

APPLICATION OF ABC AND ECONOMIC ORDER QUANTITY METHODS IN THE MANAGEMENT INFORMATION SYSTEM OF AL MAEDA PHAMACIES

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ABSTRACT

Al Maeda Pharmacy is a trading business that is engaged in the sale of medicines and community services, especially in health services. Problems that occur at Al Maeda Pharmacy are experiencing difficulties in planning incoming and outgoing drugs, because the determination of drugs to be ordered to PBF / Distributors is only expected to see the previous month's sales so that the current system has not been able to maintain the availability of drugs which results in a drug vacancy . Then the proposed solution to overcome the problems at the Al Maeda Pharmacy is that an inventory management information system is needed. The ABC (Always Better Control) method is one of the classification techniques in the supply that aims to classify drugs according to their investment, which is the drug with the highest investment that supplies must be considered. The EOQ (Economic Order Quantity) method is to determine the optimal order for which a high investment value can be reduced inventory costs. The FIFO (First In First Out) and FEFO (Fisrt Expired First Out) methods are applied in the reception and storage of drugs which will affect the process before the drugs come out to consumers.

Keywords: Management Information Systems, Always Better Control, Economic Order Quantity, First In First Out, First Expired Out.

1. INTRODUCTION

1.1 Background to the Problem

Al Maeda Pharmacy is located at Jl. Tanjungsari North Market No. 04 Jatisari Village, Tanjungsari District, Sumedang Regency, West Java which is a unit that provides services in the pharmaceutical field. Al Maeda Pharmacy provides a variety of medicines that are sold to the surrounding community. In running a business that is engaged in trade, Al Maeda Pharmacy is led by Pharmacy Owners assisted by 3 work sections, one of which is the Head of Warehouse. In this case the Head of Warehouse is responsible for overseeing all operational activities at the Pharmacy starting from the planning of drugs to the drug out to consumers. Based on the results of interviews conducted with Mr. Mochamad Thosin as Head of the Warehouse, there

are several obstacles in managing drug supplies at the Al Maeda Pharmacy. The Head of the Warehouse has difficulty in planning the entry of drugs, namely in determining which drugs should be procured and the amount that must be ordered to the distributor. Because the incoming drug planning process that has so far been carried out is only estimated based on the recapitulation of the number of outgoing drugs, namely sales that occurred in the previous month. Looking at the recapitulation of drug supply data [Appendix A.1] at Al Maeda Pharmacy in February 2019. For example medicine of five mg 150 mg tablets 100's shows a final stock of 2 strips, then mutation comes out 50 strips so the planning of drug entry in the following month for the drug is 50 the drug strips come out minus the 2 final stock strips of 48 strips. By estimating this, there is a problem with inventory, which is that there are still some drugs that occur when needed. Vacancies occur when there is a surge in demand for drugs from consumers who make some drugs experience emptiness. To overcome the vacancy of the drug, the Head of Warehouse orders CITO, which is to order drugs from other pharmacies because the drugs will come on the same day. Cito ordering is done to overcome the vacancy of the drug, especially for consumers from Midwives and Mantri in the area. CITO orders recorded in the 2018 recapitulation [Appendix A.2] there were 94 drugs out of 419 drugs or accounted for 22.4% of the total number of drugs. The Head of the Warehouse explained that the price of drugs purchased from other pharmacies is more expensive than the prices of drugs purchased from PBF / distributors, the selling price of drugs at Al Maeda Pharmacy will be the same as the purchase price of drugs made from other Pharmacies.

The Head of Warehouse also explained that difficulties in drug planning were out when consumer demand came. Because the drug planning process that has been carried out has not been guided by the preparation of drug stocks and drug storage information. This causes the discovery of expired drugs.

