

Information System Design Planning And Control Of Aluminum Raw Material Inventory Case Study At PT Mamagreen Pacific

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Abstract

PT Mamagreen Pacific has been running for approximately nineteen years. For a long period in data processing, it still uses a manual system to input data for incoming and outgoing goods and requires a long time to manage. Therefore it is necessary to find alternatives to handling the problem. When viewed from the current era of globalization, the use of computers is expected to solve existing problems, not only calculations but also the ability to store data and convey information quickly and accurately that can be accessed in real-time. The system that will be applied to the PPIC division, especially for the aluminum raw material warehouse section, follows the stages of system development using the prototype, which consists of four main steps: requirements collection, planning, design, and implementation. An evaluation prototype for the system is already made. Evaluation prototype that has been carried out using usability testing, the results show that the five aspects starting from the elements of learnability, efficiency, memorability, errors, and satisfaction have an average value above 3, indicating that the Stock RM Aluminum has taken into account the usability or is already usable. This application program is made to find the stock of aluminum raw materials still available in the warehouse. This application program is designed using the MySQL program as a database for data storage, while the programming language uses PHP to design the program interface.

Keywords

Prototype, raw material inventory, usability testing, database

1. Introduction

The development of information technology in Indonesia has been very fast, and this has made several companies start to make improvements and updates to long-running business strategies. This is done to improve performance and productivity and provide the best service to consumers. The existence of industrial revolution 4.0 has brought changes to new business models in the manufacturing sector, which are considered capable of increasing performance by 20% to 50%. This is because of integrated digital technology (Kemenperin, 2019). The furniture industry has also risen after undergoing a crisis due to COVID-19 in the first quarter of 2021. The performance of the furniture industry was able to rise and grow positively by 8.04% after, in the same period last year, it contracted 7.28% due to the impact of the Covid-19 pandemic. Based on data, the export value of furniture products in 2022 reached USD 1.91 billion, an increase of 7.6% from 2019, which reached USD 1.77 billion. The most prominent export destinations for Indonesian furniture in 2020 include the United States, Japan, the Netherlands, Belgium, and Germany (Kemenperin, 2021). According to the 2017 Trade Assessment and Development Agency of the Ministry of Trade, based on the raw material, metal furniture such as stainless steel, brass, aluminum, and iron reached 8% in Indonesia.

Meanwhile, in the world furniture market, the contribution of metal furniture was 22%. The metal-based furniture industry has fluctuating performance compared to furniture made of other materials. The highest production value of metal furniture was Rp 2,844 billion in 2012 from 2010 – 2014. In 2010, the production value of metal furniture reached Rp 2,248 billion and decreased to Rp 1,753 billion in 2014.

PT Mamagreen Pacific is a manufacturing company engaged in the furniture industry. Its main activity is to produce outdoor furniture for the export market. The company has warehouses that store raw materials such as teak wood, metal, fabrics, and sub materials. In general, activities in the company's raw material warehouse begin with the receipt of previously purchased materials through purchase order documents. The materials are inspected and temporarily stored in the warehouse before being sent to the production department.

Based on the results of observations that occurred in the company, the recording of incoming and outgoing goods inventory is still done manually, so it takes a long time to find out the total stock of goods. This can affect production activities due to delays in making decisions to replenish raw materials. In addition, the unavailability of information on inventory status also affects the PPIC department, which will not be able to make decisions in calculating the product completion time immediately after they receive the order so that the customer response time becomes longer.

From the above background, this research is needed to design a warehouse management information system that suits the needs so that company activities related to the administration of aluminum raw material warehouses can run more effectively and efficiently. So in this study, researchers are interested in raising the topic in the final project with the title "Information System Design Planning and Control of Aluminum Raw Material Inventory Case Study at PT Mamagreen Pacific.

1.1 Objectives

Based on the background description, the researcher formulates the problem regarding research on how to build a raw material planning and control system with the prototype model software development method?

