

IMPLEMENTATION OF INVENTORY INFORMATION SYSTEM DESIGN USING ECONOMIC ORDER QUANTITY METHOD

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Abstrak—Permasalahan penelitian yang dihadapi adalah diantaranya biaya pemesanan barang yang selalu berubah-ubah setiap ada pemesanan. Pendataan order produk yang kurang baik dan kurang optimalnya penanganan order produk hal ini dapat merugikan perusahaan. Untuk memecahkan ketidak baikan penanganan manajemen inventory ini, maka menggunakan metode Economic Order Quantity (EOQ) dimana terbukti efektif dalam mengatasi permasalahan tersebut. Kontribusi yang dihasilkan dengan membangun sistem informasi manajemen inventory, supaya permasalahan yang dihadapi tidak terulang lagi. Tujuan dari penelitian ini supaya biaya pemesanan barang menjadi lebih stabil dan menjadi lebih optimal dalam penanganan order produk.

Kata Kunci: Sistem Informasi; Economic Order Quantity (EOQ) Model Waterfall; Persediaan Barang

Abstract—The research problems faced are among others the cost of ordering goods which always changes every time there is an order. Poor product order data collection and less than optimal handling of product orders can harm the company. To solve the problem of controlling inventory management, the Economic Order Quantity (EOQ) method is used, which is proven to be effective in overcoming these problems. Contribution is generated by building an inventory management information system so that the problems faced are not repeated. The purpose of this study is to make the cost of ordering goods more stable and more optimal in handling product orders.

Keywords: Information Systems; Economic Order Quantity (EOQ) Waterfall Model; Inventory

INTRODUCTION

PT. MSJ is a company engaged in manufacturing. Where in the process of ordering raw materials, incoming or outgoing goods still use a manual process, namely by using paper to record them. Likewise with the stock items still using paper. Of course, this can create big risks that will occur. Based on observations at PT. MSJ has several obstacles, namely difficulties in finding data on a raw material stock (Ramdhany & Fitriasih, 2019) (Humaeni, Muanas, & Sudradjat, 2019), data processing goods, supplier data, and raw material purchase data. In the process of making reports, the company still takes a long time to prepare reports on raw material stock, incoming goods, and outgoing goods that still use paper records which at any time can be lost and damaged by rain and dirty in uncertain conditions.

The current purchasing and inventory processes are deemed not going well and efficiently, where all processes are still running manually (Cahyana, Yuwono, & Asmoro, 2012) (Pudjiarti,

Puspitasari, & Septyawati, 2019) (Atikah, 2017), do not have good control, and do not have good data collection (Apriani, Aisyah, & Anggraini, 2019). As for some of the problems faced, including the cost of ordering goods which always changes every time there is an order (Tarsono & Khotimah, 2018). This ordering cost is also influenced by the type of goods, the origin of the purchase of the goods, the amount of stock. The process of making documents that still use paper documents. Frequent document loss (Fatmawati & Munajat, 2018) (Sidik, Waluyo, & Susilawati, 2018), damage to documents, and the creation of double documents. Difficulty in searching for historical data, and difficulty in making inventory reports (Setiyanto, Nurmaesah, & Rahayu, 2019). The existing system has not been able to provide accurate stock information.

Based on previous research using the EOQ method to reduce errors in data collection of ordered products (Mujiastuti, Meilina, & Rully, 2018), so that the optimal ordering frequency can be found (Anwar, Mikhratunnisa, & Cahyono, 2019). The method proposed in this study is the Economic

Order Quantity (EOQ) method. This method can answer the problems faced by PT. MSJ, which can calculate the exact reorder point (Nasution & Indriya, 2020). Optimally, it can calculate the reorder quantity. Based on the trend of using the

EOQ method (Figure 1) in 1 (one) year in 2020. The EOQ method still ranks as a widely used method for solving inventory management problems.