The ABC method directs the development of better predictions and better physical control that can help management determine the appropriate control for each drug and determine which drug should be

prioritized. [1] Then the EOQ method is used to find out how much medicine should be ordered by the distributor and the Safety Stock method in calculating the safety stock of the drug inventory at Al Maeda Pharmacy. Implementing the FEFO (First Expired First Out) system is drug storage, so that in the process of dispensing drugs see drugs approaching the expiry date are placed in front so that they will be issued first, while drugs whose expiration date is still long placed behind, and so on. This system is used so that drug turnover in pharmacies can be monitored properly so as to minimize the number of drugs approaching the expiration date at the Pharmacy.

Based on the description that has been described, the researcher intends to create an inventory management information system to help solve the problems that exist in Al Maeda Pharmacy. So the researchers conducted a study by taking the title Application of the ABC Method and Economic Order Quantity in the Al Maeda Pharmacy Drug Management Information System.

1.2 Purpose and Objectives

The purpose of this research is to develop a Drug Inventory Management Information System at Al Maeda Pharmacy. The objectives of establishing an Inventory Management Information System at Al Maeda Pharmacy are to:

1. Assist the Head of the Warehouse in planning the drugs that enter the Al Maeda Pharmacy.
2. Assist the Head of Warehouse in planning the drug that comes out of the Al Maeda Pharmacy

1.2 Information System

Information Systems (SI) are a combination of information technology and the activities of people who use the technology itself to support operations and management processes. According to Tata Subaru In his book entitled Analysis of Information Systems the term information system is a process that refers to interactions between people, algorithmic processes, technology funding data. This process aims to facilitate business processes [5].

1.3 Pengertian Sistem Informasi Manajemen

Management information system (SIM) is defined as a computer-based system that provides information for several users with similar needs. The user usually forms a formal organizational entity - the company or subunits below it. Information describes the company or one of its main systems regarding what has happened in the past, what is happening now and what might happen in the future. This information is available in the form of periodic reports, special reports, and outputs from mathematical simulations. Information output is used by managers and non managers in the company to make decisions in solving problems. [2]

1.4 Always Better-Control (ABC Analysis)

The ABC Analysis method is very useful in focusing management attention on determining the most important types of goods and need to be prioritized in inventory. [3]

ABC Analysis is an inventory application of the Pareto principle. The Pareto Principle states that there are a few things that are important and many things that are trivial. The goal is to create an inventory policy that concentrates resources on the essential components of a small inventory and not on a lot but trivial. The analysis is as follows: [4]

1. Group A is the group with the highest 70% investment value and is a group of supplies that require high investment funds.
2. Group B is a group that is between the two groups (20%) and is a group of supplies that require moderate investment funds.
3. Group C is the group of 10% or the lowest investment value, and is a group of supplies that require low investment funds.

ABC Analysis results must be followed by inventory management policies, including: [6]

1. Group A planning must receive greater attention than other items.
2. Group A must be subject to tighter physical control than groups B and C, records must be more accurate and frequency of checks more frequent.
3. Suppliers must also pay more attention to group A so that shipping delays do not occur.
4. Cycle counting, a verification through an internal audit of existing records, is carried out more frequently for group A, which is 1 month once, for group B every 4 months, while group C every 6 months.

For management purposes, type A goods must receive maximum analysis, be evaluated and rechecked, because the types of goods in group A are items that have very high sales value. Type B goods is a concern afterwards and group C types of goods must be considered one by one their tendencies, for example those that tend to increase sales or have the most inventory levels. However, all types of goods included in group A must be the main focus of attention. [4]

1.5 Economic Order Quantity (EOQ)

This economical order quantity (EOQ) concept is balancing inventory maintenance costs with ordering costs. While the definition of EOQ is actually the most economical volume or number of purchases to be carried out at each time of purchase. So by applying the EOQ model in purchasing ordering costs and storage costs can be reduced. [4] The assumptions made in this model are, as follows:

1. Demands or needs are known and are constant.
2. Lead time or waiting time required from the time the order is made until the goods arrive known and constant.
3. Orders are accepted at once and surely.

