DESIGN OF INVENTORY MANAGEMENT SYSTEM APPLICATION (STUDY: OUTBOUND INVENTORY PT SEMEN PADANG)

FINAL PROJECT REPORT

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ABSTRACT

PT. Semen Padang is one of the biggest state-owned enterprises in Sumatra, Indonesia. The company was opened around 1910 and was once confirmed to be the biggest factory controlled by regional ownership outside Jawa. To support the distribution of products, PT Semen Padang has four warehouses in Riau Province to store the types of cement. To manage the warehouses, PT Semen Padang needs inventory management. PT Semen Padang has a unit that controls inventory management activity in the warehouse called Outbound Inventory Unit. Outbound Inventory is a unit in PT Semen Padang that manages the cement product stock and delivery process outside the main factory. Outbound Inventory requests the transportation unit to deliver a certain amount of products to the warehouse and also makes a daily report of products stocked in the warehouse. In giving the information to the Outbound Inventory Unit supervisor, staff will send the reports through e-mail every morning. PT Semen Padang is one of the biggest manufacturing companies in Indonesia, the company should have a private information system to support its daily activity. Therefore it's necesarry to develop an information system that can help Outbound Inventory Unit manage inventory and make daily reports.

The study employed several stages including object-oriented analysis to analyze the system that will be developed into the recommendation system. Object-oriented design to make diagram that shows the information system created. Database design by using entity relationship diagram. Programming using PHP and MySQL as database, and also Verification and Validation.

Based on the data processing results, the minimum inventory value and maximum inventory for goods are obtained with application designed have the same calculation results as manual calculation. The designed inventory management information system can be used by 3 user which is the head of the warehouse, the manager, and the logistics section. Inventory management information system in outbound PT Semen Padang designed to be capable support the company in carrying out control planning inventory. With this application, it can facilitate outbound PT Semen Padang to search quickly related to cement product stock and delivery process outside the main factory, fast inventory calculation and a friendly user interface make advantages of the information system.

Keywords: Inventory Management System**,** Object-Oriented Analysis, Object-Oriented Design

ABSTRAK

PT. Semen Padang adalah salah satu badan usaha milik negara terbesar di Sumatera, Indonesia. Perusahaan ini dibuka sekitar tahun 1910 dan pernah dikonfirmasi sebagai pabrik terbesar yang dikendalikan oleh kepemilikan daerah di luar Jawa. Untuk mendukung distribusi produk, PT Semen Padang memiliki empat gudang di Provinsi Riau. Untuk mengelola gudang, PT Semen Padang membutuhkan manajemen persediaan. PT Semen Padang memiliki unit yang mengendalikan aktivitas manajemen persediaan di gudang yang disebut Outbound Inventory Unit. Outbound Inventory adalah unit di PT Semen Padang yang mengelola stok produk semen dan proses pengiriman di luar pabrik utama. Outbound Inventory meminta unit transportasi untuk mengirimkan sejumlah produk ke gudang dan juga membuat laporan harian produk yang disimpan di gudang. Dalam memberikan informasi kepada supervisor Unit Inventaris Outbound, staf akan mengirimkan laporan melalui e-mail setiap pagi. PT Semen Padang adalah salah satu perusahaan manufaktur terbesar di Indonesia, perusahaan harus memiliki sistem informasi pribadi untuk mendukung aktivitas sehari-hari. Oleh karena itu perlu dikembangkan sistem informasi yang dapat membantu Unit Outbound Inventory mengelola persediaan dan membuat laporan harian.

Penelitian ini menggunakan beberapa tahapan diantaranya analisis berorientasi objek untuk menganalisis sistem yang akan dikembangkan menjadi sistem rekomendasi. Desain berorientasi objek untuk membuat diagram yang menunjukkan sistem informasi yang dibuat. Desain database dengan menggunakan entity relationship diagram. Pemrograman menggunakan PHP dan MySQL sebagai database, dan juga verifikasi dan validasi.

Berdasarkan hasil pengolahan data, nilai persediaan minimum dan persediaan maksimum untuk barang yang diperoleh dengan aplikasi yang dirancang memiliki hasil perhitungan yang sama dengan perhitungan manual. Sistem informasi manajemen persediaan yang dirancang dapat digunakan oleh 3 pengguna yaitu kepala gudang, manajer, dan bagian logistik. Sistem informasi manajemen persediaan di outbound PT Semen Padang dirancang agar mampu mendukung perusahaan dalam melakukan perencanaan pengendalian persediaan. Dengan aplikasi ini, dapat memudahkan Outbound Inventory unit PT Semen Padang untuk melakukan pencarian secara cepat terkait stok produk semen dan proses pengiriman di luar pabrik utama. Perhitungan persediaan yang cepat dan user interface yang ramah menjadikan keunggulan sistem informasi.

Keywords: Sistem Manajemen Persediaan**,** Object-Oriented Analysis, Object-Oriented Design

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Padang, June 2023

Writer

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CHAPTER I
INTRODUCTION

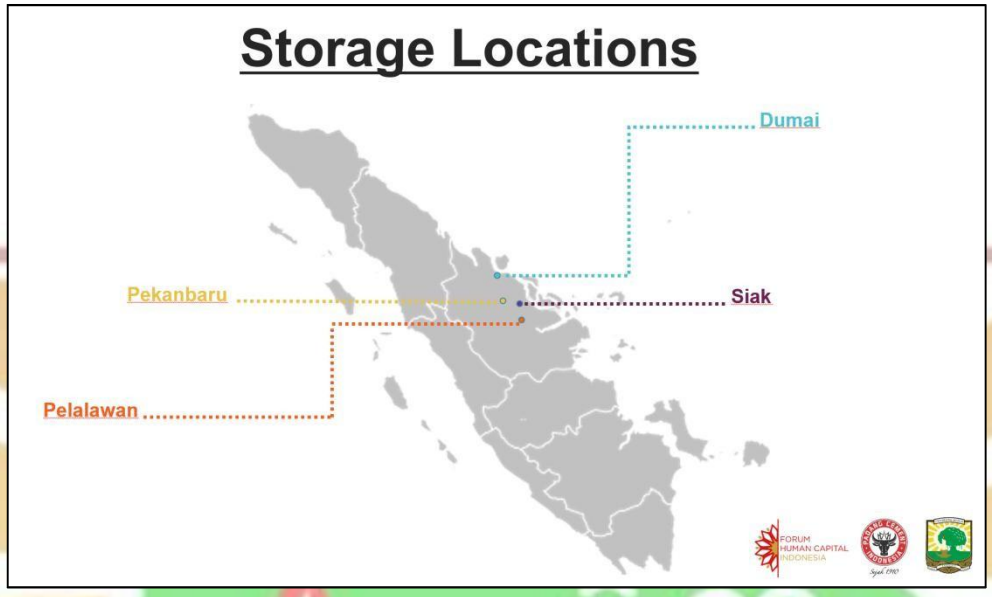
This chapter includes the research background, problem formulation, research objectives, research scopes, and report outline.

1.1 Background

PT. Semen Padang is one of the biggest state-owned enterprises in Sumatra, Indonesia. The company was opened around 1910 and was once confirmed to be the biggest factory controlled by regional ownership outside Jawa. But after it became a state-owned enterprise, some sectors still need better optimization. PT Semen Padang is engaged in the manufacturing sector. PT Semen Padang produces many cement types: Portland, Portland Composite Cement (PCC), and Portland Pozzolan Cement (PPC).

Picture 1.1 Types of PT Semen Padang products

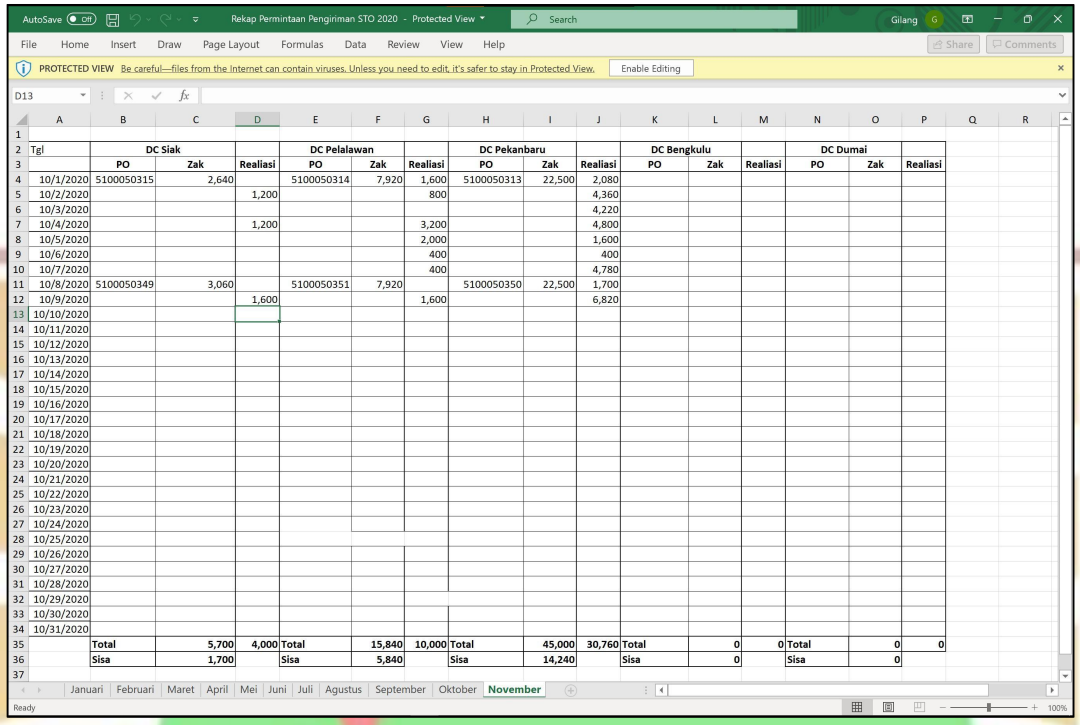
To support the distribution of products, PT Semen Padang has four warehouses in Riau Province to store the types of cement. Those warehouses are located in Dumai, Pekanbaru, Pelalawan, and Siak.



Picture 1.2 Storage Locations of Outbound Inventory Unit

To manage the warehouses, PT Semen Padang needs inventory management. Inventory Management is a decision-making activity of a company that can optimally cover the needs for materials or commodities for both production and sales business activities with the lowest possible risk. PT Semen Padang has a unit that controls inventory management activity in the warehouse called Outbound Inventory Unit.

Outbound Inventory is a unit in PT Semen Padang that manages the cement product stock and delivery process outside the main factory. The Outbound Inventory Unit's main office is on the 2nd floor of the Semen Padang Headquarters building in Jalan Raya Indarung, Padang City. While doing the inventory management, the staff coordinates with the Transportation Unit. Outbound Inventory requests the transportation unit to deliver a certain amount of products to the warehouse and make the reports. Following is the appearance of the sample reports.



