Inventory Information System for Health Equipment and Medicines Products Using the EOQ (Economic Order Quantity) Method in Pharmacy Installation of RSUD HAMS Web-Based Range

Jeperson Hutahaean[1]*, Neni Mulyani[2]

[1,2] Sistem Informasi,
STMIK Royal Kisaran, Jl. Prof.H.M.Yamin No.173, Kisaran Naga, Kec. Kisaran Tim., Kabupaten Asahan, Sumatera Utara 21222

*) Email Author's Correspondence: jepersonhutahaean@yahoo.com

A R T I C L E   I N F O

A B S T R A C T

This study aims to determine the efficiency of inventory management of medical equipment and drugs in the pharmacy installation of RSUD HAMS Kisaran Hospital using the EOQ method. This study uses a qualitative approach, data obtained by conducting interviews and observations to the pharmacy installation of RSUD HAMS Kisaran Hospital. The data collected is then processed using the EOQ (Economic Order Quantity) method. Pharmacy installation is part of the hospital in charge of organizing, coordinating, regulating, and supervising all pharmaceutical service activities as well as carrying out pharmacy technical guidance in hospitals. At present the pharmacy installation of RSUD HAMS Kisaran Hospital has not efficiently controlled the supply of goods as its function. Procurement of goods is done by recapitulating the data of whatever items are needed, then made a purchase of the goods. Inventories of goods are calculated manually on average use of goods per month without any details regarding storage costs and inventory ordering costs for one item of goods. EOQ is a method used to determine the number of purchases of materials at each order with the lowest cost. The results of the research that has been done, using the Economic Order Quantity method can help the pharmaceutical installation of HAMS Public Hospital. The range is to find out the inventory data, the number of items to be ordered, when to order the goods, and how much it costs to meet these needs so that the process inventory management can be carried out more effectively and efficiently.

1.   Introduction

The hospital is a health care institution that conducts complete individual health services that provide inpatient, outpatient and emergency services. A pharmaceutical installation is a part of a hospital that has the task of organizing, coordinating, regulating, and supervising all pharmaceutical service activities as well as carrying out pharmaceutical technical development in the hospital. The function of a pharmaceutical installation is carrying out pharmaceutical inventory management or management starting from planning, procurement, storage, preparation, prescription services, drug distribution to pharmaceutical inventory control. At present the pharmacy installation of HAMS Kisaran hospital has not efficiently controlled its inventory as its function.To assess whether the inventory management is adequate or not is to see whether there is often a delay or the required materials are not available, how many times the frequency is, how much inventory is idle (idle stock) and how long it happens. How much is expired or damaged or unused material.

Inventories are stored materials or goods that will be used to fulfill a certain purpose (Herjanto in Wijaya, et al, 2016). There are two costs that must be considered when making a decision on the amount to be ordered, namely related to storage costs (carrying cost / holding cost) and ordering costs (ordering cost / acquisition cost). If the quantity of ordered ordered increases, the storage costs will increase while the order costs will decrease.

Therefore, we need a calculation that serves to balance the two costs. One of the most frequently used

methods of controlling inventory is the Economic Order Quantiy (EOQ) method. Inventory is controlled by controlling the time interval for ordering goods as well as the number of goods ordered to be carried out. The EOQ method can determine the optimal frequency of orders so as to minimize production costs without reducing targets or profits to be achieved.

The inventory management application using the EOQ method was built using the Php programming language and the Mysql database, so that it can help pharmaceutical installations at the HAMS Regional Public Hospital. is done, how much does it cost to meet those needs.

2. Literature Review

2.1. Information Systems

Information system is a system within an organization that meets the needs of managing daily transactions, supports operations, is managerial, and strategic activities of an organization and provides certain external parties with the reports needed (Jeperson Hutahaean, 2014)

2.2. Inventory

Inventories are stored materials or goods that will be used to fulfill a certain purpose (Herjanto in Wijaya, et al, 2016). So basically the inventory is as goods that are stored and to be used in the future period and to fulfill the purpose.

There are two costs that must be considered when making a decision on the amount to be ordered, namely related to storage costs (carrying cost / holding cost) and ordering costs (ordering cost / acquisition cost).

Therefore, we need a calculation that serves to balance the two costs. One of the most frequently used methods in determining the quantity of orders in inventory management is the Economic Order Quantiy (EOQ) method.
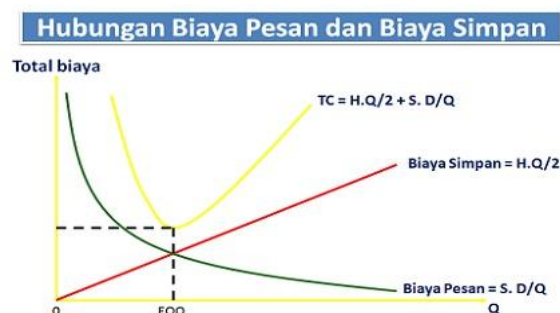

Fig 1. Graph of Relationship between Message Costs and Save Costs

2.3. Economic Order Quantity (EOQ) Method

EOQ is a method used to determine the quantity of inventory procurement that minimizes the direct costs of inventory storage and inventory ordering costs. EOQ aims to determine the optimum amount of ordering the most economical goods or materials for each order.