4. Quantity discount is not possible.
5. Variable costs consist of the cost of ordering and storage costs.
6. Stockouts or shortages can be avoided, if the order arrives on time the formula used in EOQ, can be seen in formula 1:

$$EOQ = \sqrt{\frac{(2 \times D \times S)}{H}} \dots\dots\dots (1)$$

Where :

Q = the number of messages each time

D = Needs per period

S = Order fee for each order

H = Storage cost per unit

2. RESEARCH CONTENTS

2.1. Model of Drug Inventory Management Information System at Al Maeda Pharmacy

Inventory management information system (MIS) analysis is an analysis of how procedures related to drug supply will be implemented in a drug inventory management information system at Al Maeda Pharmacy. The current procedure is still in use but there are a number of inventory management processes proposed in the drug inventory management information system at Al Maeda Pharmacy.

The management model that will be applied to the drug inventory SIM at Al Maeda Pharmacy can be seen in Figure 1.

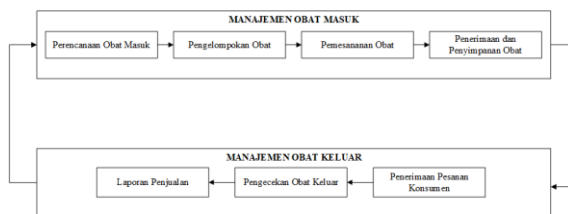


Figure 1. Inventory SIM Model

2.1.1. Analysis of Incoming Drug Management

The process carried out in analyzing the management of admission drugs is as follows:

1. Doing Stock Taking

In this case the head of the warehouse will input the amount of physical or real stock. If any discrepancies or discrepancies are found between the amount of physical stock and the amount of inventory in the data, it will be adjusted to the policy of discrepancy of stock taking from the Pharmacy owner.

2. Drug Classification

The following will conduct an analysis in classifying drugs using the ABC analysis method both based on sales value and based on investment value which can be seen in the drug classification stage in Table 1.

Table 1. Drug Classification Stage

Stage	The steps
Classifying drugs using ABC Analysis method based on the number of sales	<ol style="list-style-type: none"> 1. Calculate the number of drug sales during the past 6 months for each drug item. Data is obtained from drug sales reports that have been carried out on drug entry planning. 2. Sorting the number of sales, ranging from the largest to the smallest then made a percentage of the number of drug sales at the Al Maeda Pharmacy. 3. Calculate the cumulative value of sales by adding up the percentage of sales that have been sorted.
Classifying drugs using ABC Analysis method based on the amount of investment	<ol style="list-style-type: none"> 1. Calculate the number of drug sales during the last 6 months for each drug item along with the price of each drug item. 2. Multiply the number of sales during the past 6 months by the price per drug item, so that the investment amount obtained for 6 months. 3. Sorting the amount of investment, starting from the largest to the smallest then made a percentage of the investment amount of the drug inventory. 4. Calculate the cumulative value of an investment by adding up the total percentage of investments that have been sorted. 5. Classify each item based on a percentage of the investment amount.

Calculating the cumulative value of sales value by adding up the percentage of sales that have been sorted, so that the grouping of hard drugs based on ABC Analysis on the number of sales can be seen in Table 2 below:

Table 2. Results of the Always-Better Control (ABC) Analysis based on the number of sales

Group	Number of Medication items	Number of drug items (%)	Sales Amount	Percentage of Sales (%)
A	38	46,91	3549	70,29
B	26	32,10	1030	20,40
C	17	20,99	470	9,31
Total	81	100	5049	100

Based on Table 2 it can be explained that the grouping based on the number of sales is as follows:

1. Group A is hard drugs with the highest (highest) total sales, namely sales of 3549 drugs or 70.29% of total sales consisting of 38 drug items or 46.91% of the 81 existing hard drug items.
2. Group B is hard drugs with moderate total sales, namely sales of 1030 drugs or 20.40% of total sales consisting of 26 drug items or 32.10% of the 81 existing hard drug items.
3. Group C is hard drugs with the lowest total sales, namely sales of 470 drugs or 9.31% of total sales consisting of 17 drug items or 20.99% of the 81 existing hard drug items.