2. Literature Review

After reviewing the literature, researchers found several studies that have similarities in the subject of prototype software development methods. According to Kumaladewi, Utami and Arrosyid (2015), this research resulted in the existence of a raw material and production control system that could facilitate business processes in the operational division of PT Sinergitama Mandiri and with the creation of a system this information the information obtained is more accurate. the reason for being re-examined is because in previous studies the evaluation of the prototype used in testing web-based applications has not been explained. The difference with previous research is by adding prototype evaluation testing using usability testing so that it can be seen whether the application that has been made has a usability factor.

2.1 Understanding the system

A system is a group of interrelated variables to achieve the goals of an organization or company consisting of several resources (Sofyan et al., 2016: 1)

From this opinion, it can be concluded that the understanding of the system is a collection of several variables that interact with each other to achieve the goals of an organization.

2.2 Understanding Information

According to (Tohari, 2014:2), information is a combination of facts or data that has been processed to have a more valuable and helpful meaning for its users.

Information is data that has undergone a process into a form that has meaning for the recipient and has natural and felt value for decision making for now or for decision making in the future (Sutabari in Sofyan et al. (2016:2).

From this opinion, it can be concluded that the notion of information is a combination of facts or data that have been processed to have a valuable and helpful meaning for decision-making in the future.

2.3 Understanding Data

Data are facts that have not been applied to the decision-making process but are generally recorded and archived with the intention of not being used soon for the decision-making process (Sofyan et al., 2016:2).

Data is a fact or reality that can explain an event with a specific purpose (Tohari, 2014). Computer data is anything that can be symbolized, encoded, or digitized into symbols or codes understood by computers. (Wahyudi, 2018:16).

From this opinion, it can be concluded that the notion of data is a record of a collection of facts that can be used for decision-making.

2.4 Basic Concepts of Information

Systems Information systems are data, arrangements of people, processes, and information technology that combine process, store, and provide the output needed to contribute to the information. (Kumaladewi et al., 2015:2)

Information systems are a collection of four main components: software, hardware, infrastructure, and trained human resources (Sofyan et al., 2016).

From this opinion, it can be concluded that an information system is a set of interrelated components that collect, process, store, and disseminate information to support the decision-making process.

2.5 Database

According to Kumaladewi et al. (2015), The database consists of two words: base and data. The base is a headquarters or warehouse, a gathering place, and the data is a picture of actual-world facts representing an object then recorded in numbers, letters, symbols, text, images, or a combination thereof. If combined, the notion of a database is a collection of interacting data groups that are organized in such a way that they can be reused quickly, easily, and stored in electronic storage media.

From this opinion, it can be concluded that the database is an organized collection of data, generally stored and accessed electronically from a computer.

2.6 Javascript

According to (Nurkhamid, 2015), Javascript is a language in the form of a collection of scripts that provide a more interactive appearance on the web. In other words, this language is a programming language to provide additional capabilities to the HTML programming language (Hyper Text Markup Language) by allowing the execution of commands on the client and not the server documents.

From this opinion, it can be concluded that javascript is a collection of programming languages that make the website more attractive and interactive.

2.7 Website

According to Godbole and Kahate (in Kumaladewi et al. 2015), The World Wide Web is a collection of the internet that provides information for users using hypertext.

From this opinion, it can be concluded that the website is an information page provided via the internet so that it can be accessed from all over the world as long as an internet network connection is available.

2.8 PHP

PHP (Hypertext Preprocessor) is a web-based programming language that can process and process data dynamically (Fadila et al. 2019).

From this opinion, it can be concluded that Hypertext Preprocessor is a programming language on the server-side, generally used for creating and developing a website, such as managing dynamic content, databases, session tracking, and even entire e-commerce sites.

2.9 MySQL

According to Raharjo (2011), MySQL is a Relational Database Management System (RDBMS) that creates, organizes, and manages databases that can be done easily, quickly, accurately, safely, and reliably.

MySQL is an RDBMS that is fast and easy to use and has been widely used for various needs (Enterprise, 2014:2).

According to Kadir (in Kumaladewi et al. 2015), MySQL is a relational data business management system that supports a database consisting of a combination of relations or tables.

From this opinion, it can be concluded that MySQL is a database management system with a relational or liaison nature with the intent of controlling data in the database and later will be placed in several separate tables; therefore, data manipulation will be much faster.