Tgl	DC Siak			DC Pelalawan			DC Pekanbaru			DC Bengkulu			DC Dumai		
	PO	Zak	Realiasi	PO	Zak	Realiasi	PO	Zak	Realiasi	PO	Zak	Realiasi	PO	Zak	Realiasi
10/1/2020	5100050315	2,640		5100050314	7,920	1,600	5100050313	22,500	2,080						
10/2/2020			1,200			800			4,360						
10/3/2020									4,220						
10/4/2020			1,200			3,200			4,800						
10/5/2020						2,000			1,600						
10/6/2020						400			400						
10/7/2020						400			4,780						
10/8/2020	5100050349	3,060		5100050351	7,920		5100050350	22,500	1,700						
10/9/2020			1,600			1,600			6,820						
10/10/2020															
10/11/2020															
10/12/2020															
10/13/2020															
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10/15/2020															
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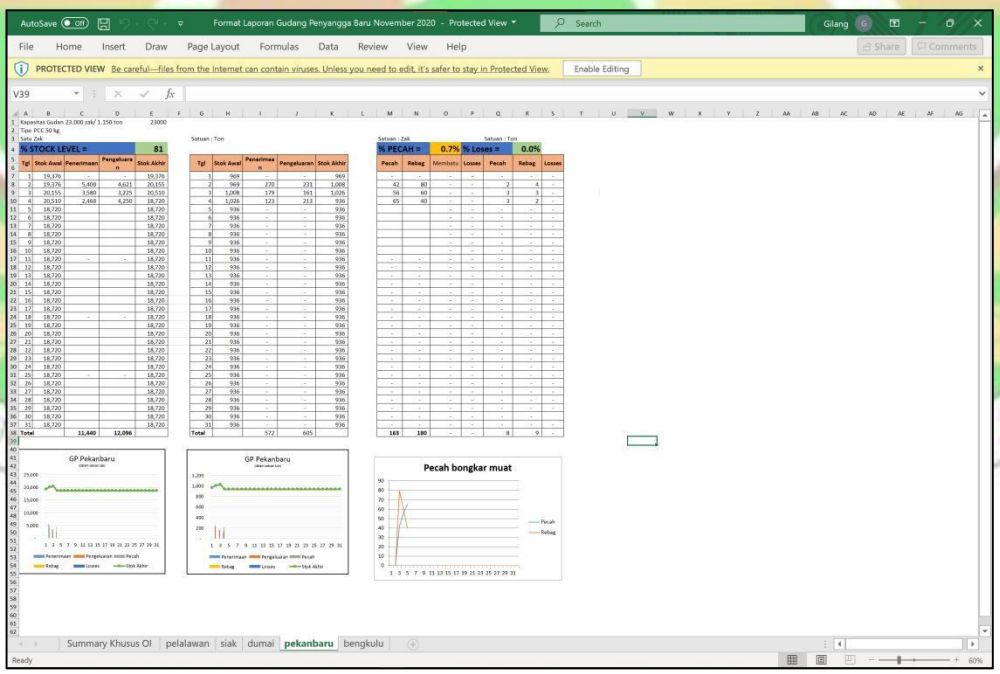
10/25/2020															
10/26/2020															
10/27/2020															
10/28/2020															
10/29/2020															
10/30/2020															
10/31/2020															
	Total	5,700	4,000	Total	15,840	10,000	Total	45,000	30,760	Total	0	0	Total	0	0
	Sisa	1,700		Sisa	5,840		Sisa	14,240		Sisa	0		Sisa	0	

Picture 1.3 Report of the delivery amount requested by Outbound Inventory to Unit of Transportation

Besides making a delivery report, Outbound Inventory also makes a daily report of products stocked in the warehouse.



Picture 1.4 The appearance of the product stock report

Every company has a private information system to support operational activities such as making daily reports. Information System is a system in an organization that meets the needs of daily transaction management, supports operations and strategic activities of an organization, and provides certain required reports for outside parties. (Hutahaean, 2014). The importance of information systems is to make the job more effective and efficient. Also, to make it easier to facilitate the information flow of every connected user.

According to **Picture 1.3** and **Picture 1.4**, In giving the information to the Outbound Inventory Unit supervisor, staff will send the reports through e-mail every morning since Outbound Inventory was established in late 2019. The unit has a shortage of facilities. Even though PT Semen Padang is one of the biggest manufacturing companies in Indonesia, the company should have a private information system to support its daily activity. Based on the background, the company necessarily designs an information system.

1.2 Problem Formulation

The problem formulation of this research is how to develop an information system that can help Outbound Inventory Unit manage inventory and make daily reports.

1.3 Research Objective

The research objectives are to make an information system to help Outbound Inventory Unit manage inventory and make a daily report.

1.4 Research Scope

The scopes of the research are:

1. The data used are from last year
2. The focus of the design of the information system is inventory management and daily report appearance.

1.5 Outline of Report

The Outline of the report is written as follows:

CHAPTER 1 INTRODUCTION

This chapter describes the background of the research, the problem formulation, the objective, and the research's scope.

CHAPTER 2 LITERATURE REVIEW

This chapter describes all the theories related to the research.

CHAPTER 3 RESEARCH METHODOLOGY

This chapter explains the steps of the research.

CHAPTER 4 DATA COLLECTING AND DATA PROCESSING

This chapter contains the data collected during the research process as well as the results of the data processing that will be used and needed in the analysis and interpretation chapter.

CHAPTER 5 ANALYSIS

This chapter contains an analysis of the discussion based on the results of data collection and processing that has been carried out previously

CHAPTER6 CLOSING

This chapter outlines the conclusions that can be formed based on data analysis and interpretation, as well as inputs supplied based on the study outcomes and for the enhancement of the next final project research.

CHAPTER II
LITERATURE REVIEW

The chapter contains a literature review that supports the research.

2.1 Information System

The system is a collection of several interconnected components and has limitations to achieving a goal. And information is a set of data that is transformed so that it helps reduce uncertainty in the future. Therefore, information can influence decision-making. An information system has the purpose of collecting the required information. An information system combines hardware, software, data sources, people, policies, and procedures for receiving, converting, storing, and disseminating information in organizations (O'Brien and Marakas, 2012).

Alcami and Carafiana (2012) classify the functions of information systems into four classifications:

a. Data Collecting and Processing

This function consists of capturing external (environmentally related) and internal (generated within the company) information and transmitting it through the communication system to the entity within the information system, which is responsible for managing it to avoid duplication and useless information. The information provided will depend on the type of company they work for. Sales staff, buyers, and managers at various levels in the hierarchy of company members in direct contact with organizations in the environment can act as information gatherers. The data collection and collection process should be more intense in the environmental field or sector and the companies experiencing the most significant change.

b. Storage

The information can be stored across different services and departments or in a single location accessible to all users. The company will decide which of these options is most appropriate, depending on how specific the information is. Access or retrieval of data can be done in various forms; for example, passwords can be used to access databases, allowing only authorized personnel to access information when needed.

c. Information Processing

Information processing aims to convert stored information into helpful information meaningful to those who need it. This is the primary function of all information systems. A computer subsystem does information processing. The spectacular development of computers means that, on the one hand, the volume of data stored and processed is constantly increasing. On the other hand, falling hardware costs have led to the general use of computers.

d. Information Distribution and Dissemination

Information systems provide for each user's needs and must disseminate information to others within the company. Different company members need to know certain information about the company and the environment to respond more quickly and efficiently to everyday situations and solve problems or make decisions.

2.2 Inventory Management

Inventory is an idle resource waiting for further processing to use in production activities in manufacturing, marketing, or household consumption activities (Noviandi, Destiani, Partono. 2012).

2.3 Object-Oriented Analysis Design (OOAD)

OOAD is a method that checks system requirements information based on classes and objects. OOAD consists of OOA and OOD. Object-Oriented Analysis (OOA) is used to see the terms or conditions requirements needed in a system from the point of view of the object interconnected. Object-Oriented Design(OOD) directs designer software based on manipulating objects in the system.

2.4 Unified Modeling Language (UML)

According to Braun (2001), *Unified Modeling Language* (UML) is a tool used as modeling convection used to define or describe a software system associated with objects.

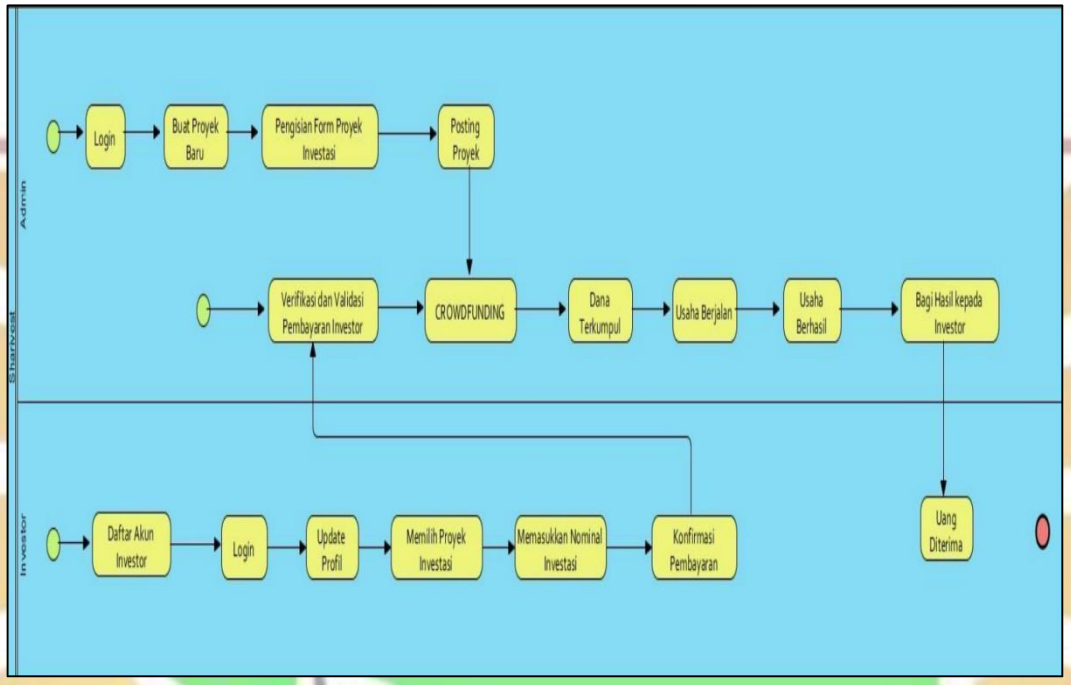
2.4.1 Business Process Diagram

According to Childle and J. Bennet (1995), the business process visualizes business activities within the company.

The following is a part of the business process diagram.

1. *Event* is used to see something that happened during ongoing business processes.
2. *Activity* is used to see the general work done by the company
3. *Gateway* is used to control branching and to merge sequence flow.
4. *Sequence flow* is used to show the activities carried out.
5. *Message Flow* shows the flow of messages between separate groups/paths.
6. *Association* is used to associate` data, information, and artifacts with the flow.
7. *Swimlane* categorizes visuals, describing the different functions and responsibilities.

An example of a Business Process Diagram can be seen in **Picture 1.5**



Picture 2.1 Business Process Diagram (Crist, 2018)

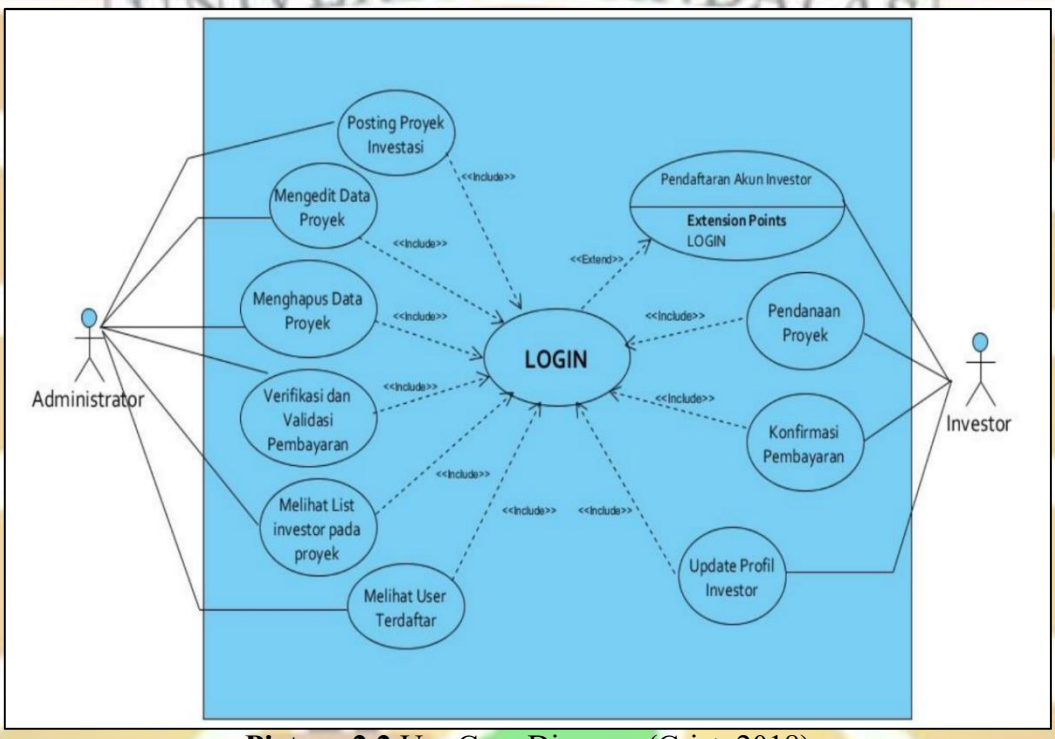
2.4.2 Use Case Diagram

According to A.S and Salahudin (2014), *Use Case Diagram* or *Use diagram* represents the user's interaction with the systems that show the relationship between the users and the different use cases in which users are involved. Use Case Diagrams are not used in explaining every detail of the *Use Case*. However, it shows the relationship between actors in the system.