The final step is to calculate the cumulative value of the investment amount from drug sales by adding up the percentage value of the investments that have been sorted, so that the results of the grouping of hard drugs based on ABC analysis on drug inventory investments can be seen in Table 3 and for details on the types of drugs each group can be seen in the results ABC Analysis of investment amount [Appendix A.3].

Table 3. The results of the Always-Better Control (ABC) analysis based on the value of the investment

Group	Number of Medication items	Number of drug items (%)	Sales Amount	Percentage of Sales (%)
A	36	44,44	12262465	70,43
B	25	30,86	3539737	20,33
C	20	24,69	1609406	9,24
Total	81	100	17411608	100

Based on Table 3, the grouping can be explained based on the amount of investment as follows:

1. Hard drugs included in group A were 36 drug items or 44.44% of the total hard drugs with an inventory value of Rp.12,262,465 and took a portion of 70.43% of investment.
2. Hard drugs included in group B were 25 drug items or 30.86% of the total hard drugs with an inventory value of Rp.3,539,737 and took a portion of 20.33% of investment.

3. Hard drugs included in group C were 20 drug items or 24.69% of the total hard drugs with an inventory value of Rp. 1,609,406 and took up 83.4% of the investment.

The results of grouping based on the amount of this investment will then be calculated the number of drug orders to the distributor.

3. Ordering Medication

1. Calculation of the number of drugs to be ordered Guidelines for the EOQ method before carrying out calculations can be seen in Table 4.

Table 4. Guidelines for calculating EOQ

EOQ Factor	
Demand (D)	Number of sales of each drug item for the past 6 months.
Lead Time (L)	The waiting time for all medicines to be received at the pharmacy after ordering is done to the distributor.
Order Cost (S)	The fee for each order is telephone and stationery.
Holding Cost (H)	Storage costs are 26% of unit cost or each drug item.
Unit Cost	Unit price of the drug

The drug sample used in the analysis of EOQ calculations is Dexteem Plus, because it is the most sold drug in the previous month and has the highest amount of investment previously obtained from the ABC method analysis. The EOQ analysis in calculating the amount of Dexteem Plus drug that will be ordered to the distributor is as follows.

$$EOQ \text{ formula: } \sqrt{2DS / H}$$

Where :

1. Demand (D) or sales for the last 6 months from September 2018 to February 2019 is 184 strips.
2. Lead Time (L) or waiting time required from ordering to the distributor until the drug is received from distributor 2 (results of the interview with the head of warehouse)
3. Order cost (S) or the cost of each time an order consisting of telephone and stationery costs is Rp. 2,000.
4. Holding Cost (H) or storage fee of 26% of the price per drug item [1]

Then the calculation of Dexteem Plus drug EOQ is:

$$\begin{aligned} \text{Sales amount} & \\ \text{Last 6 months (D)} & = 184 \\ \text{Ordering fee (S)} & = 2,000 \\ \text{Storage costs (H)} & = 26\% \times 6550 \\ & = 1703 \end{aligned}$$

$$Q = \sqrt{2DS / H}$$

$$= (2 (184) (2000)) / 506,481703$$

$$= 20.79 \approx 21 \text{ strips (rounding result)}$$

So the economical number of orders in every order Dexteem Plus is 21 strips. For the results of calculation of the number of economic orders for all drugs have been attached [Appendix A.4].

After calculating the number of messages using the EOQ method, then evaluating the results that have been calculated by calculating the order frequency, calculation of the cost of the message, the total cost of the message and the total cost in one period (6 months).