The Economic Order Quantity or EOQ calculation formula is as follows:

$$EOQ = \sqrt{\frac{2SD}{H}}$$

Where :
D   = Estimated usage or request per time period
S.   = Ordering Fee (Order preparation and machine storage) per order
H   = Storage costs per unit per year

This EOQ model can be applied if the following assumptions are met:
a. The demand for products is constant, uniform and known (deterministic).
b. The price per product unit is constant.

c. Storage costs per unit per year (H) are Constant.
d. Ordering fee per order (S) is constant.
e. The time between an order is made and the items received (Lead Time, L) is Constant.
f. There is no shortage of goods or "Back Orders".

Economic Order Quantity (EOQ) is one of the inventory management models, the EOQ model is used to determine the quantity of inventory orders that can minimize storage costs and inventory ordering costs. (Mardison, 2017).

2.4. The web
According to Samsudin and Abdullah in Maudi, Nugraha, & Sasmito, 2014 the Web is a graphic-based information service on the internet that allows anyone to be 24 hours / day on the internet.

3. Research methodology

Methodology on There are studies, namely:
a. Identification of problems
At this stage the problem identification is carried out to determine what problems are found in the research object
b. Data collection through the process of observation and interviews regarding the procurement system and inventory of goods, in the form of usage reports, procurement reports, stock taking reports at the end of each month. Then the calculation is done using the EOQ method.
c. Study of literature
To achieve the goals that have been determined, it is necessary to study some of the literature that will be used in research, relating to the supply of goods and the EOQ method.
d. System analysis
At this stage an analysis of data has been collected, determining the needs of the system.
e. System planning
The process of designing a model using UML (Unified Modified Language), designing a database consisting of interconnected tables and user-interfaces
f. System Testing and Implementation
Testing uses blackbox texting to determine the expected level of accuracy, validity and reliability. The application is built using the PHP programming language, Mysql database and editors using Sublime Text 3 according to system requirements.

4. Results and Discussion

4.1. Data Testing and Processing
Testing is the most important part in building a system. Testing is done to ensure quality and also know the weaknesses of a program. The purpose of this test is to ensure that the program that is built has better quality than the previous system, which is able to present the main study of the specifics, analysis, design and coding of the program itself.

Testing of the application inventory management using the EOQ method at RSUD HAMS The web-based range is performed using Black Box testing that focuses on the functional specifications of the software. The tester can define a collection of input conditions and test the functional specifications of the program.

Black Box Testing tends to find the following:
a. Incorrect or missing function.
b. Interface errors.
c. Errors in data structures and database access.
d. Performance errors.
e. Initialization and termination errors.
    Testing is designed to answer the following questions:
a. How are functions tested to be valid?
b. What kind of input can be used as a good test case material?
c. Is the system sensitive to certain inputs?
d. How can data sets be isolated?
e. How much data is the average and the amount of data the system can handle?

f.   What effect can a combination of data have on a specific system operation?
     In data processing, tables are needed for the input process of the inventory application system at the RSUD HAMS Kisaran.

a.   Login Table
     Login table is used to store the username of the manager of this system later. Each username will have a password that can be used to enter the system.

Table 1
Login

No	Field Name	Type	Description
1	Nama_Admin	Text (30)	Password
2	Password	Text (15)	Password
3	Status	Text (15)	Status

b.   Item Data Table
     The goods data table is a place for storing all data items that have filled the goods table.

Table 2
Inventory

	Field Name	Type	Description
1	Kd_ barang	Int (10)	Kd barang
2	Nm_ barang	Varchar (20)	Nm barang
3	Jenis_ barang	Varchar (20)	Jenis barang
4	Harga	Int (10)	Harga
5	Stok	Int (10)	Stok

c.   Purchase Data Table
     Purchase data table is a place to store all purchase data that has filled the purchase table.

Table 3
Purchasing data

No	Field Name	Type	Description
1	Kd_beli	Int (11)	Kode beli
2	Tgl_beli	Date	Tgl beli
3	Kd_barang	Int (11)	Kode barang
4	Jumlah	Int (11)	Jumlah

d.   EOQ Calculation Table
     EOQ data table is a place to store all EOQ data that has filled out the EOQ table.