2.10 UML

UML (Unified Modeling Language) is a family of graphical notations supported by a single meta-model, helping to describe and design software systems, especially systems created using object-oriented programming (Kumaladewi et al., 2015).

Unified Modeling Language is a language that has become the industry standard for visualizing, creating, and archiving software systems (Sofyan et al., 2016).

From this opinion, it can be concluded that UML (Unified Modeling Language) is a visual modeling method used to design object-oriented systems.

2.11 Usability

Usability is software's ability to assist users in completing tasks (Yumarlin, 2016).

From this definition, it can be concluded that usability is the system's quality that is easy to learn and use and encourages users to use the system as a positive tool in completing tasks.

3. Methods

This research is a case study with qualitative methods, while the case discussed is the policy of raw material supply to ensure the smooth production process at PT Mamageen Pacific. In this study, all data on the supply of aluminum raw materials at PT Mamageen Pacific was used. The stages that must be carried out in the system development methodology using a prototype model consist of the system requirements collection stage, the planning stage, the interface design stage, the programming implementation stage and the prototype evaluation stage. Prototype evaluation is used to test the output of the application that has been implemented. In this process the role of the user

is needed to be able to know and evaluate the application that has been made. The method used in evaluating this prototype is usability testing.

4. Data Collection

4.1 Observation

Activities were carried out by looking directly at the business processes running at PT Mamagreen Pacific. This research was conducted under the guidance of Mrs. Anita, the manager of the PPIC division. Observations began on April 4 to April 29, 2022, by observing physical activities and the process of exchanging data and information on logistics and production activities at PT Mamagreen Pacific.

4.2 Interviews

Interviews are conducted by asking questions directly to employees in companies who are competent in their fields. This method is expected to obtain data about the company's general description, raw materials inventory, and other data related to the problems to be studied.

4.3 Documentation

Documentation is carried out for data collection whose investigation is shown in the description and explanation through document sources.

4.4 Literature Study

The study was conducted by studying and understanding various reading sources related to research on supply chain management and raw material inventory. These reading sources include journals, study books, and the internet. A list of books, journals, and websites that are references in this research can be seen in the bibliography.

4.5 System Development Method

The stages that must be carried out in the system development methodology using a prototype are:

a) Gathering requirements

At this stage, activities are carried out by defining problems and limitations used in system development. At this stage, another activity is to describe problems and opportunities as well as orders that affect the development of this system. By paying attention to the problems, scope, opportunities, and orders, it can be seen how much research this information system has.

b) Planning

1. Process Design

At this stage, the goal is to model a natural system with an emphasis on what to do. The result of this stage is a complete understanding of the system as the basis for making prototypes. The method used at this stage is the object-oriented analysis and modeling using a rich picture to illustrate the system model's purpose by describing all stakeholders' interests and the main structure of the work context in business organizations. The tool used to assist at the design stage of this system is UML (Unified Modeling Language). The UML diagrams that will be used in this design include the following:

- a) Use case diagrams
- b) Activity
- c) diagrams Sequence diagrams

2. Database Design

This stage aims to select and determine the potential data that can be used in the system. The diagrams used to describe the database planning stage are Class diagrams.

3. Interface design

This stage describes a rough description of the application used on the system. The interface design contains images and descriptions that visually explain how the application will be implemented, such as:

- a) display Login
- b) Display stock goods
- c) Display of incoming goods
- d) Display of goods out
- e) Display of supplier data

4. Programming Implementation

In this section, apply the design results into programming code lines for database design and computer languages using MySQL software to manage databases and notepad++ and XAMPP software for programming applications using the PHP language.

5. Device
Installation Software and hardware installation with applications that have been made so that these applications can operate appropriately as expected.
6. Evaluation Prototype
Perform testing of the output of the application that has been implemented. In this process, the user's role is needed to know and evaluate the applications that have been made. The method used in evaluating a prototype is usability testing.

5. Results and Discussion

5.1 Gathering requirements

The analysis is the first step to getting an overview of a system that will be created. A system analysis running at PT Mamagreen Pacific will later obtain a system that is in accordance with the current system needs so that inventory staff will not feel confused in using this application later. This raw material inventory system was created to assist the process of monitoring inventory at PT Mamagreen Pacific so that it can be faster and easier to manage goods data, as shown in Figure 1.