1. Use Case is used to see the functionality that describes the system as a unit that exchanges messages with other units.
2. Actor or Actors are used to seeing people who activate the system's function.
3. Lines without arrows describe associations between Use Cases and Actors.
4. Lines with arrows are used to associate when the actors interact with the system.
5. Include is used as a Use Case call by another Use Case

6. Extend is used as an extension of another Use Case with terms and conditions

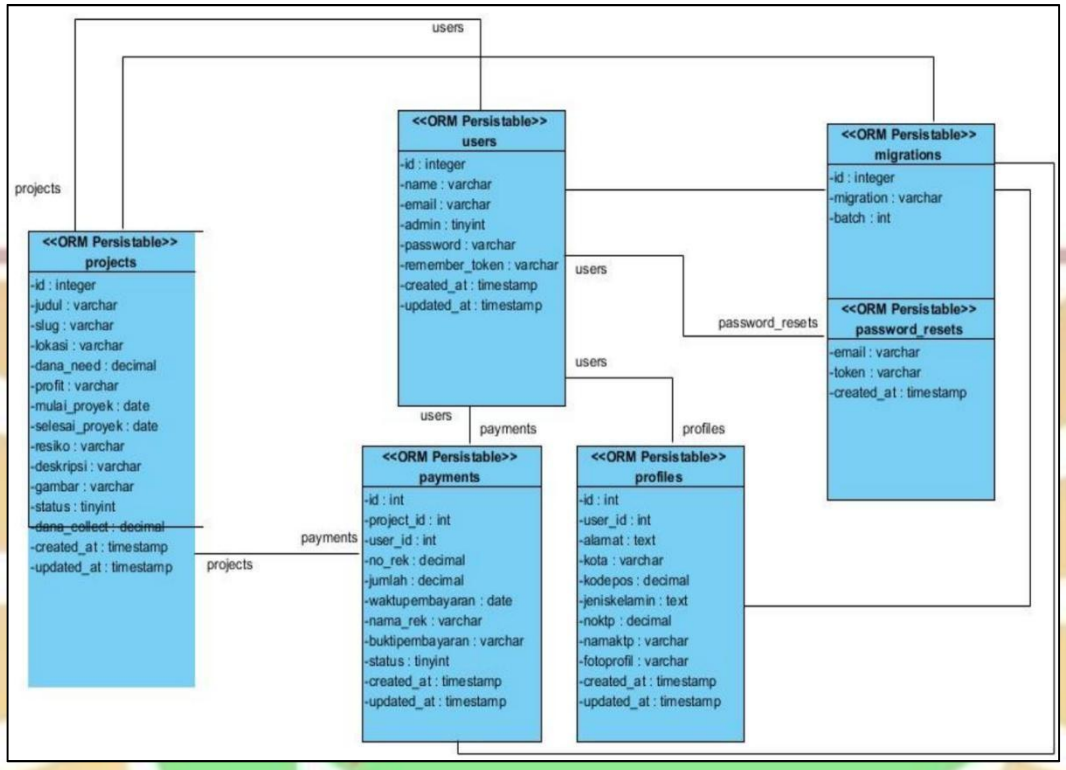
The image of the Use Case Diagram can be seen in **Picture 2.2**



Picture 2.2 Use Case Diagram (Crist, 2018)

2.4.3 Class Diagram

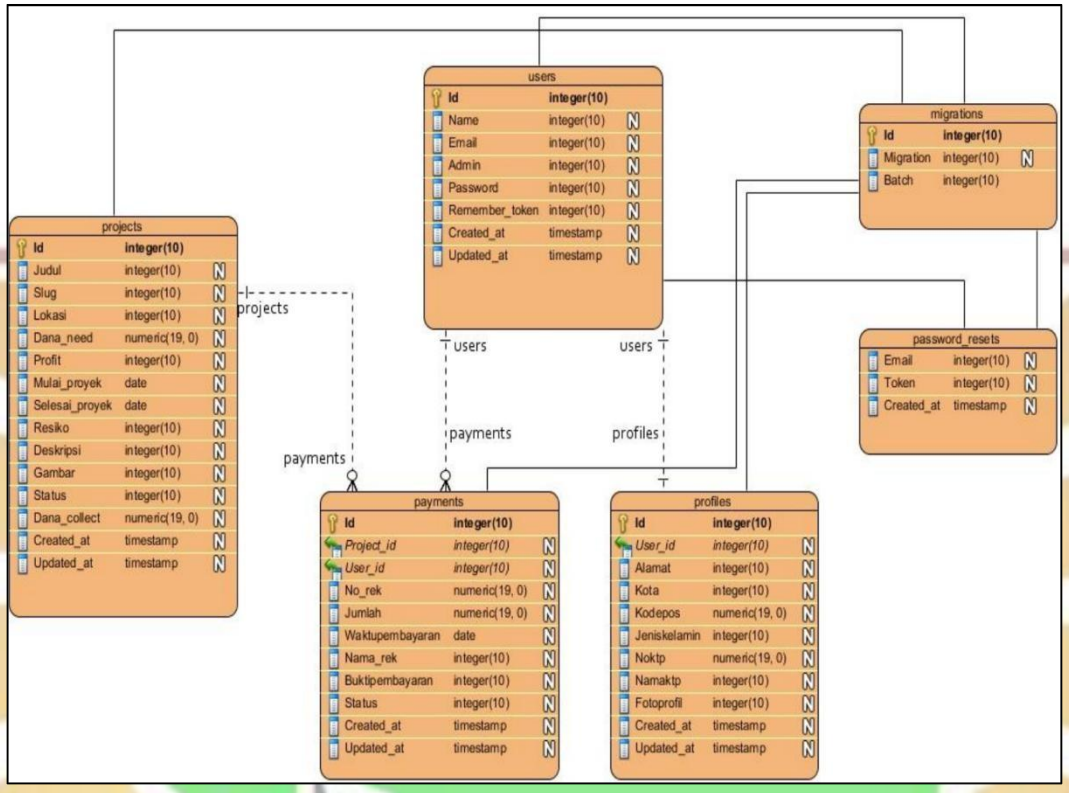
According to A.S and Shalahudin (2014), Class Diagram depicts structure by showing the system classes, their attributes, operations, and the relationship between the objects. The following diagrams can be seen in **Picture 2.3**



Picture 2.3 Class Diagram (Crist, 2018)

2.4.4 Entity Relationship Diagram

According to Edi and Stevalin (2009), Entity Relationship Diagram (ERD) is a model to explain the relationship between data in the database according to related objects in the database that have connections. The following ERD picture can be seen in **Picture 2.4**



Picture 2.4 Entity Relationship Diagram (Crist, 2018)

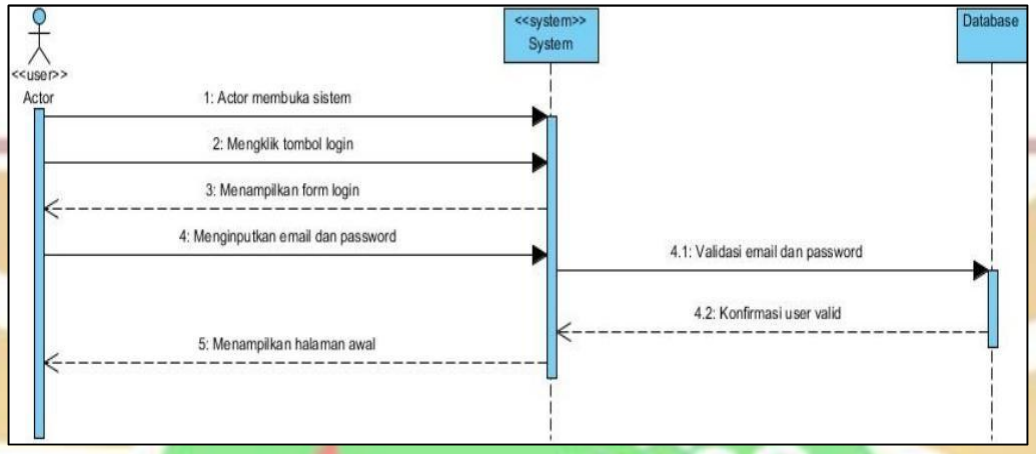
2.4.5 Sequence Diagram

According to AS and Salahudin (2014), the sequence diagram depicts the interaction between objects. It indicates the communication between objects, and Sequence Diagrams also show a series of exchanged messages.

The sequence Diagram consists of the following:

1. Entity Class is used to see parts of the system in the form of a class group.
2. Boundary Class is used to see classes that interact with one or more of the system.
3. Message is used to send messages between classes
4. Activation is used as the execution for the object operation
5. Lifeline is used as a dotted line connected to the object.

The Sequence Diagram image can be seen in **Picture 2.5**



Picture 2.5 Sequence Diagram (Crist, 2018)

2.5 Hypertext Preprocessor

Based on Batubara (2012), PHP stands for Hypertext Preprocessor; PHP is open-source programming. PHP is the code used to make web pages dynamic. Here are some reasons people use PHP:

1. Simplicity, PHP is a simple programming language. Because of the simplicity, the beginner user can understand PHP easily
2. Easy understanding, PHP has many references, which makes PHP an easy-to-understand programming language
3. PHP is an Open Source, which means the programming language is open to the public, and people do not need to pay the purchase fee. PHP that is available free allows the developers always to develop it
4. Web Server that supports PHP can be found everywhere
5. PHP can be used on Linux or Windows platform
6. PHP needs a few Resources System

2.6 Inventory

According to Herjanto (2007), raw materials inventories are materials or goods that can be stored for the fulfillment, such as raw material inventory or spare parts used to replace defective machine components. The inventory that the company uses has certain purposes. Inventory is used to optimal levels. According to Ristono (2009), there are some objectives of inventory management:

1. Fulfilling consumer needs and demands quickly
2. Used in maintaining production continuity or keeping the company does not run out of material that can stop production

2.7 ABC Analysis

According to Reinder and Heizer (2010), ABC analysis divided inventory into three groups based on yearly volume in money units. ABC analysis divided inventory into three groups based on the value percentage of investment that the supplies can generate. According to Schroeder (2010), ABC classification consists of the following:

1. "A" class is an inventory with a high percentage of investment value, the generated value approx. 75% to 80%.
2. "B" class is an inventory with a medium percentage of investment value, the generated value approx. 10% to 15%
3. "C" class is an inventory with a low percentage of investment value, the generated value approx. 5%

These are the steps to do ABC analysis on investment:

1. The number of items used is calculated.
2. The price of each item is determined.
3. The investment for each item is obtained by multiplying the use of goods at the price of goods.

4. The obtained investments are sorted from the largest to the smallest number. The total investment is calculated for each type of goods divided by the total investment to get the investment percentage.
5. The sum of investment percentage obtained in value
6. The sum of investment percentage values grouped into 3, group A has a total investment value percentage between 0% to 80%, group B has the sum of percentage values of investment between 80% to 95%, and group C has a sum of investment value between 95% to 100%.

