



“WCOMVIS” : Water Meter Reader Application With Image Recognition For Billing Management

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ABSTRACT

Water is the basic need for living things in this world, including human being. It is the daily need that must be available every day, not only for the consumption but also for the other activity as like washing. There are so many ways to fulfill their daily need including the clean water such as using the water meter to get the water. By using water meter, people are able to know the fee based on the water usage. However, practically, the water volume calculation is still using manual method. The usage water of each person is recorded in a book and reported to country treasurer. This affects the calculation into a problem for example when there is a damage on the book of recorded water usage. As the developing technology, therefore it is created an application to read the water meter by image recognition. The whole system that is made is about the scanning of number water meter based on android. However, this project will not discuss when the taken image is blur. This application is expected to improve service optimally so that people will get easy access to their needs.

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1. Introduction

Water is a basic need for all beings in this world, including humans. For humans water is basic needs that must be available in life everyday, good for consumption, washing, or for bathing. Useful water universal or comprehensive from every aspect of life making it possible to be even more valuable water is good when viewed in terms of quantity or the quality. The higher the level of one's life, then the need for water will increase. Therefore, the processing must be arranged as such in such a way that it can be used efficiently and effective. Especially using clean water. Various ways done by humans so they can fulfill the necessities of life include the need for clean water, one of them is making artesian wells. Well artesian (deep well) is a well that has the depth of the hole is approximately 15 meters more inside of an ordinary well. Very artesian well suitable for use in complex environments because of the wells artesis is not easy to experience drought, other than that also arterial wells will produce quality water good if the process of making wells is done with correct. Because the benefits of artesian wells are very necessary, then the need for a strict policy in use of clean water. One of them with reporting or recording the water used everytime home residents every month. To know use of water there is a water meter. Water meter is a tool to measure the amount of water flow continuously [1]. With a citizen water meter can find out the fees charged according to proportion of water used. But in practice water volume calculation using a meter still manually where the amount of water is calculated still counted manually which is then recorded at book and reported to the treasurer RT (Leader of Neighbor) to paying still causes a lot of problems, one of them is still often an error in calculations and prone to damage to the notebook use of water. Also often discrepancy between the meter with the data reported thus gives rise cheating on water payments.

Therefore to overcome this the application is made Android as a water meter reader and calculation with image recognition. With the camera smartphone, users can find out usage water and costs incurred. Meter data that is captured by a smartphone camera will be processed use the image recognition method so water usage data obtained for one month. Images that have been changed using the method image recognition will be the next number reprocessed by the admin to do the process payment administration. That way citizens can know the amount that citizens have to pay. With this method is expected the application can run with good.

1.1. Water Meter

Water meter is a tool for measuring the amount of water flowing through the work system which is equipped with a sensor unit, a counter unit and measuring unit indicators. Water material usually used to calculate the volume of water that is distributed by PDAM [1]. Water meter has various forms in between as seen in Figures 1.1 and 1.2



Figure 1.1 Electromagnetic Water Meter
(sumber: Indonesian watermeter)



Figure 1.2 Ultrasonic Water Meter
(sumber: Indonesian watermeter)

In making this application, the meter used is the meter as in Figure 1.3



Figure 1.3 The water meter used is a Nutating type of Disk Meter
(sumber: Indonesian watermeter)

1.2. Image Recognition

Image recognition is part of artificial intelligence (AI) which aims to improve image data. In other words, it aims to prepare images that will be input so that they are feasible and easier to process at a later stage. The main steps in the image recognition process are as follows :

- a. Image quality improvement.
Improving the quality of the image can be by changing the color of the image that originally had a grayish color or commonly called the grayscale processing method.
- b. Image segmentation
Image segment aims to select and separate an object from the whole image. At this stage there is a down sampling method to reduce the number of pixels and eliminate some information from the image. In addition, the image segmentation phase eliminates noise or noise disturbances in the image such as lack of blurring in the image.
- c. Introduction and interpretation
At this stage the image that has been processed will be represented in an appropriate form so that it has good quality. The interpretation also includes the emphasis in interpreting objects that are recognized [2].