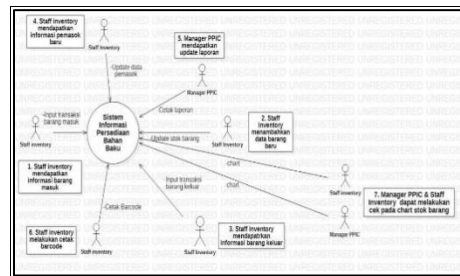


Figure 1. System Requirements Analysis

5.2 Planning

This design process is a system design that will be formed, which can be in the form of describing processes or an element of a component. This process is an early stage of designing an information system for planning and controlling raw materials at PT Mamagreen Pacific. The stages of system design using diagrams include:

a) Use Case Diagram

Use Case Diagrams describe the expected functionality of a system that emphasizes "what" the system does, not "how" a system works. A Use Case represents an interaction between the actor and the system. The following is a use case diagram proposed at PT Mamagreen Pacific in Figure 2.

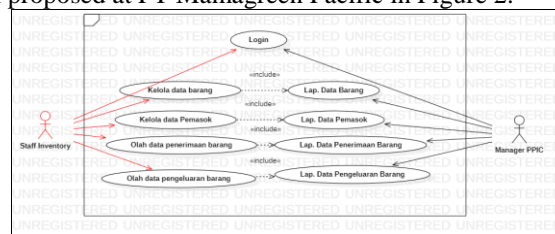


Figure 2. Use Case Diagram

In Use Case Diagram, there are several actors involved in the system. Among them are inventory staff and the PPIC manager. The following explains the access rights of each actor in the use case in table 1.

Table 1. Description of Actor Use Case

No	Actor	Description
1.	Staff inventory	Actors who have access rights to manage goods data, manage supplier data, process goods receipt data and create processing of goods release data.
2.	PPIC Manager	An actor who has access rights to receive reports on stock data, supplier data, goods receipt data and goods release reports.

Following in table 2 there is an explanation of each *use case* diagram which has been made.

Table 2. Description of Use Case

No.	Use Case	Description
1.	Login	The page used to use the system by entering a username and password.
2.	Manage supplier data	Displays a menu of supplier data such as <i>input</i> , <i>update</i> and delete data.
3.	Manage item data	Displays a menu of stock data items such as <i>input</i> , <i>update</i> and delete data.
4.	Processing of goods receipt data	Displays a menu of goods receipt data <i>such as input</i> , <i>edit</i> and delete data.
5.	Processing of goods expenditure data	Displays a menu of goods expenditure reports such as input, edit and delete data.

b) Activity Diagram

An activity Diagram (activity diagram) is a diagram that describes the flow of functionality from the system. At the business modeling stage, activity diagrams can show business workflows. It can also be used to describe the flow of events.

Based on the data processing results, the following is an activity diagram login proposed at PT Mamagreen Pacific, so all actors must log into the system, as shown in Figure 3.

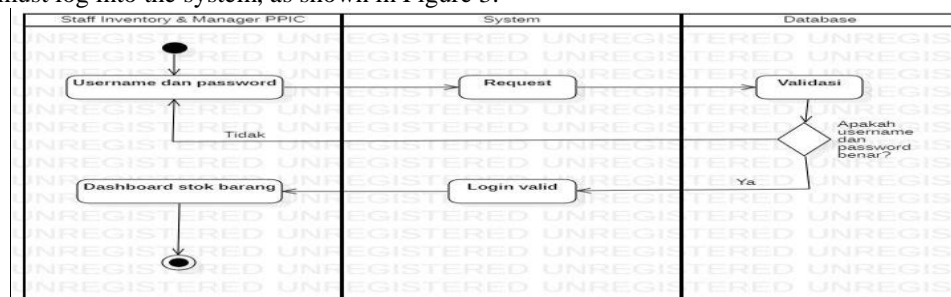


Figure 3. Login Activity Diagram

Following *activity diagram* are the proposed:

- Inventory staff* and PPIC manager *log* into the system
 - Inventory staff* *input* supplier data
 - staff* data *input* stock
 - Staff Inventory* data *inputs* for receiving goods.
 - Inventory staff* data *inputs* goods.
- c) *Sequence Diagram*

The next step in each sequence diagram is the action of the actors, the first of which is the interface. Sequence diagrams describe the interactions between objects the next time. Nevertheless, sequence diagrams are used in the abstraction layer of the object model. Its purpose is to show the series of messages sent between objects, as well as interactions between objects, and to show something that happened at a certain point in the execution of the system. A sequence diagram's main components consist of objects written in a named rectangular box, messages are represented by lines with arrows, and time is represented by a vertical. The following is a sequence diagram, as shown in Figure 4.

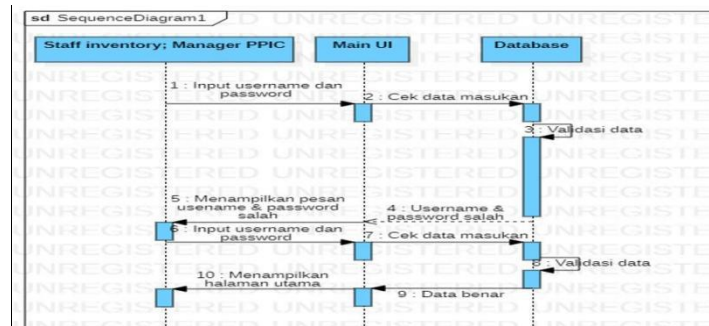


Figure 4. Sequence Diagram Login

d) Class Diagram

The class represents something that is handled by the system. A class diagram can be made by looking at the characteristics of the raw material inventory application system and the processes that occur. The following in Figure 5 is a class diagram of the proposed inventory information system.

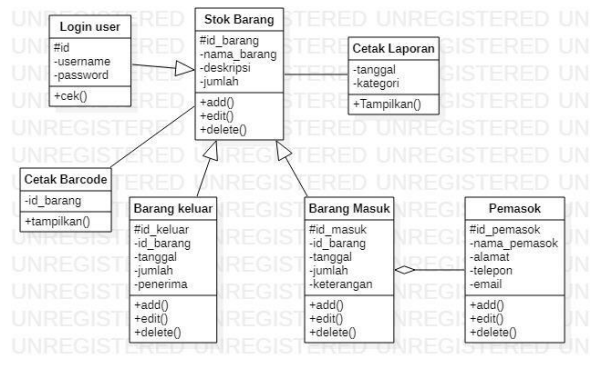


Figure 5. Class Diagram

5.3 Interface Design

The last process in the design stage is to design the interface for the forms required for the system and to design the system development. The design of the selected system display is as follows:

a) Display User Login

Figure 6 is the first display all actors must do to fill in the username and password on the login form.

Login

Username

Password

Login

Figure 6. Login Display Design

b) Display of Stock Items

Figure 7 is a display of stock data. This page displays the item code, name, description, and quantity and is equipped with a search button to search for items.

Figure 7. Stock Item Display Design

c) Incoming Item Display

Incoming Item Display Figure 8 is a display of incoming item data, on this page displays the entry code, item code, date, amount, and description and is equipped with a button add goods," which is used to add incoming and search to search for items.

Figure 8. Incoming Item Display

d) Outgoing Item Display

Figure 9 is a display of outgoing item data. This page displays the exit code, item code, date, amount, and recipient and is equipped with an "add item" button to add outgoing goods and search for an item.

Figure 9. Outgoing Item Display

e) Supplier Data Display

Figure 10 is a display of supplier or supplier data. This page displays the supplier code, supplier, name, address, telephone number, and e-mail and is equipped with a button add supplier, which is used to add a supplier new and search to perform a search.

Figure 10. Supplier Data Display

5.4 Program Implementation

Programming implementation is the definition of the results of the programming implementation design using the PHP language as the application platform and MySQL as the database implementation.

a) Display User Login

Figure 11 is the first page displayed where the actor must input the username and password data previously created.