2.8 Safety Stock

According to Rangkuti (2007), safety stock is used as additional stock that can cover the supply run-out. Safety stock is a deterrent to inventory supply due to high demand fluctuations and maintains the supply to get along with the lead time. Calculation of safety stock obtained through the following formula:

$$\text{Safety Stock} = (SS*Z) \quad \ldots(1)$$

SS = Standard Deviation
Z = Service Factor

2.9 Minimum Inventory

According to Indrajit and Djokopranoto (2004), the Minimum Inventory is the number of goods used to avoid the depletion of safety stock. Replenishment orders are placed at a predetermined point in the stock control system. The formula for Minimum Inventory is as follows:

$$\text{Minimum Stock} = (T*C) + R \quad \ldots(2)$$

T = Usage of goods per month

C = Grace Time

R = Safety Stock

2.10 Maximum Inventory

According to Indrajit and Djokopranoto (2004), the Maximum Inventory is the number of goods that should not be excessive to avoid considerable costs due to the procurement of goods. The formula for Maximum Inventory is as follows:

Maximum Inventory = 2(T*C) + R …(3)

T = Average usage of goods per month

C = Grace Time

R = Safety Stock

2.11 Number of Reorders

According to Indrajit and Djokopranoto (2004), the number of reorders is the number of goods ordered to replenish inventory. The formula is as follows:

Q = Max-Min …(4)

CHAPTER III
RESEARCH METHODOLOGY

The research methodology section is a section that discusses the steps of conducting final project research consisting of preliminary studies, problem identification, data collection, information system design, and analysis, as well as conclusions and suggestions.

3.1 Preliminary Study

A preliminary study was conducted by collecting data and information regarding the information system to be designed. Data and information needed is done by conducting direct interviews with employees of PT. Semen Padang. References relating to information systems and warehousing are also carried out at this stage—references obtained from books, journals, and final assignments.

3.2 Problem Identification

Identification of problems is made by analyzing the problems that occur in the current system. The current systems often run out of goods, even though the company needs the goods—the matter is due to the indefinite amount of safety stock or existing safety stock in the current system. One item that has run out is "Cement type A." The existing system at the company is currently only capable of calculating the balance of goods, and the system cannot determine the minimum and maximum amount of goods in the warehouse.

3.3 Data Collection

The data collected in this study are in the form of the following:

1. Information flow of activities carried out in the company
2. Data on the goods name, the number of goods in the company, and the company's investment.
3. Data on the amount and types of goods going out of the company

3.4 Data Processing

The data that has been collected and then processed using:

1. MinMax Inventory consists of minimum inventory, maximum inventory, and reorder rate.

3.5 Information System Design

The system information is designed to use in the warehouse—the warehousing system information is operated by staff in the warehouse system. The design stages start from the Object-Oriented Analysis, then Object-oriented Analysis Design, Database Design, and verification and validation.

1. Object-Oriented Analysis is done by analyzing the system that will be developed into the recommendation system. This stage of the information system started with designing the company's business process. The business process developed into Use Case Diagram. The Use Case Diagram determines the actors to use in the information system.
2. Object-Oriented Design is done by making a diagram that shows the information system created. The diagrams used are Class Diagram, Activity Diagram, and Sequence Diagram.
3. Database Design is done by using Entity Relationship Diagram
4. Programming using PHP and MySQL as database

5. Verification and Validation of Information systems are done after determining the information created. Verification is carried out by determining whether the information system created has carried out its functions as it should. Validation is used to determine which system is designed according to user requirements.

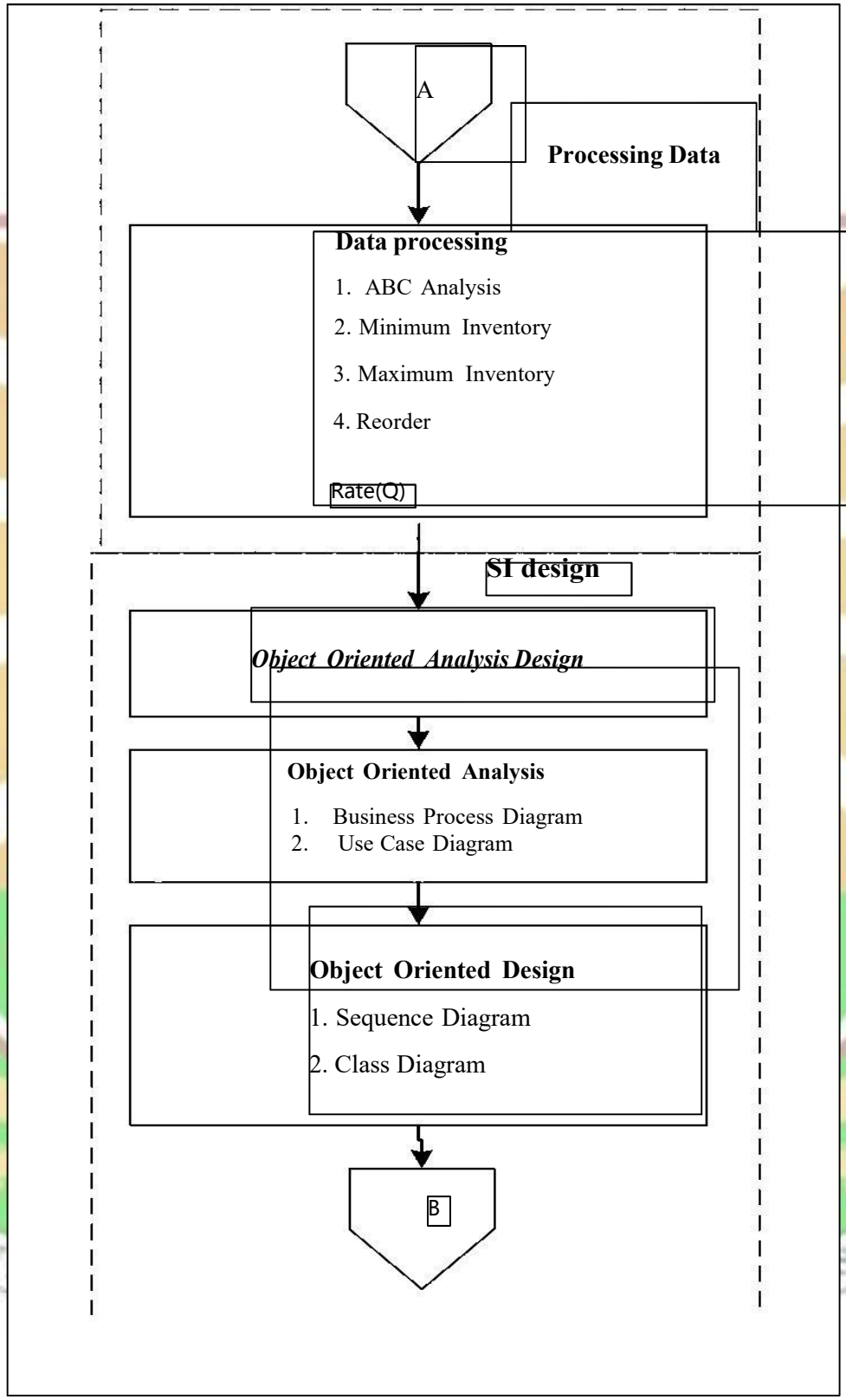
3.6 Analysis

The analysts carried out in this study are as follows:

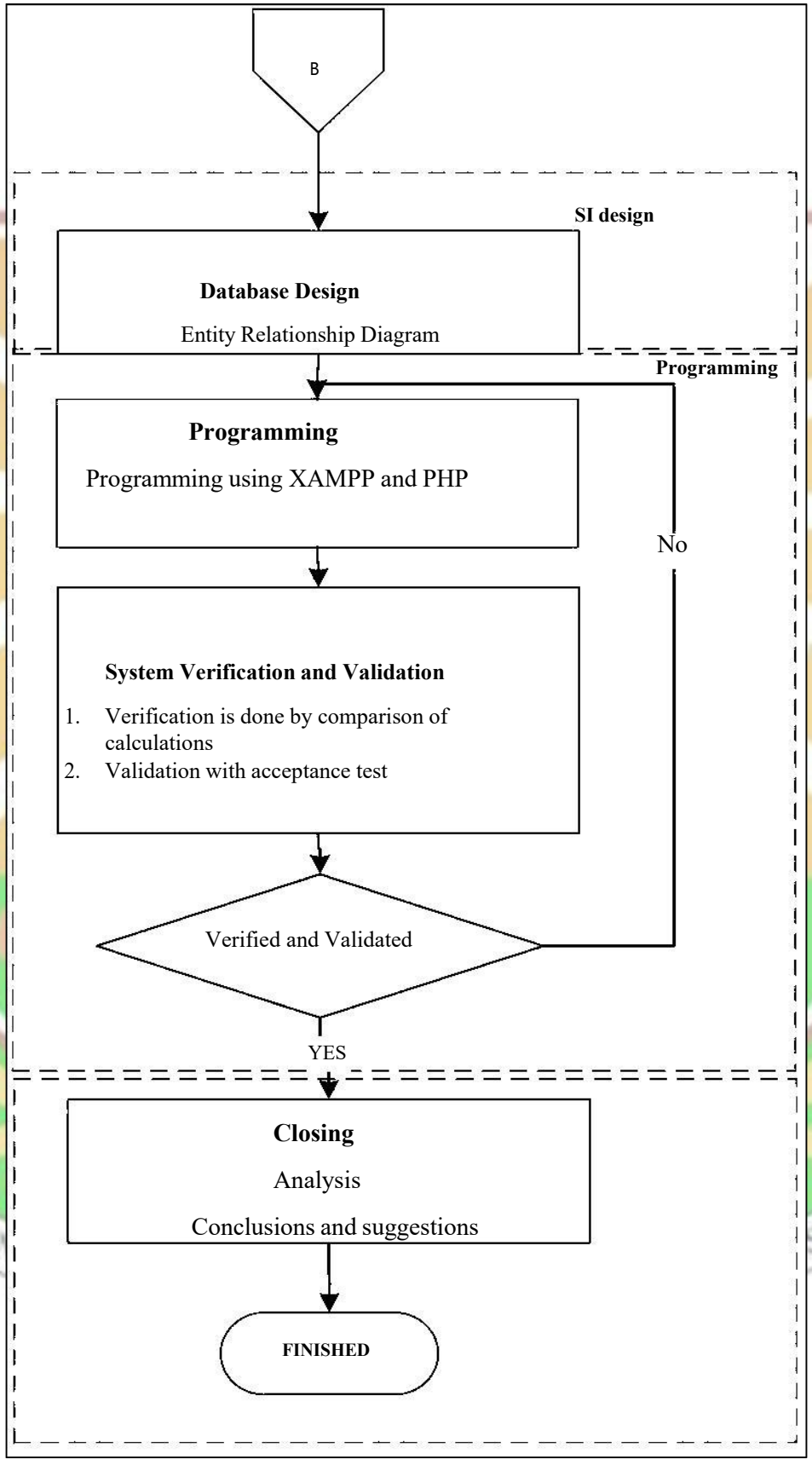
1. MinMax Inventory calculation analysis
2. Analysis of information system design
3. Analysis of actual and designed information system
4. Analysis of system verification and validation
5. Analysis of the system's strengths and limitations

3.7 Closing

The closing contains conclusions from the processing and analysis results carried out in this study. Suggestions are given for further research. The research flowchart can be seen in **Picture 3.1**



Picture 3.1 Flowchart Diagram



Picture 3.1 Flowchart Diagram (con.)

CHAPTER IV
COLLECTING AND PROCESSING OF DATA

This chapter contains the collection and processing of data. The data that has been collected will then be processed using the chosen method that has been determined

4.1 Data collection

Data that has been collected is primary data obtained from the outbound inventory unit of PT Semen Padang in the form of data on the outbound inventory unit stock of PT Semen Padang in 2022 and warehouse handling fixed cost data.

4.2 Data processing

Data processing in this final project is divided into 2 parts: ABC analysis data processing and min-max data processing.

4.2.1 ABC Analysis Data Processing

ABC analysis is the method used to classify goods based on three major groups: A, B, and C.

4.2.2 Data processing MinMax Inventory

MinMax Inventory is a stock management method used to control inventory levels by setting minimum and maximum stock quantities. This method relies on historical data to determine the usage rate of goods and calculates when to place orders based on the difference between maximum and minimum stock levels.