Calculate order frequency

Formula:

$$F = D / Q$$

Where :

D: Number of sales in the last 6 months

Q: EOQ calculation results

Then the frequency of ordering Dexteem Plus is:

$$F = D / Q$$

$$= 184 / 21$$

$$= 8.9 \approx 9 \text{ times order}$$

Determination of Safety Stock is done to anticipate the occurrence of vacancies during the order period, the Al Maeda pharmacy needs to provide safety stock (safety stock). This is anticipated if there are delays in drug delivery by the distributor. An example of calculating safety stock for Dexteem Plus is as follows.

Known:

Lead time (L) = 2 days

Amount of usage

Last 6 months = 184 strips

Number of days for

Last 6 months = 180 days

Amount of usage

average (d) = 198 strips / 180

$$= 1 \text{ strip}$$

Service Level Z (98%) = 2.05

$$\text{Safety Stock (SS)} = Z \times d \times L$$

$$= 2.05 \times 1 \times 2$$

$$= 4.19 \text{ or } 4 \text{ strips}$$

The reorder point occurs when the amount of inventory contained in the stock decreases, therefore the following is the calculation of the reorder point that must be done so as not to run out of stock using the ROP (Reorder Point) method. Data obtained from Al Maeda Pharmacy under this pharmacy has 180 days of work within a period of 6 months and the lead time is 2 days in receiving the drug. Example of reorder point calculation for Dexteem Plus drug:

Known :

D : 184/180 = 1

L : 2 days

SS : 4 strips

Then the reorder point (ROP):

$$\text{ROP} = (d \times L) + \text{SS}$$

$$= (1 \times 2) + 4$$

$$= 6 \text{ strips}$$

So the Head of Warehouse must reorder when the Dexteem Plus drug stock has reached 6 strips.

4. Drug reception and storage

Drug acceptance from the distributor is an action in carrying out supervision to ensure that the quantity and type of drugs ordered are from the distributor, namely checking the suitability of the drug purchase invoice with the drugs coming in and checking the expiration date of the drug. In this case using a supervision when receiving drugs from the Distributor.

Examination of the drug expiration date is intended so that if there is a drug that is approaching expiration, the drug can be detected immediately and can be ordered or returned to the distributor.

Based on the results of supervision, namely drug inspection, it can be seen that the drugs sent by distributors are in accordance with SP documents.

Furthermore, the head of the warehouse acts as follows:

A. If the order is not in accordance with the quantity ordered, the head of the warehouse contacts the distributor that the order is not suitable for sending the medicine again.

B. If the order is appropriate, the pharmacy employee directly stores the medication received from the distributor.

1. Spatial Layout Arrangement and Drug Storage Arrangement

1. Layout Settings

The layout setting is an analysis to determine the place or block of storage of each drug.

A. Current Layout Analysis of Drugs

In the current layout, the Al Maeda Pharmacy is labeled and separated only by the type of unit of the drug (strips and syrup). Each rack has 3 levels, namely the lowest level of ordinary medicine, level 2 or the middle of free drugs is limited and the highest level 3 of hard drugs. The following is a picture of the layout of hard drug storage in the hard drug storage room at Al Maeda Pharmacy.

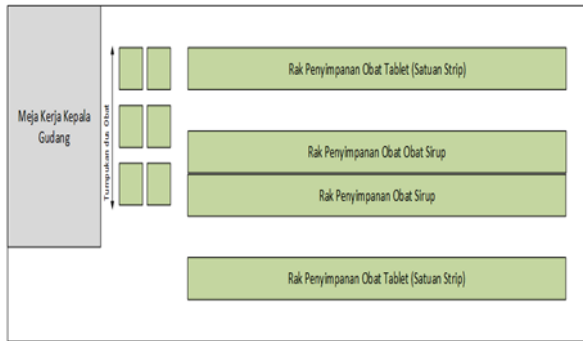


Figure 2. Initial Storage Layout

B. Analisis Tata Letak Usulan

The layout of the proposed drug is done by labeling the drug names alphabetically and separated by type of drug (normal, limited and hard). For the selection of the order, the pharmacy staff uses the FIFO method in which the last drug received in a horizontal arrangement from behind follows the capacity of each drug and FEFO, which is where the earlier drug has expired afterwards. So it is also given a proposal on each shelf and each drug storage block is given the first entry and the last entry.