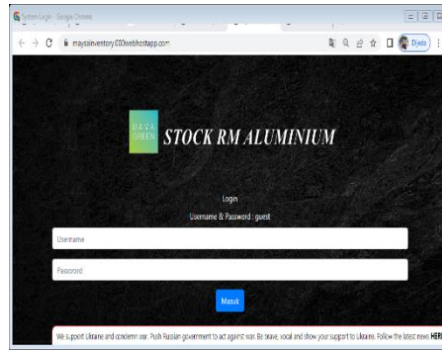


Figure 11. Display User Login

- ### b) Home Page Display

If the login is successful, the user will enter the main page, as shown in Figure .

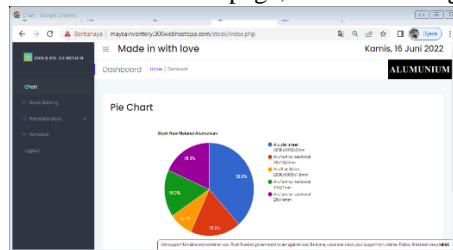


Figure 12. Home Page Display

- ### c) Stock Items Page Display

Figure 13 displays the stock menu, which contains the added item feature, the search column feature, the data export feature, and then edit and deletes feature.

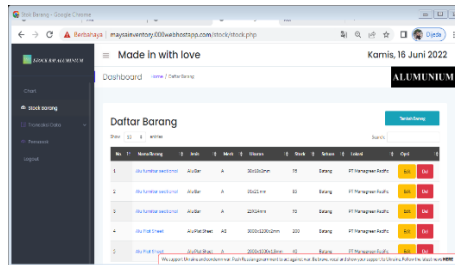


Figure 13. Stock Items Page Display

- #### d) Incoming Item Display

Figure 14 is a menu display of incoming goods data transactions. Here there is an added feature for incoming goods, a search feature, a data export feature, and can edit and delete feature if you press the green "+" (plus) sign next to the number.

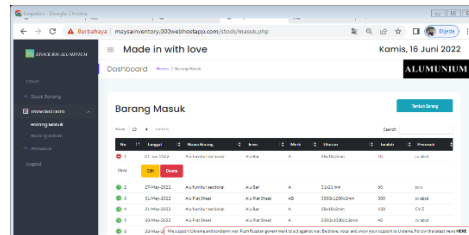


Figure 14. Incoming Item Display

- e) Item Display Out

Figure 15 is a menu display of outgoing goods transactions. So the menu display is almost the same as in Figure 14. The only difference is the use of this menu and the appearance of the table of items that come out.

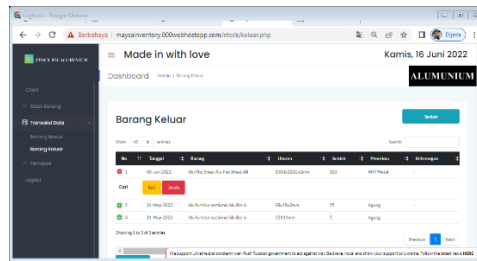


Figure 15. Item Display Out

f) Supplier Data Display

Figure 16 displays the supplier menu with a list of suppliers and information from suppliers of goods for raw materials in the company.

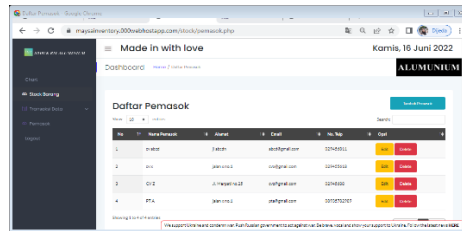


Figure 16. Supplier Data Display

g) Item Barcode Display

Figure 17 is a display of the barcode of items. This barcode will appear when you have inputted data on the addition of goods on the stock menu. Then by clicking on the name of the item, the barcode of the item will be displayed according to the item id.

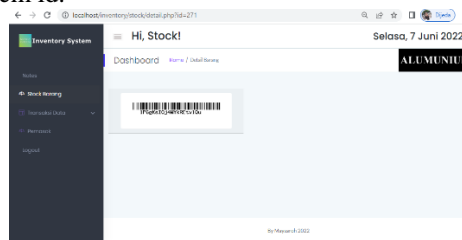


Figure 17. Item Barcode Display

5.5 Prototype Evaluation

The first step in evaluating the prototype is conducting an acceptance test (usability testing) by giving questionnaires to respondents who previously knew and used an application based on PT Mamagreen Pacific's RM Aluminum Stock.

