

Figure 6. Layout of Mockup Landing Page.

The mockup for donor management involves several menus such as dashboard, user management and blood donor data. The dashboard menu shows information about the number of partners, donor, active donor, UUD registered and several information graphics about active donors and total donors. The dashboard mockup can be seen in figure 8.

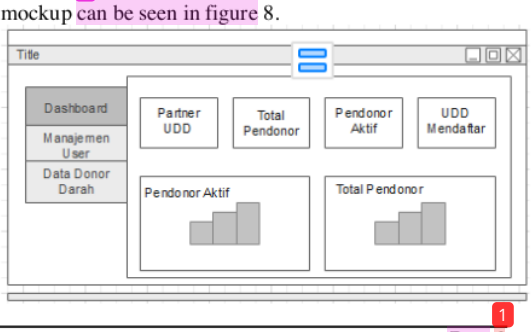

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Figure 1. Mockup Dashboard

The user management mockup can be seen in Figure 8. This user management is used to add new donors and observe all donors who has registered.

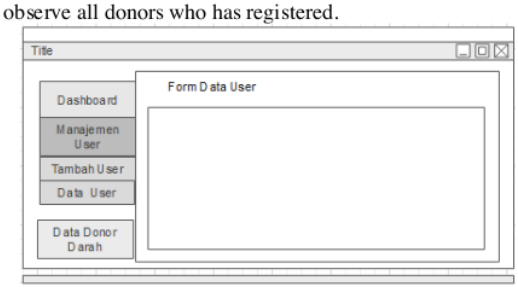

Figure 8. Mockup Manajemen User

The user management mockup can be seen in figure 10. This blood donor data is used to add new donor data (for the process of checking blood data) and to see all data of the donors who has donated their blood before.

Figure 9. Blood Donor Mockup Data

III. RESULT AND ANALYSIS

3.1 Writing Format

In this part implementation is conducted for the previously designed mockup. This implementation starts from the landing page and user management. The landing page implementation result can be seen on figure 12 and is checked in the website page https://www.sidu-id.com/. When it gets into the system, the admin will be asked to login by entering their username and password, as can be seen in figure 11.

Figure 10. Login Admin

Figure 11. Landing Page Sidu-id.com

After you log in, you'll go straight to the dashboard page as shown in figure 13. Admin can directly know the information that is often needed such as number of donors, failed donors, and graphical information.

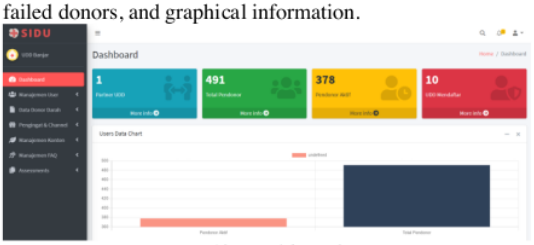

Figure 12. Dashboard Page

The user management layout can be seen in figure 14. Admin can easily add user and and see existing user data, while previously you'd need a lot of time to do all that. In contrast, now the layout for blood donor data can be used to easily observe the data for donor data increase and the history of the donor. The mockup of this layout can be seen in figure 15.

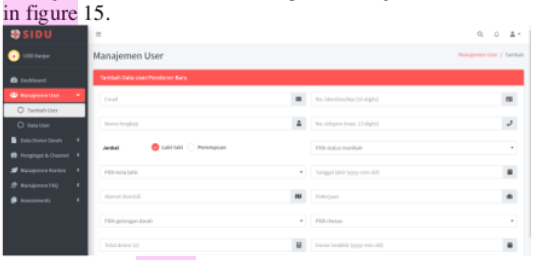

Figure 13. User Management

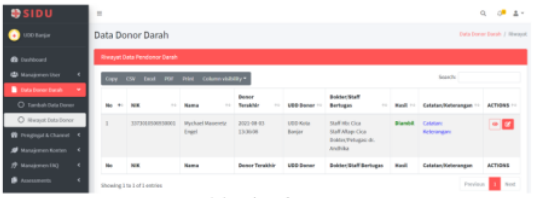

Figure 14. Blood Donor Data

3.2 Testing and Result Discussion.

Testing has been done in two steps. First is the fungsionality test using dilakukan menjadi dua yaitu pengujian fungsionalitasnya menggunakan metode

Blackbox Testing method and the second one is by doing a direct survey to the UDD comitte.

3.2.1 Testing.

Test on the system is done using the Blackbox Testing method. Blackbox Testing aims to test the functionality of the software that has been made so that it fits its function (Rachman, 2019; Tjahjono & Paramita, 2021). This method has the advantage that admins carry out the testing process by providing input and obtaining the output as shown in Figure 15.