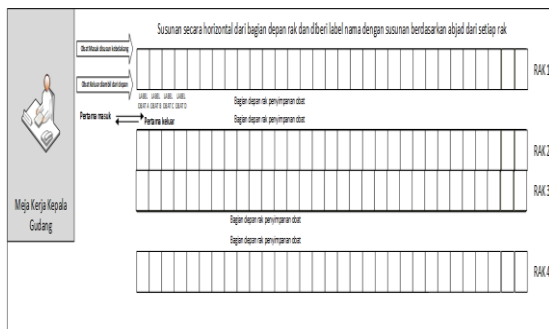


Figure 3. Proposed layout

1. Pengaturan Penyimpanan Obat

Drug storage arrangements are made to make it easier for Pharmacy employees to find drugs when the drugs will be sold to consumers. Medicines are placed on a shelf that has not been arranged by name or type. Compilation that runs is only separated based on the type of drug unit namely strips (tablets) and syrup. Even then, if there is a drug that not all can be arranged on each shelf, then the drug is left in the box and placed piled near the warehouse chief officer. Following are the stages of the drug storage system that will be proposed at Al Maeda Pharmacy:

1. Medicines arranged in alphabetical or numbered and given names on each drug rack in Al Maeda Pharmacy.

2. Drugs are arranged according to the frequency of use:

- FIFO (First In First Out). Which means the medicine that comes early must be removed first.
- FEFO (First Expired First Out) n means an earlier drug that has expired must be removed first.

2.1.2 Analysis of Drug Management Out

The drug management process is carried out starting from receiving consumer orders, monitoring outgoing drugs and evaluating outgoing drugs.

1. Acceptance of consumer orders

Acceptance of consumer orders is carried out by the pharmacy employee and checks beforehand whether the drugs needed are available and sold at Al Maeda Pharmacy.

2. Drug Check Out

At this stage the drug checking process is carried out to see the available drug stocks to fulfill orders from consumers. This stage is a continuation of the flow of drugs of drug storage that is the analysis of the flow of drugs to be sold. At this stage also the system checks.

The order of analysis performed is:

1. Check drug availability

Checking drug availability is looking at drug stock in the system. The system shows the drug stock data stored in the storage section. Before the drug is issued to the consumer, the pharmacy employee first sees the stock recorded in the system. Checking the availability or stock of drugs occurs because it has carried out the process of receiving and selling drugs. An example of an analysis when consumers come to order the drug dexteem plus, then the pharmacy employee checks the stock which can be seen in Table 5:

Nama Obat	Satuan	Stock Akhir	Status
Dexteen Plus	STR	20	Layak di jual

Table 5. Checking drug information

2. Check the condition of the drug

At this stage, before it is given to consumers the pharmacy employee will check the physical condition of the drug as shown in Table 6.

Tabel 6 Pengecekan detail obat

Nama Obat	Satuan	Stok	Tanggal masuk	Expire Date
Dexteen Plus	STR	5	05/02/2019	21/08/2020
Dexteen Plus	STR	20	06/03/2019	10/11/2020

3. Membuat Laporan Penjualan

This stage is done if the stock in storage fulfills orders from consumers, the pharmacy employee will record a history of drug sales. there is also a document that must be made after the release of drugs is a daily report to report every month.

2.2 ERD Analysis

In Figure 6 is an analysis of the design of a drug inventory management information system at the Al Maeda Pharmacy using ERD.