1. Safety Stock Calculation: Safety Stock is additional inventory held to mitigate uncertainties in demand or lead time. In this example, Safety Stock is calculated using the formula: SS = (Standard Deviation) x (Service Factor).
2. Minimum Inventory Calculation: Minimum Inventory is the minimum quantity of goods that must always be available before a reorder is initiated. It's calculated using the formula: Minimum Inventory = (T x C) + R, where T represents the average usage of goods per period, C denotes the lead time, and R stands for Safety Stock.
3. Maximum Inventory Calculation: Maximum Inventory is the maximum quantity of goods that needs to be stored before triggering a reorder. It's calculated using the formula: Maximum Inventory = 2(T x C) + R, where T represents the average usage of goods per period, C denotes the lead time, and R stands for Safety Stock.
4. Order Quantity Calculation: Order Quantity signifies the amount to be ordered when the inventory reaches the reorder point (Q). It's calculated by subtracting Minimum Inventory from Maximum Inventory, and then the result is rounded to the smallest possible packaging size (in this example, 50 tons).

Table 4.2 presents a breakdown calculation for the inventory level using the Min-Max Inventory method, specifically for OPC cement type in PP Teluk Bayur. This table provides valuable insights to determine the minimum, maximum inventory levels, and other factors needed in managing inventory using this method. It details the calculation of inventory requirements necessary to ensure sufficient availability of goods under specified lead times and demand variability.

Table 4.2 Breakdown Calculation For The Inventory Level

PP TELUK BAYUR (OPC)	Amount (tons)
JANUARY	46,491
FEBRUARY	52,853
MARCH	40,447
APRIL	56,913
MAY	47,071
JUNE	16,639
JULY	43,638
AUGUST	15,365
SEPTEMBER	7,141
OCTOBER	25,851
NOVEMBER	39,779
DECEMBER	52,429
AVERAGE	37,051
STANDART DEVIATION	16622.93853

Safety Stock = (SS x Z)

SS = Standard Deviation = 16,622.93 tons

Z = Service Factor = 1.64

Safety Stock = (SSxZ)

Safety Stock = (16622.93 x 1.64) = 27261.6 tons

Minimum Inventory = (TXC) + R

T = average use of goods per period = 37,051 Tons

C = Lead Time = 0.5 Months

R = Safety Stock = 27,261.6 tons

Minimum Inventory = (T x C) + R

Minimum Inventory = (37,051 x 0.5) + 27,261.6

Minimum Inventory = 45,787.1 tons

Maximum Inventory = 2(TXC) + R

T = Average use of goods per period = 37,051Tons

C = Lead Time = 2 weeks = 0.5 months

R = Safety Stock = 27,261.6 tons

Maximum Inventory = 2(T x C)

Maximum Inventory = 2(37,051 x 0.5) + 27,261.6 = 64,312.6 Tons

Q = Max - Min = 64,312.6 – 45,787.1 = 18,525.5 tons

Remaining = 18,525.5 % 50 = 25.5 Tons

Q order = Q - Remaining

= 18,525.5 Tons – 25.5 Tons = 18,500 Tons

4.3 Information System Design

Information system design using the OOAD concept. OOAD consists of Object Oriented Analysis (OOA) and Object Oriented Design (OOD).

4.3.1 Object-Oriented Analysis

Object Oriented Analysis consists of Business Process Diagrams and Use Case Diagrams.

4.3.1.1 Business Process Diagrams

A business process diagram is a description of a collection of interrelated work to solve a particular problem. Business process diagrams when the production/maintenance section requires certain goods. Next, the PT Semen Padang Outbound Inventory Unit warehouse section looks for the types of goods needed. After getting the type of goods needed, the next step is to go to the warehouse section to see the stock of goods in the warehouse. If the stock of goods is sufficient, the goods are sent directly to the production department. If there are insufficient goods, the company should contact the purchasing/logistics department. Purchasing/logistics processes ordered goods, and the company then sends the ordered goods to the warehouse. There is data on incoming goods when

receiving goods from purchasing/logistics. Then the goods are issued to the production department, where there is data on outgoing goods. Goods issued and incoming goods will be recapitulated in the report. This report will be submitted to the mill manager. The difference between the business process diagrams in existing companies and those that will be designed lies in the calculation of MinMax inventory. The picture of the business process diagram at the company in the Outbound Inventory Unit can be seen in **Figure 4.1.**

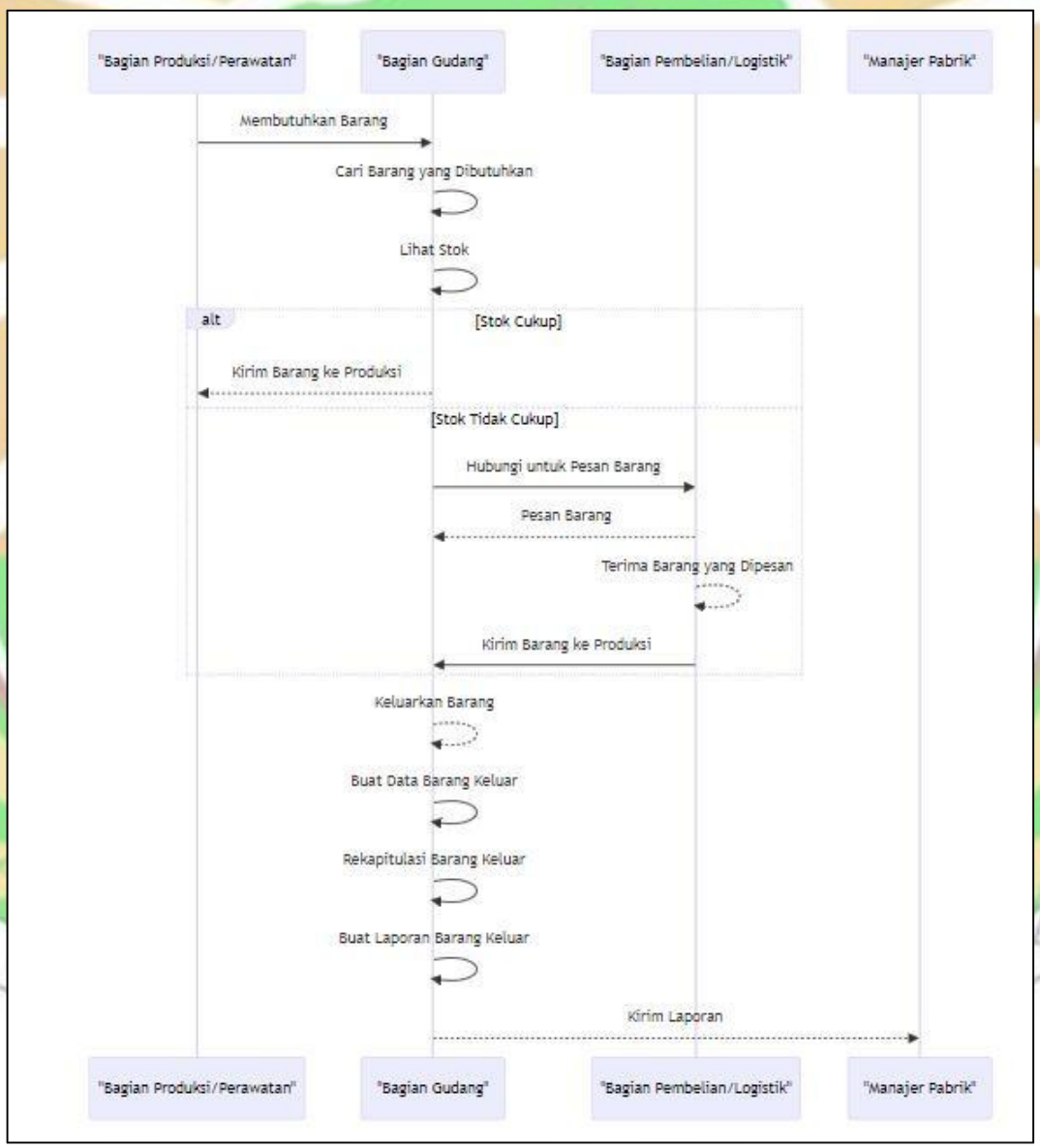


Figure 4.1. Business Process Diagrams Existing in Outbound Inventory

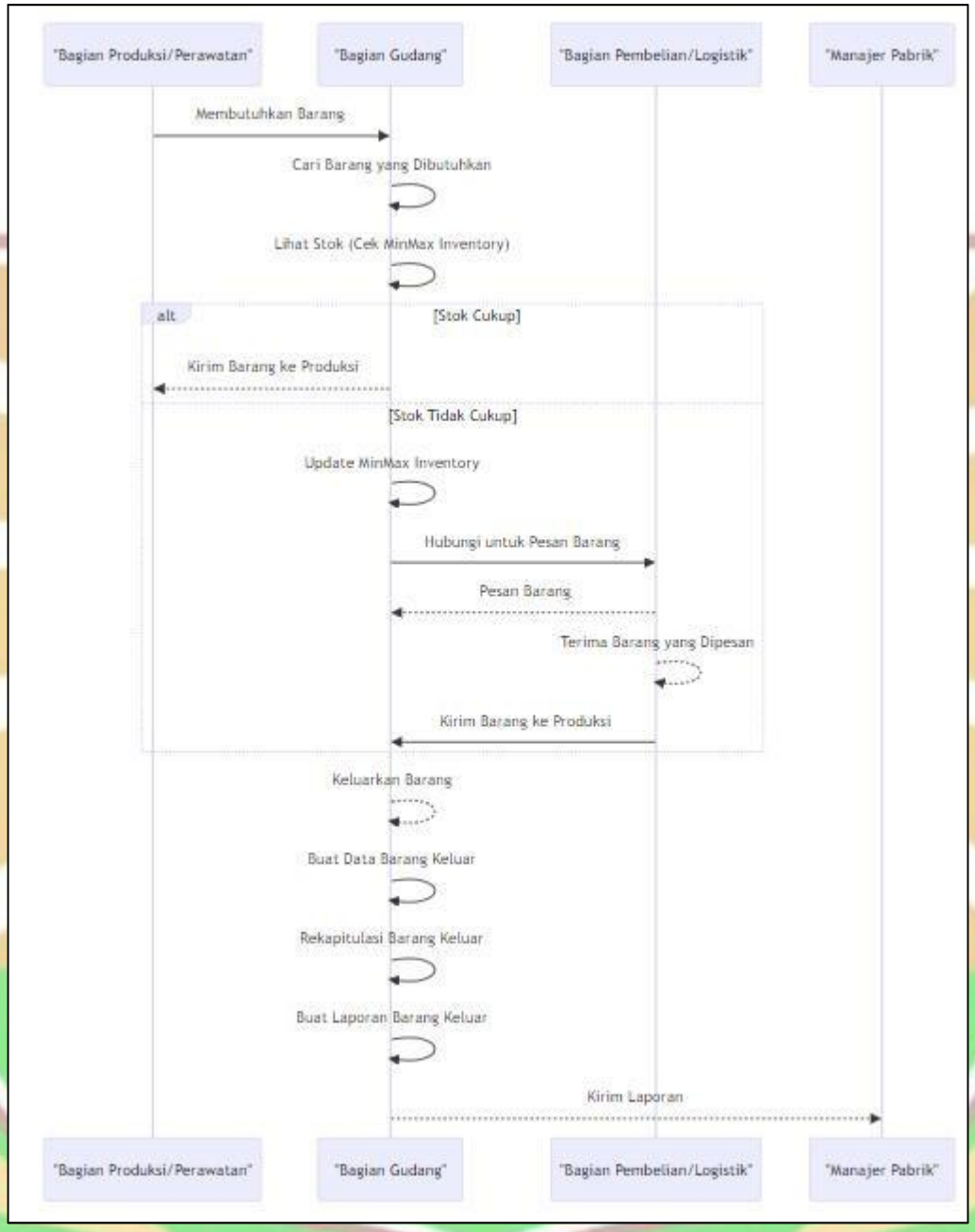


Figure 4.1 Business Process Diagrams existing in Outbound Inventory (con.)