2. Analysis and Design

2.1. Architectural System

- a. General Description

A general description of the W-Comvis application system is shown in Figure 2.1.a

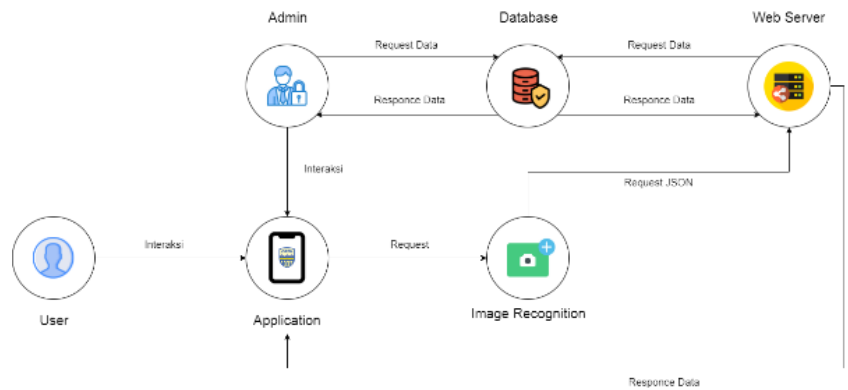


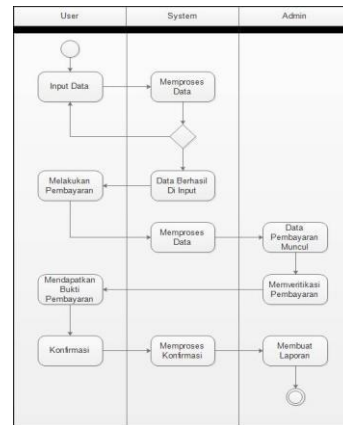
Figure 2.1.a General Description System

When the application is run and will enter the process of entering data, the data will be transferred to the web server via the front end request according to the application user input data, after that the request of the web server's own data will be digested and then stored to the data base so that it can be managed or generated, and attendance functions develop itself is interacting incoming data so that later it is returned back to be processed data information as a report.

b. User Target Application

The target users of the W-Comvis application are people aged 18 to 50 years with special requirements to not have a disability or have a disability. With this application, users are expected to be able to pay water meter bills effectively.

c. Flow Chart Application



Figuree 2.1.b Flow Chart Application

The business process in the picture above is as follows :

a) User

As a first step, the user enters the application first, then the user takes a photo of the water meter using his smartphone's camera. After that comes the figure which is the calculation of the cost of using water. Then the user pays the water bill to the admin.

b) Application

In the application will display water usage data from users. If the user wants to enter new data, the application will cause a photo capture with a smartphone camera, then the numbers in the picture will appear multiplied by the cost of using water. It will also display a recapitulation of water usage calculations every month.

c) Database

Data that is inputted will be stored in a database, the calculation process and data recap will go through the database database first.

d) Admin

Admin will ensure user data appears. Then if the data is correct, the admin will verify the payment made by the user. In addition, the admin will recap bill payments so that it can be seen by users.

2.2. Development Requirements System

a. Software Requirements

No.	Name App s	Version	Function
1	Photoshop	CC 2015	Create Mockup Apps
2	Edraw	Max 2018	Create Design System and Sturcture Apps
3	Android Studio	3.6	Create Operation Function W-COMVIS Apps
4	Retrofit	-	Rest Api Client Simple to send and receive
5	MySQL	-	Database Apps
6	Web Hosting	-	Hosted website contains application data server