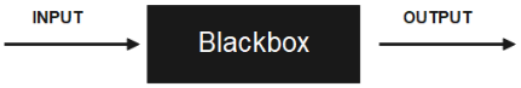

Figure 15. BlackBox Testing

This functional testing phase is performed by three admins at UDD Banjar who execute daily activity processes using the created system. The test is implemented using several use case scenarios for the UDD admin as shown in Table 1. The table lists what scenarios were tested along with the expected results and test results. The test results are in accordance with the expected results and all features work as they should.

Table 1. Functionality Testing by UDD Admin

No	Testing Scenario	Expected Result	Test result
1	Login to system with the right to access as UDD admin	Login is success. Data is displayed with the right to access as UDD admin	Accordance
2	Dashboard page appears automatically	UDD partners information is displayed directly, such as total donors, total non active donors with all their attributes	Accordance
3	User management process – add the new user	Admin can add new users.	Accordance
4	User management process – look saved user data	Admin can access saved user data and retrieve user data instanly	Accordance
5	Data input data ptocess of the donating donors	Admin can enter the data of donating donor's	Accordance
6	Checking the history of donated donors	Admin can display all the donors data needed	Accordance

3.1.2 Analysis results

This stage is the application acceptance testing phase. In this phase the User Acceptance Testing (UAT) method is used. This method will test whether the application made can be accepted and used properly by users (Peham, n.d.; Tjahjono & Paramita, 2021). This UAT method can not validate the suitability between user needs and applications that have been made, this is as written by Thomas Peham as seen in Figure 16.

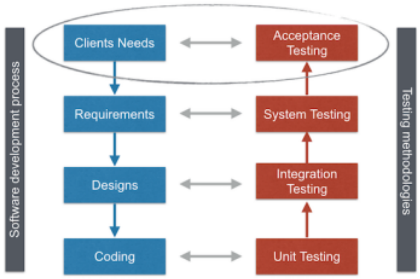

Figure 16. The relationship between testing methodology and Software Development (Peham, n.d.)

The UAT process begins by creating questionnaire questions based on the research analysis that has been done to ensure whether the features created are in accordance with the needs. Table 2 shows the answer choices and the weights of the questionnaire statement.

Table 2. Answer and weight of the UAT questionnaire (Tjahjono & Paramita, 2021)

Answer	Explanation	Weight
A	Very easy/Good/Accordance/Clear	5
B	Easy/Good/Accordance/Clear	4
C	Neutral	3
D	Quite difficult /Good/ Accordance/ Clear	2
E	Very difficult /Good/ Accordance/ Clear	1

Table 3 shows the result of three UDD admins at Banjar who answer the questionnaire of UAT. The admins do the operational activity at UDD.

Table 3. UAT questionnaire question with answers

No	Questions	Numbers of answer				
		A	B	C	D	E
1	Does the application make an easier user addition process?	3				

2	Does the application easy to use?	3				
3	Does the application relate to the needs of your job (especially donor data administration)?	3				
4	Does the application have an easy data input process?	3				
5	Is there any significant difference before and after the application is used?	3				

The data obtained in Table 3 will be processed as shown in Table 4. Data processing is carried out by multiplying the number of answers obtained by the weight of the assessment of each answer. Then the result is added up to get the total value. The total value is then divided by the maximum weight multiplied by the total number of respondents so that the percentage value is obtained. It should be noted that the user can immediately understand and easily use it to execute the activities. Table 4 shows the result has obtained a value of 100% of each aspect asked.

Table 4. UAT Questionaire Data analysis

No	Questions	Subtotal Value					Total Value	Value Percentage
		A	B	C	D	E		
1	Does the application make an easier user addition process?	3					15	100%
2	Does the application easy to use?	3					15	100%
3	Does the application relate to the needs of your job (especially donor data administration)?	3					15	100%
4	Does the application have an easy data input process?	3					15	100%
5	Is there any significant difference before and after the application is used?	3					15	100%

IV.CONCLUSION

This research has been carried out starting from conducting a needs analysis, system design to testing, and lead to conclusions as follow:

- The solutions that have been designed meet the needs of the analysis phase. The solution offered is that donor data is stored properly so that if there is a donor who comes, they just need to confirm so that there is no duplicate data. If there is a new user, then the data can be stored properly.
- The process, which was originally only centered on one admin, now each admin can access it easily and quickly.
- The BlackBox Testing method to test the functionality of the system prove that the whole system work well received with a UAT result of 100%. It means the application provides the solutions to their problem.

V. RESEARCH LIMITATION AND FURTHER STUDY

As all study, this research is always open for improbvement. Numerous of feature can be added for better service such as giving thanks after the donor, adding an automatic reminder system for donors to come back, and a system that will be used for news and information. education to the community.

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