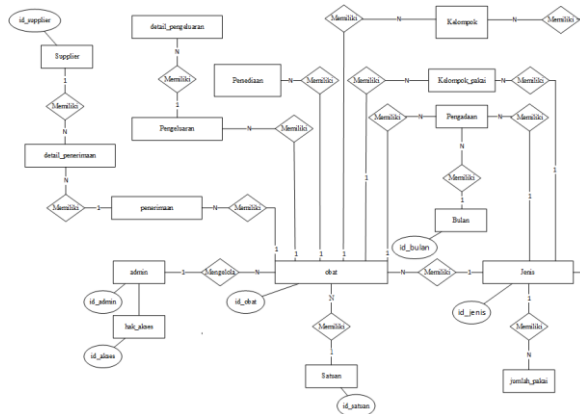
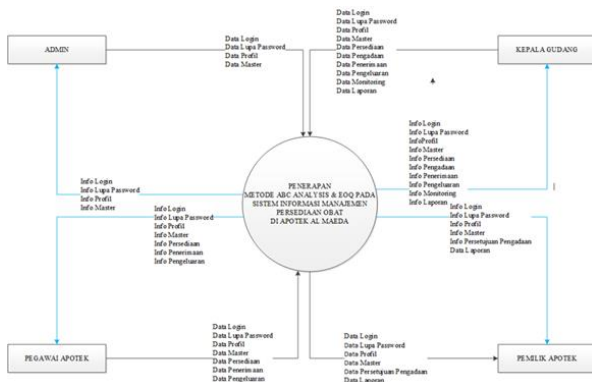


Figure 6. ERD Analysis

2.3 Context Diagram Analysis

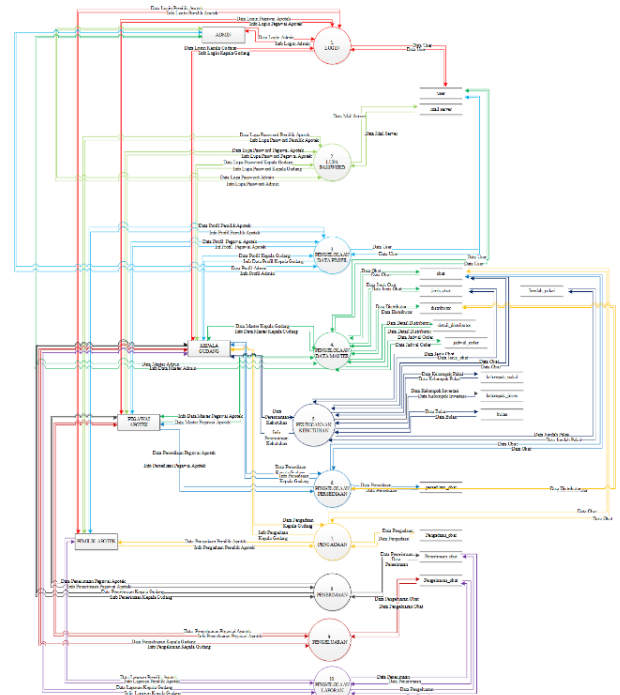
Figure 7 is an analysis of the design of a drug inventory management information system at Al Maeda Pharmacy using a Context Diagram.



Gambar 7. Analisis Diagram kontekstual

2.4 DFD Level 1

In Figure 8 it can be dilated is the design of a drug inventory management information system at Al Maeda Pharmacy at DFD Level 1.



Gambar 4. Analisis DFD Level 1

3. CLOSING

3.1 Conclusions

Based on the results of tests conducted on inventory SIM at Al Maeda Pharmacy. The conclusions obtained are as follows:

- 1. In planning drug supplies in the system is to examine and record the results of the stock taking done*
- 2. In determining which drugs will be ordered using a grouping of drugs using the ABC Analysis method.*
- 3. In determining the number of drugs to be ordered using the EOQ method in the next 6 months.*

3.2 Suggestions

Based on the results of testing the inventory management information system at Al Maeda Apotyek and the results of interviews conducted with the head of the warehouse and pharmacy staff, it was obtained that this SIM teaching advice is better to complete the information system of managing drug inventory at Al Maeda Pharmacy.

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