Tabel 2.2.a Software Requirements

b. Hardware Requirements




Laptop				
No	Tipe Laptop	Processor	HDD	RAM
1	Lenovo Ideapad 310	Intel Core i5	1 TB	8GB
Smartphone				
No	Tipe Smartphone	Operating System	Memory	RAM
1	Xioami Redmi 5A	Oreo 8.0	16GB	2GB
Water Meter				


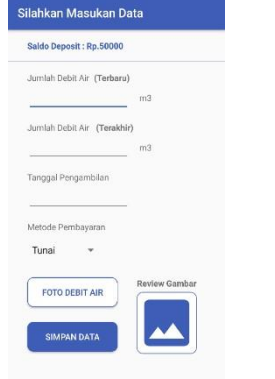
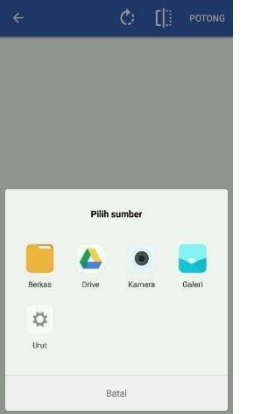

Tabel 2.2.b Hardware Requirements


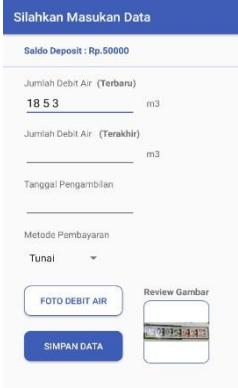


3. Implementation


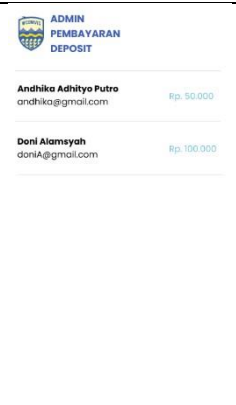


a. Interface Implementation

Interface Implementation is a framework design application that was previously designed. Table 3.1 implementation of the W-Comvis application interface.

No.	Interface	Information
1.		Initial display at first opening application
2.		Display when the user will enter the W-Comvis application
3.		Display register page for new W-Comvis users

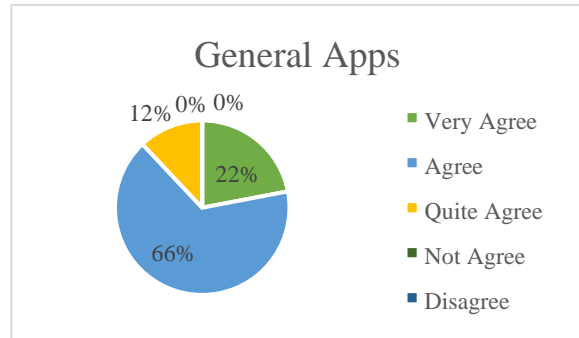
<p>4.</p>	 <p>Selamat Datang Doni Deposit Rp 50.000</p> <p>Jumlah Debit Baru : 46 Jumlah Debit Terakhir : 12 Rp 46.000 - Deposit</p> <p>29 Maret 2020 LUNAS</p> <p>29 Maret 2020 BELUM LUNAS</p> <p>29 Maret 2020 BELUM LUNAS</p> <p>+</p>	<p>The screen that lists usage water meter the user The screen that lists usage water meter the user.</p>
<p>5.</p>	 <p>Silahkan Masukan Data</p> <p>Saldo Deposit : Rp.50000</p> <p>Jumlah Debit Air (Terbaru) m3</p> <p>Jumlah Debit Air (Terakhir) m3</p> <p>Tanggal Pengambilan</p> <p>Metode Pembayaran Tunai</p> <p>FOTO DEBIT AIR Review Gambar</p> <p>SIMPAN DATA</p>	<p>The view that contains the form needed when the user wants to add a new meter data.</p>
<p>6.</p>	 <p>Pilih sumber</p> <p>Berkas Drive Kamera Galeri</p> <p>Unut</p> <p>Batal</p>	<p>Display permission to take meter pictures water</p>
<p>7.</p>	 <p>ONDA</p> <p>10181519131 m³</p> <p>Q₃ = 1,6m³/h</p> <p>2547.000P</p> <p>17085409</p> <p>Mode</p>	<p>Display when using the camera to take meters pictures Water</p>