4.3.1.2 Use Case Diagrams

A Use Case Diagram is a model that is used to find out what functions exist in an information system and who has the right to use these functions. The actors in the designed information system are the head of the warehouse and the manager. The head of the warehouse has the task of adding incoming goods, editing incoming goods, deleting incoming goods, adding outgoing goods, and

deleting outgoing goods. At the same time, the manager has the task of viewing reports on the use of goods and ordering goods. The logistics section has the task of receiving a list of goods orders. The use case diagram of the information system to be made can be seen in **Figure 4.2**

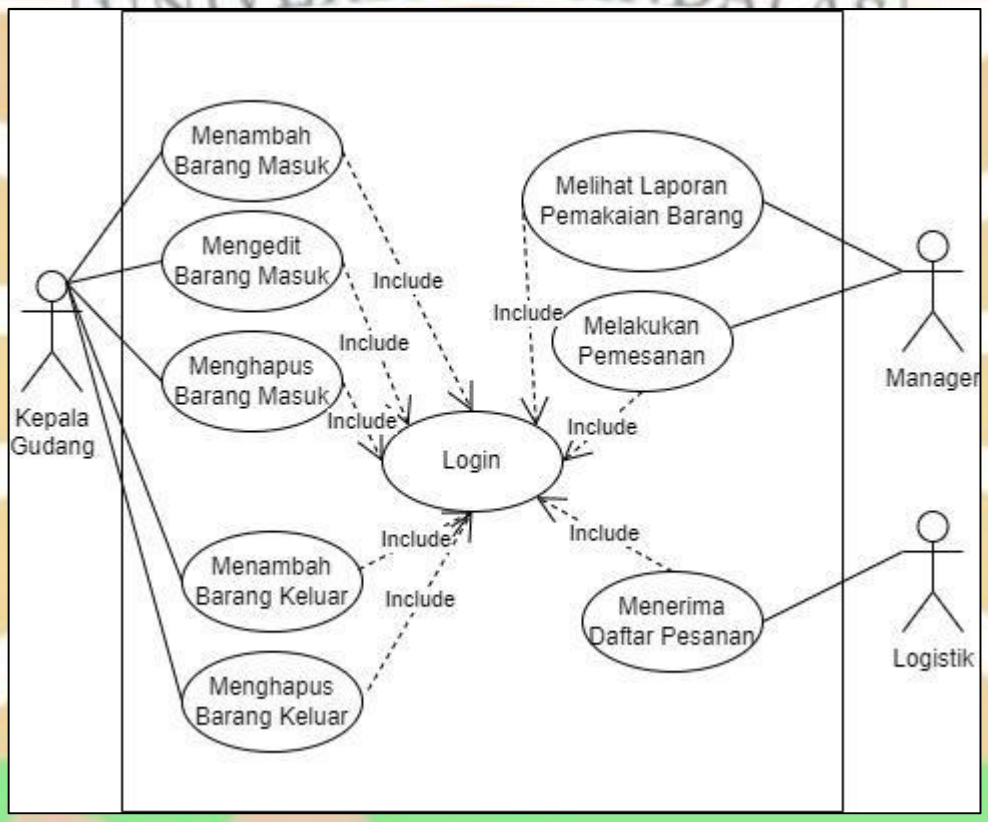


Figure 4.2 Use Case Diagrams in the warehouse

4.3.2 Object-Oriented Design

Object Oriented Design (OOD) directs software designers based on manipulating objects in the system. OOD is done by making sequence diagrams and class diagrams.

4.3.2.1 Class Diagrams

Class diagrams describe the structure of the system in terms of defining the classes that will be made to build the system. Based on the business process diagram, there are two data components used in this system, namely incoming

goods and outgoing goods. The class diagram that is made consists of 5 classes, namely: user class, goods data class, incoming goods class, outgoing goods class and goods order class. Class diagrams can be seen in **Figure 4.3.**

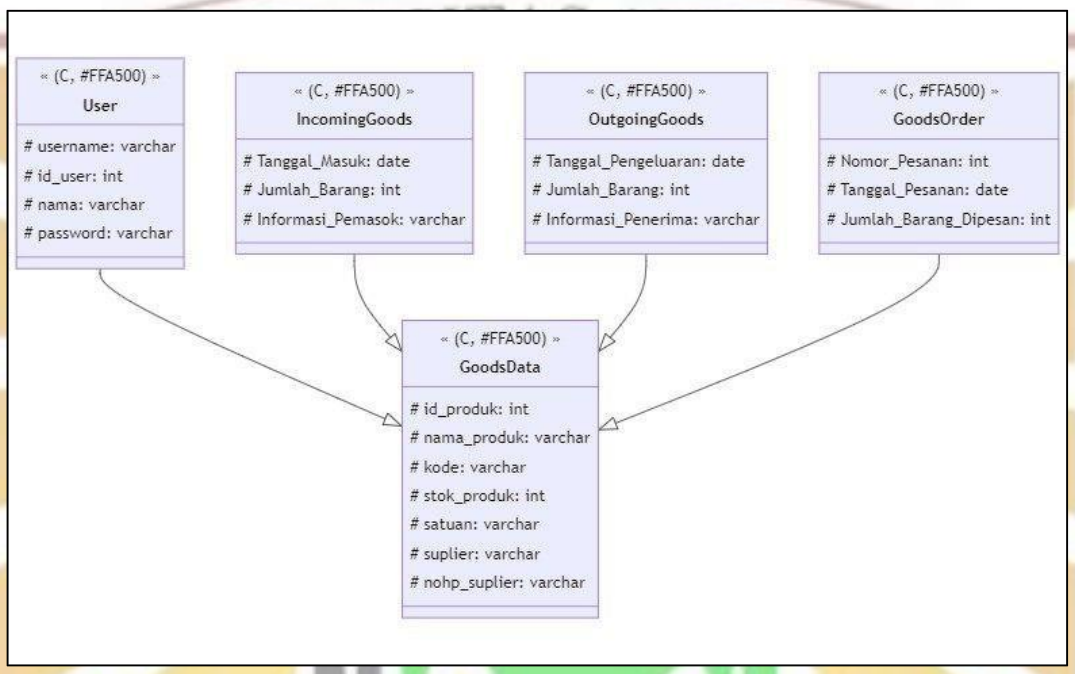


Figure 4.3 Class Diagrams Warehouse at Outbound Inventory Unit PT. Semen Padang

4.3.2.2 Sequence Diagrams

Sequence diagrams describe object behavior based on messages sent and received between objects. Sequence diagrams are designed based on the interactions between actors, the response from the system created and the existing data base in the information system. The login sequence diagram can be seen in **Figure 4.4.**

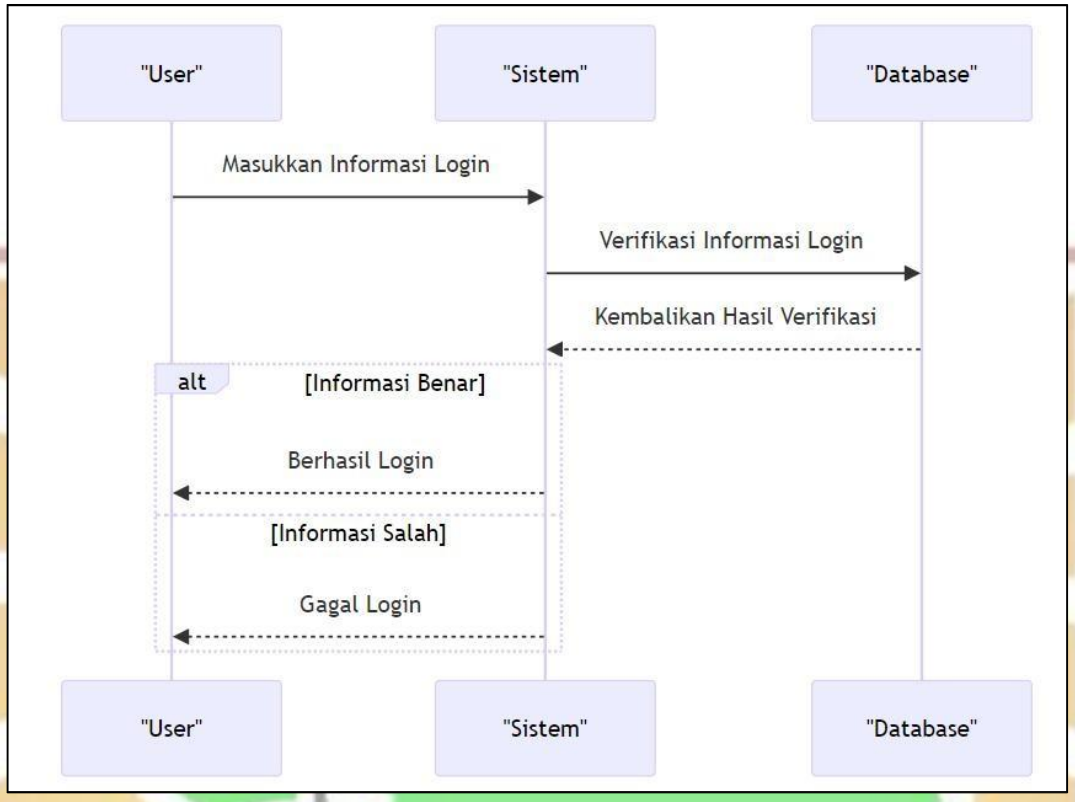


Figure 4.4 Sequence Diagrams Login

Sequence diagram of adding incoming goods data can be seen in **Figure 4.5**

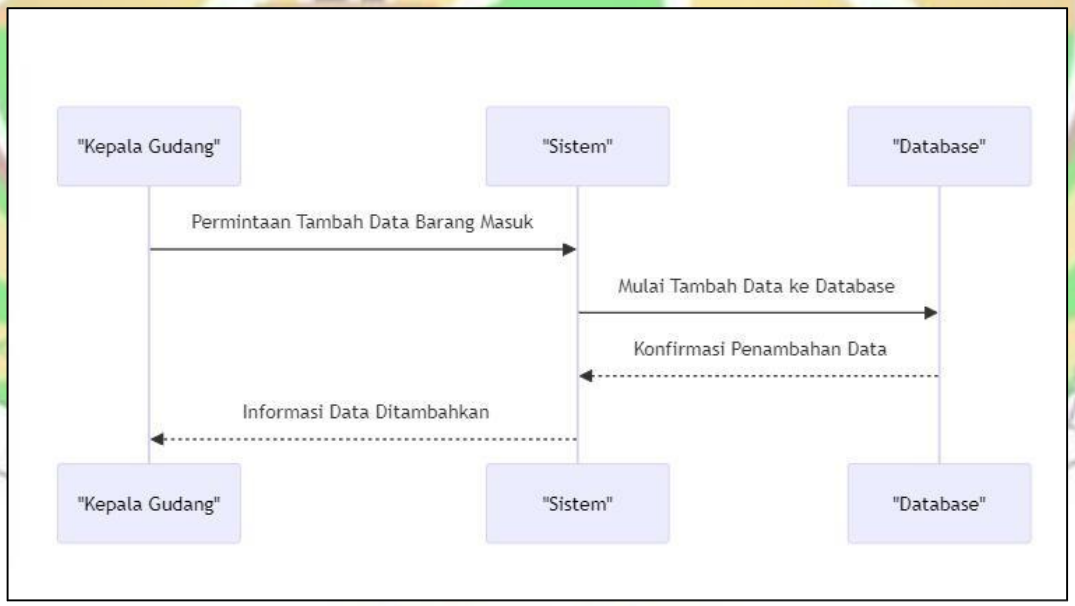


Figure 4.5 Sequence Diagrams Add Item Data Accessed by Head of Warehouse

The sequence diagram for editing incoming goods data can be seen in **Figure 4.6.**