Table 4
EOQ Calculation Table

No	Field Name	Type	Description
1	Id	Int (11)	Id
2	Kd_barang	Int (11)	Kd_barang
3	K_tahun	Int (11)	K_tahun
4	B_simpan	Int (11)	B_simpan
5	B_pesan	Varchar (10)	B_pesan

4.2. Results
     The program structure is a picture of a series of program modules that are bound to each other involved in the data processing. The structure of this program is intended to make it easier to understand the relevance of data processing programs that are designed as shown below:
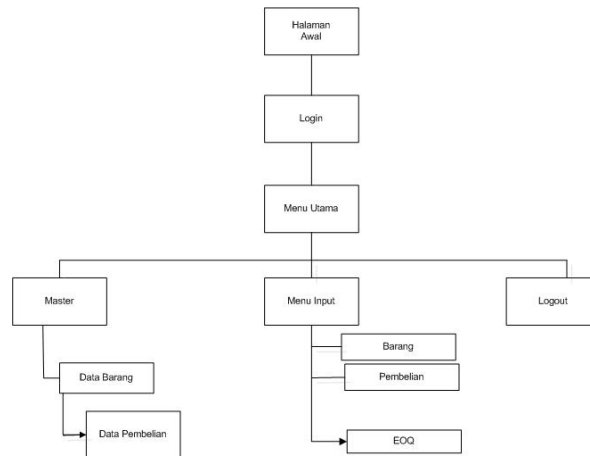
Fig 2. Program Structure

Here are the results of the program display inventory management application with the EOQ Method in RSUD HAMS Web-Based Range.

a.   Display Login Form

To be able to bring up the menus and buttons on the main menu form. The login form contains the required buttons such as the login button and the logout button. The following is the appearance of the login form:
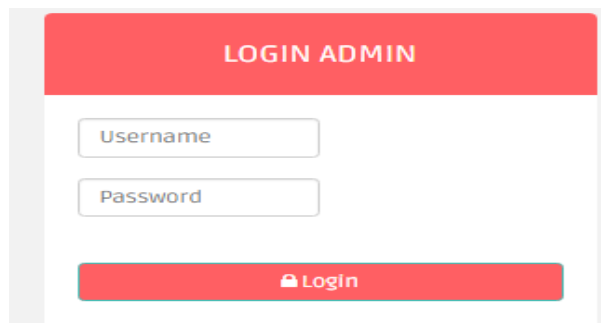

Fig 3. Display Login Form

b.   Main Menu Display

The main menu form of the inventory management application with the EOQ Method at the HAMS Public Hospital Range Based on Web is the initial appearance when entering the program after logging in. This main menu form functions to enter various other desired forms. The following is a picture of the initial appearance of the system's main menu form.
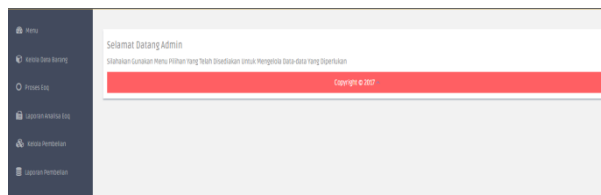

Fig 4. Main Menu Display

c.   Display Item Data Input Form

Item data input form functions to process item data such as item code, item name, item type, item price and stock. The following is the display of the item data input form:

Fig 5. Display Item Data Input Form

d. Display EOQ Data Input Form

The EOQ data input form functions to process EOQ data such as item codes, annual requirements, storage costs, and message costs. Following is the appearance of the EOQ data input form:

Fig 6. Display EOQ Data Input Form

e. Display Purchase Data Input Form

Purchase data input form functions to process the purchase data such as the purchase code, date of purchase, item code, and purchase amount. The following is the display of the purchase data input form:

Fig 7. Display Purchase Data Input Form

f. Display of EOQ Analysis Report Output

The output display of the EQO analysis report contains the item code, item name, needs per year, storage costs, order costs, economical order quantities and order time intervals. The following is an output display of the EOQ analysis report:

LAPORAN ANALISA EOQ

KODE BARANG	NAMA BARANG	KEBUTUHAN PERTAHUN	BIAYA SIMPAN	BIAYA PESAN	JUMLAH PEMESANAN YANG ECONOMIS	INTERVAL WAKTU PEMESANAN
KB001	Maksit	90000	45000	45000	424 Unit	2 Hari
KB001	Maksit	300	200	500	39 Unit	47 Hari
BRG002	SUNTIK	100	10000	20000	20 Unit	73 Hari
BRG002	SUNTIK	120	5000	5000	15 Unit	47 Hari
BRG002	SUNTIK	10	10	5000	100 Unit	3,650 Hari
BRG002	SUNTIK	10	1000	5000	10 Unit	365 Hari
BRG002	SUNTIK	200	4500	5000	21 Unit	38 Hari
BRG002	SUNTIK	259	35000	1000	4 Unit	5 Hari

Fig 8. Display of EOQ Analysis Report Output

g. Display Purchase Report Output

The buyer report output display contains the purchase code, date of purchase, item code, item name, purchase amount, price and total. The following is an output display of the purchase report:

LAPORAN PEMBELIAN

KODE PEMBELIAN	TANGGAL PEMBELIAN	KODE barang	NAMA barang	JUMLAH BELI	HARGA	TOTAL
12345	2016-12-27	KB001	Maksit	2	5600	11200

..........., 29 Jun 2017
Mengetahui,

Administrator

Fig 9. Display Purchase Report Output

5. Conclusion

After conducting training and testing using Mathlab 6.1, the following conclusions can be concluded:
   a. Managing inventory data is more optimal.
   b. Data security is more guaranteed, data is stored in a database.
   c. Faster and easier.
   d. The data generated is also more accurate.

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