<p>8.</p>		<p>Display the image of the water meter to be cut which will later be processed using image recognition to be taken data</p>
<p>9.</p>		<p>Display when users have cut pictures and data will be automatically filled in the form. To reduce read errors on the form, the latest debit can be replaced by the user so that the data is the same as the picture.</p>
<p>10.</p>		<p>A view that contains detailed data from a list payment the user. And there are options when users want to print data as evidence.</p>
<p>11.</p>		<p>Admin view When enter the application W-Comvis wants enter account</p>

<p>12.</p>		<p>Display on login and admin choose what activities to choose. There is a choice payment payment or confirmation of payment.</p>
<p>13.</p>		<p>Display when admin chooses activity deposit payment. There are user data and the deposit.</p>
<p>14.</p>		<p>Detailed view when the admin selects one user data. Admins can renew user deposits.</p>
<p>15.</p>		<p>Display when admin chooses payment confirmation activities. This page contains data on users who have paid and who have not yet paid. And the admin can change the user's payment status</p>

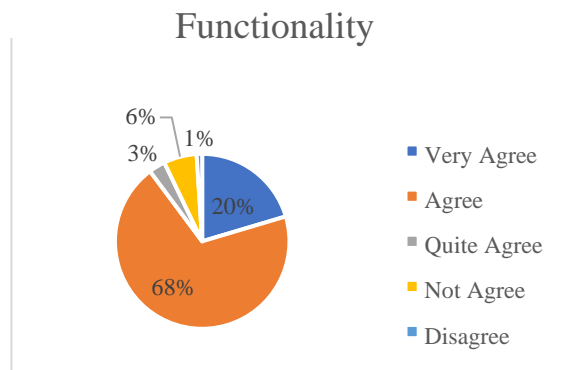
b. Usability Testing

a) General Application



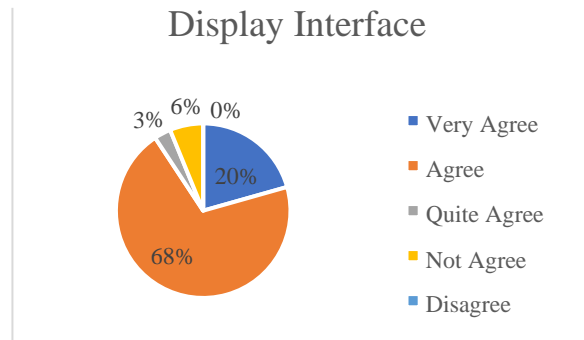
Based on the percentage of the data above, it can be concluded that the assessment of applications based on applications in general is in the very good category.

b) Functionality



Based on the percentage of the data above, it can be concluded that the assessment of applications based on application functionality is in the good category.

c) Display Interface



Based on the percentage of the data above, it can be concluded that the assessment of applications based on appearance is in the very good category.

4. Conclusions

Based on the analysis and application testing, it can be concluded as follows:

- a. W-Comvis application has been running in accordance with its function properly as evidenced by the results of testing the application functionality with a value of 72.25% which means it shows good results.
- b. W-Comvis application has a good display, evidenced by the results of the 83.33% application display test which means it shows very good results.
- c. W-Comvis application is generally good, evidenced by the results of general application testing 83.33% which means it shows very good results.

Bibliography

- [1] Water Meter Specifications. Pdf, Resettlement Research and Development Center Balitbang Ministry of Public Works.
- [2] Mulyawan, Hendy. "Identification and Tracking of Objects Based on Image Processing Real time." PENS Final Project (2011).