The Likert scale is designed to convince respondents to answer at various levels on each question item or statement in the questionnaire. Data about the dimensions of the variables analyzed in this study were addressed to respondents using a scale of 1 to 5 to obtain ordinal data and given a score as follows in table 3

Table 3. Table of Values

QQ	NSE	LE	QE	E	VE
Value	1	2	3	4	5

Information:

QQ = Questionnaire Question

NSE = Not so easy

LE = Less Easy

QE = Quite Easy

E = Easy

VE = Very Easy

The questionnaire consists of 13 questions with details of 3 questions for the system aspect (System), 5 questions for the user aspect (User) and 5 questions for the interaction aspect (Interaction) which were assessed by inventory staff and PPIC managers from PT Mamagreen Pacific in table 4.

Table 4. Usability Testing Value Recap

No.	Question	Score
SYSTEM ASPECT		
1.	Is the Stock RM Aluminum application interface easy to recognize?	4
2.	Is the Stock RM Aluminum application easy to operate?	3
3.	Is the color display on Stock RM Aluminum comfortable to see and not boring?	4,5
USER ASPECT		
4.	Is the menu display in Stock RM Aluminum easy to recognize?	3,5
5.	Is the information in Stock RM Aluminum easy to find?	4,5
6.	Is the text easy to read?	4,5
7.	Is the application easily accessible?	4
8.	Are the symbols, icons and images easy to understand?	3,5
ASPECT OF INTERACTION		
9.	Is it easy to access the information offered?	4
10.	Do the functions offered match the purpose of the application?	4
11.	Are incoming and outgoing goods data transactions easily accessible?	4
12.	Is the application security guaranteed?	3,5
13.	Is the menu and display of Stock RM Aluminum easy to remember?	3,5

When adjusted to the usability aspect plot in table 4, the RM Aluminum Stock application has been made with outstanding usability values: Learnability, Efficiency, Memorability, Errors, and Satisfaction. This can be shown by the usability value of the five attributes, as follows:

- The attribute value of "symbols, icons and images that are easy to understand" of 3.5 indicates that the application has a Learnability value.
- The attribute value "information in Stock RM Aluminum is easy to find" of 4.5 indicating that the application has an Efficiency value.
- The attribute value of "Easy to remember Stock RM Aluminum menu and display" of 3.5 indicates that the application has a Memorability value.
- The attribute value "easy to access the information offered" is 4; "the existing writing is easy to read" of 4.5; and the attribute "offered in accordance with the purpose of the application" of 4 makes the Stock RM Aluminum application has minimized the Errors aspect.
- All attributes that have an average value above 3 indicate that the application of Stock RM Aluminum has a very good Satisfaction aspect.

6. Conclusion

Based on the results of the research on the planning and control of aluminum raw material inventory planning and control systems at PT Mamagreen Pacific based on a web base to know how to build a raw material planning and control system with the prototype model software development method:

- In the system requirements analysis stage, a system has been created which can later be used to assist the process of monitoring raw material inventory so that it can be faster and easier to manage the data for these items.
- The planning stage has carried out the modeling stage of the system that will be created, at this stage using a diagram such as a use case diagram where in this diagram each actor will be given different access rights when entering the system, then the activity diagram is made a business model for depicting the flow of business work carried out by actors or users of the system, the sequence diagram has described the interactions between objects in successive time and the class diagram has generated attributes and methods as well as relationships between different classes and then presented by the system.
- The interface design stage is the last stage where a system display design result is obtained from the raw material inventory information system "STOCK RM ALUMINUM".
- The implementation phase of the program has resulted in a programming implementation using the PHP language as the application platform and MySQL as the database implementation.
- The last stage is testing to evaluate the system, namely by conducting an acceptance test (usability testing) which by giving a questionnaire to the actor or user of the application and it has been obtained that the

"STOCK RM ALUMINUM" application gets an average value above 3 which means This application has taken into account the usability factor or is already usable.

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Biography

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