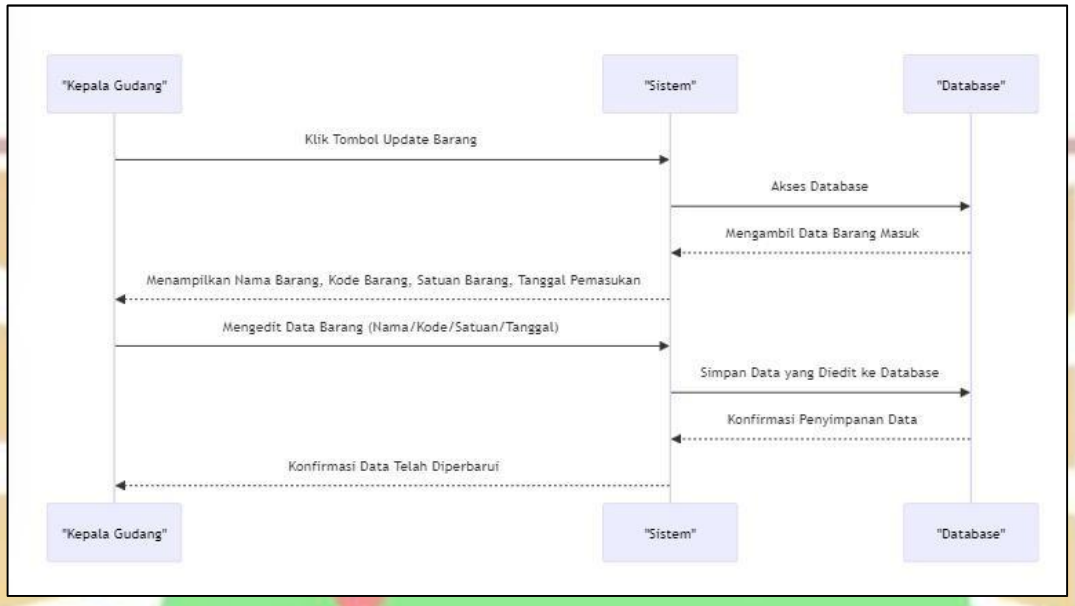


Figure 4.6 Sequence Diagrams Edit Incoming Goods Accessed by Head of Warehouse

The sequence diagram for deleting incoming goods data can be seen in **Figure 4.7**

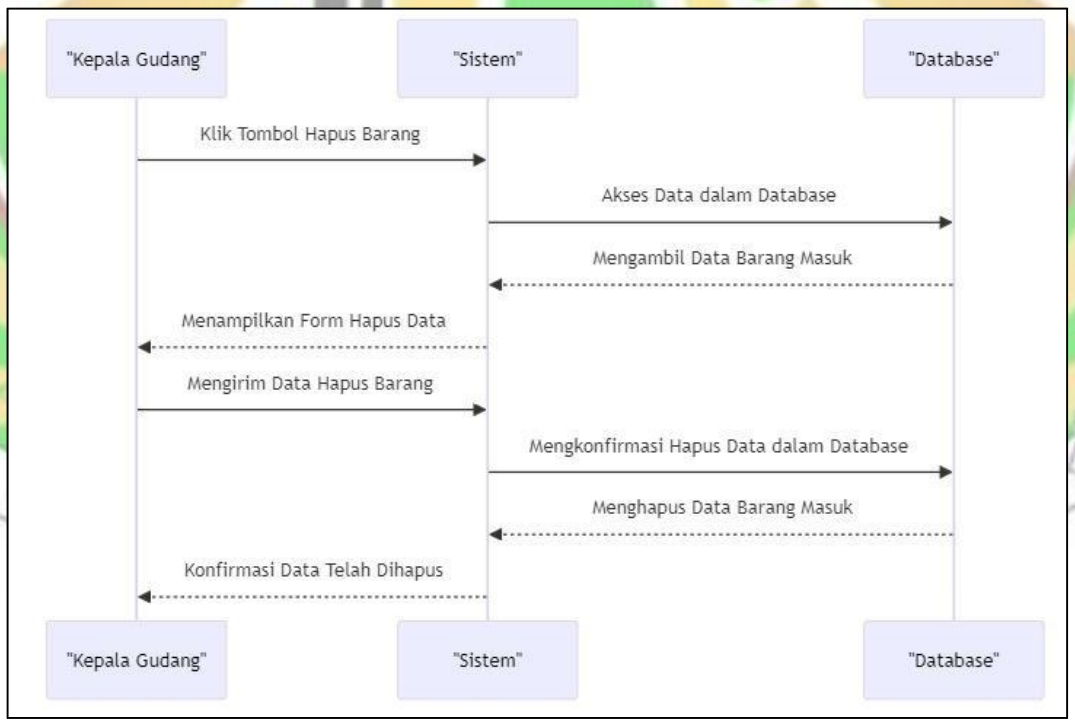


Figure 4.7 Sequence Diagrams Delete Entry Goods Data Accessed by the Head of Warehouse

Sequence diagram of added goods data out can be seen in **Figure 4.8.**

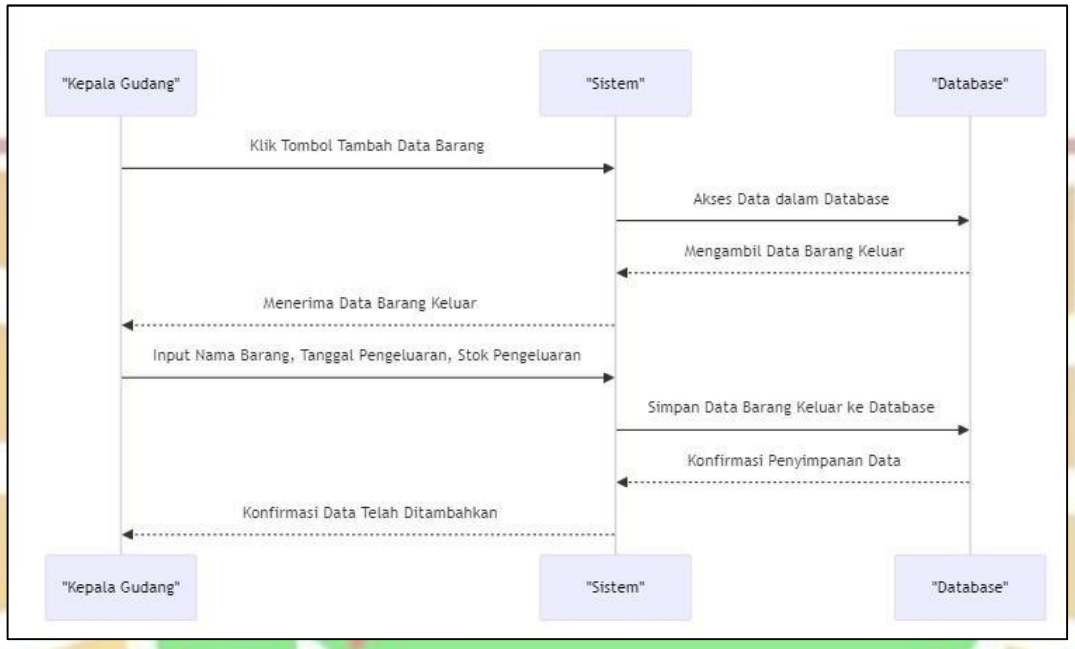


Figure 4.8 Sequence Diagrams Add Exit Items Accessed by the Warehouse Head

The following is a delete sequence diagram, which can be seen in **Figure 4.9**

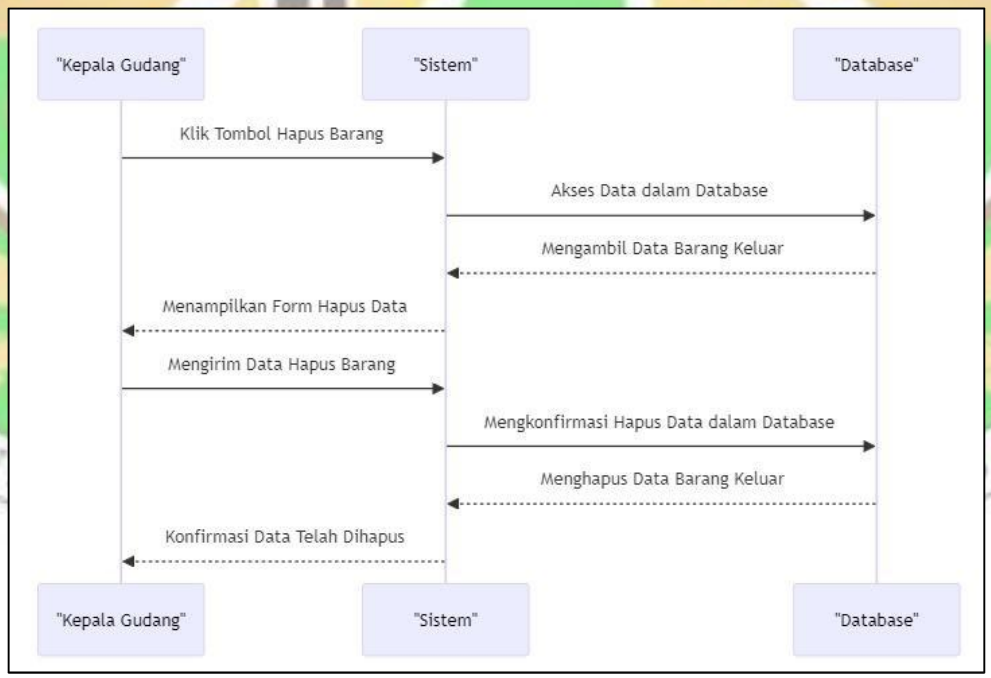


Figure 4.9 Sequence Diagrams Delete Exit Goods Accessed by Head of Warehouse

The report recap sequence diagram can be seen in **Figure 4.10.**

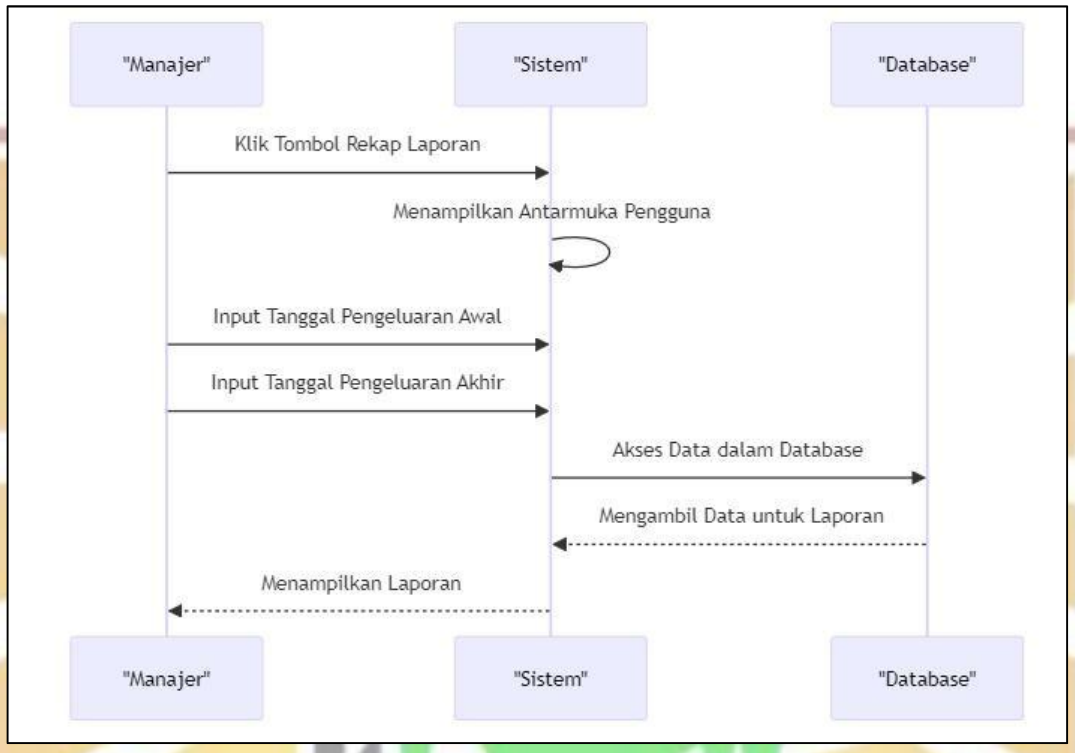


Figure 4.10 Sequence Diagrams Recap of Reports Accessed by Manager

4.4 Database Design

Database Design using entity relationship diagrams (ERD). Entity relationship diagram is a set of methods used to describe data or objects based on the real world which are called entities and the relationships between entities. The designed Entity Relationship Diagram can be seen in **Figure 4.11.**

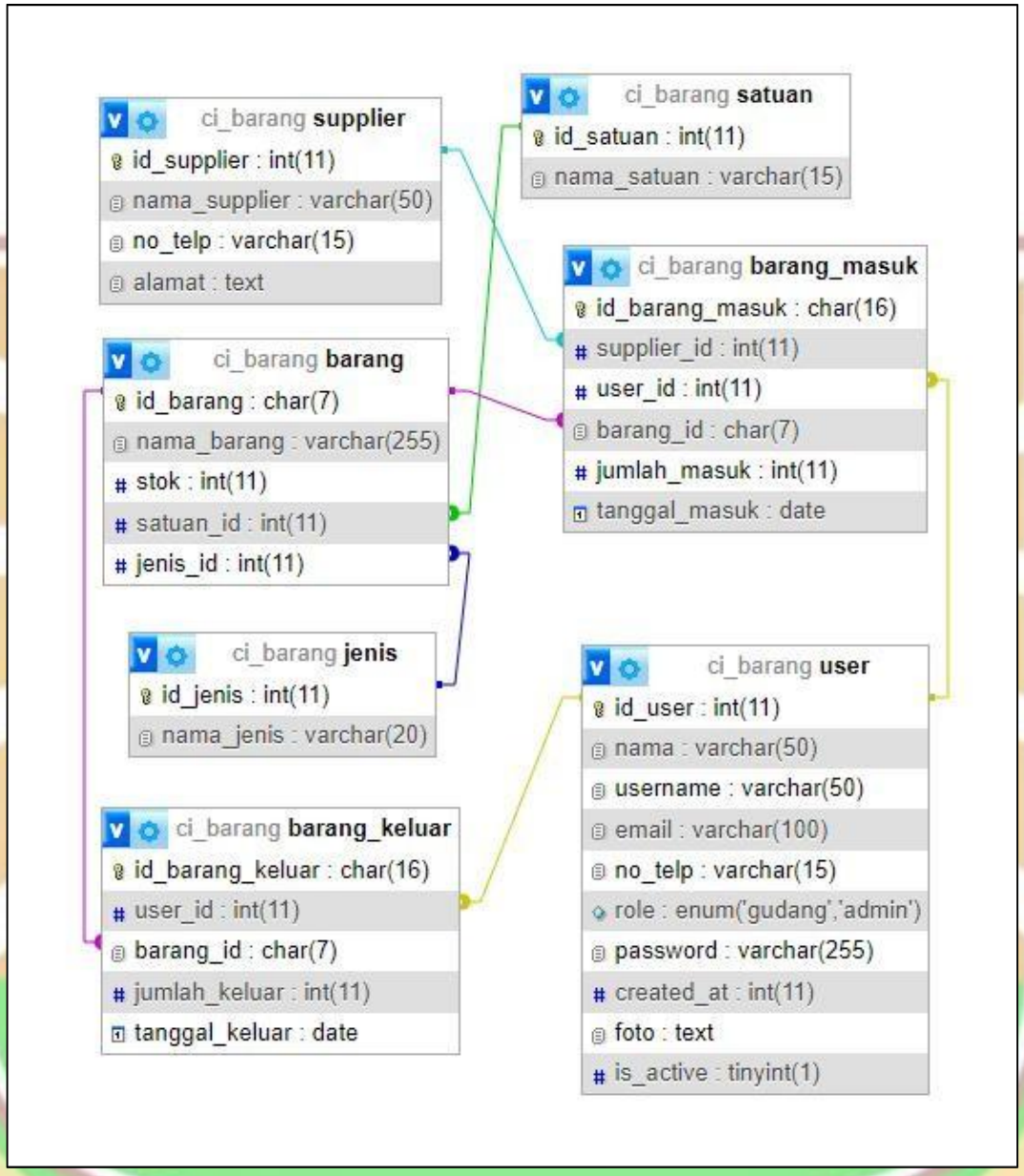


Figure 4.11. Entity Relationship Diagram Inventory Management Information System Outbound Inventory PT. Semen Padang

4.5 Programming

The designed information system is a web-based information system. The web information system is used because of the ease of access in the process of data input, data processing, data management, and friendly output. The

information system is designed using XAMPP software as localhost and MYSQL database. Programming flowchart can be seen in **Figure 4.12.**

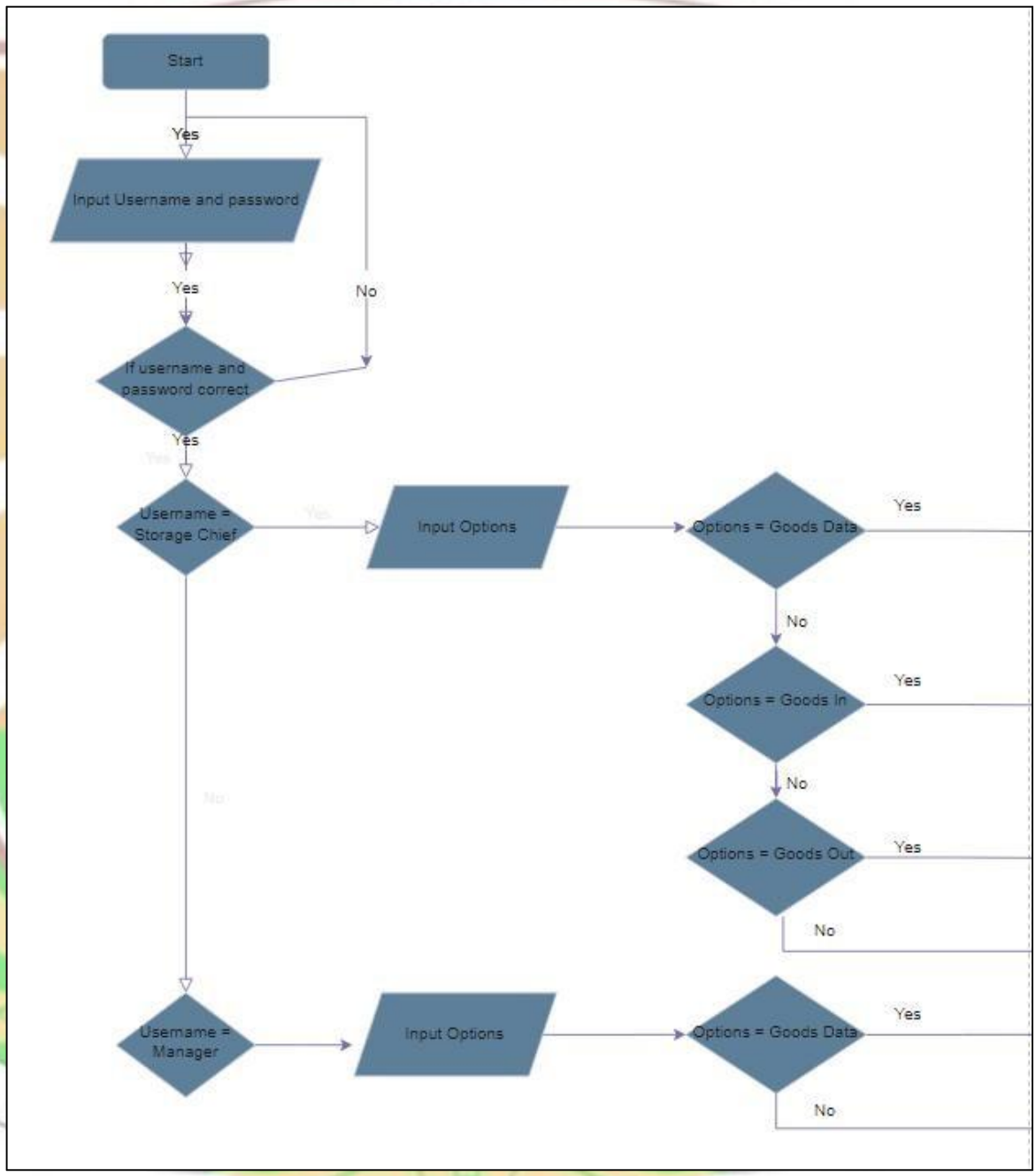


Figure 4.12 Programming Flowcharts

CHAPTER V
ANALYSIS

5.1 Min-Max Inventory Calculation Analysis

Calculation of Min-Max Inventory is done to avoid running out of stock during orders made until goods are received. Still, the amount of inventory is determined with a specified maximum amount. Restrictions are done to avoid excess procurement of goods. Calculations are carried out according to available data. Calculations were only made for the OPC type in Teluk Bayur PP because this item has high usage, and in some cases, the amount varies greatly. This item should be monitored closely.

Based on the calculation example in one of the silos, namely OPC-type cement at Teluk Bayur PP, it was found that the goods had a minimum inventory of 45,787.1 tons and A maximum inventory of 64,312.6 tons. This means that the minimum goods in the warehouse are 45,787.1 tons, and the maximum goods to avoid excess procurement of goods is 64,312.6 tons. Goods ordered as much as 18,500 tons. Orders of 18,500 tons of goods were ordered at the time of supply, reaching 45,787.1 tons. The number of existing goods reached 64,312.6 tons. This is to prevent the occurrence of excess quantity of goods.

5.2 Information System Design Analysis

Inventory management information system design is made using UMLs. The UML diagram used in system design information includes business process diagrams, use case diagrams, sequences diagrams, class diagrams, and entity relationship diagrams. Those diagrams designed starting from business process diagrams to entity relationship diagrams.

The business process diagram used is a business process proposal diagram. The proposed business process diagram is an overview of business processes if the information system is implemented in the Outbound Inventory of PT Semen Padang. The data used in the information system are goods out and incoming goods. Use case diagrams to show who uses the system and what users of the system do. The designed information system's users are the warehouse head, the manager, and the logistics department. Each user has a different task. The head of the warehouse has the task of inputting incoming and outgoing goods and seeing the item's minimum and maximum inventory limits. The manager can view incoming and outgoing goods reports and order goods to the logistics department.

Order Logistics goods to suppliers and has the task of updating supplier name data and supplier contact number. So the information system is designed based on the task of information system users. Sequence diagrams are used as a model of interaction between systems and actors. Sequence diagrams use scenarios and steps to produce a specific output responding to an event. In designing this inventory management information system, the actor performs an event, and the system displays the user interface according to the system. When the actor requests or stores the data, the user interface access the data in the database. A sequence diagram as a model of actor interaction with the system will provide an overview of how the application designed to receive input and respond to it.

Class diagrams are used to design a physical model of a system generated in the form of objects and entities. Class diagrams generate data in the form of an interconnected table. The table formed from the system-designed information consists of 5 tables: user tables, goods data tables, incoming goods data table, outgoing goods data table, and goods ordering table. The results of the class diagram will be generalized into an entity relationship A diagram that will become an information system database using MYSQL databases.

After designing the information system, the next step is Programming information systems. The programming process uses the PHP programming language, and the database uses MYSQL. PHP was chosen because the program is designed based on the web and MYSQL used as a database to store data.

CHAPTER VI
CLOSING

This chapter contains this report's conclusions and suggestions for further research.

6.1 Conclusion

The conclusions drawn from this study are as follows:

1. Based on the data processing results, the minimum inventory value and maximum inventory for goods are obtained Which application designed to have the same calculation results as manual calculation.
2. The designed inventory management information system can be applied by 3 users: the head of the warehouse, the Manager, and the logistics section.
3. Inventory management information system designed to be helpful in input incoming goods, goods out can perform calculations inventory management and can place orders for goods.
4. Inventory management information system designed to be capable support the company in carrying out control planning inventory. Data that is easy to search quickly, Fast inventory calculation and a friendly user interface make advantages of the information system.

6.2 Suggestion

The suggestions obtained for further research are as follows following:

1. Users of the application are not only the head of the warehouse, manager, and logistic section but can also be developed in other divisionsvsuch as the finance division
2. Research discusses the costs incurred by the company due to the procurement of goods, such as storage and ordering costs.

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