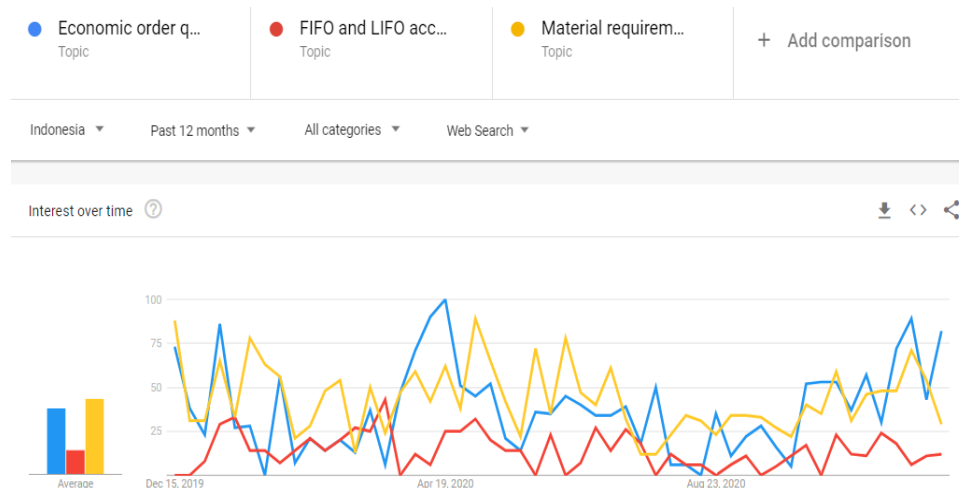


Figure 1. Trends in the Use of the EOQ Method in 2020.

This inventory information system development model adopts the waterfall model, where the flow of system development is clearer based on the phases in the waterfall model. The current research contribution refers to the application system designed and implemented at PT. MSJ.

The purpose of this research is to avoid document loss, make it easier to produce inventory reports, and be able to see accurate and correct stocks. Given the breadth of the root of the raw material inventory information system, the boundaries or coverage will be made to be analyzed. The system discussed starts from the ordering process to suppliers, warehouse stock, product categories, goods data, and releasing goods. In the process of inputting incoming goods acceptance transactions, goods releasing transactions, and printing of goods stock data reports.

RESEARCH METHODS

Data collection technique

In collecting data and information, the author researches to obtain the necessary data, by methods, including:

a. Observation

The observation process was carried out by observing directly at PT. MSJ is a system process that runs, both from the initial purchase submission until the goods being ordered are received by the

warehouse so that the research process can run well and find out the needs and shortcomings.

b. Interview

The interview method is a direct question and answer process to the executive, general administration, and logistics administration to find out problems that exist in the raw material supply process.

c. Literature review

The literature study process carried out and various reference sources both internal media, journal articles related to purchasing and inventory systems.

Economic Order Quantity (EOQ)

One of the methods used to control goods in a company (Zahirah & Arista, 2019). The existence of this EOQ method makes inventory planning better. Some things that need to be considered in the procurement of goods, namely ordering costs and storage costs. This ordering cost will continue to increase because usually, the ordering costs will continue to change, along with the number of orders for goods from suppliers. Storage costs are also a burden on the company because storage costs are also constantly changing based on the number of items stored.

EOQ has a calculation using a formula like the following:

$$EOQ = \sqrt{\frac{2 \times R \times S}{P}} \dots\dots\dots (1)$$

From equation 1, calculating the economic order quantity, where:

R: Ordering fee (order preparation and machine storage) per order

S: Estimated use or demand per period

P: Storage cost per unit per year

EOQ method can be implemented several questions can be done in the following conditions.

- The demand for a product is constant, uniform, and known (deterministic).
- The price per unit of product is constant.
- Storage Cost per unit per year (P) is Constant.
- Order cost per order (R) is constant.
- The time between order placed and goods received (Lead Time, L) is Constant.
- There is no shortage of goods or "Back Orders".

System Development Model

The Waterfall model is sometimes called the classic life cycle (Pressman & Maxim, 2015), suggests a systematic and sequential approach to software development starting with the specification of customer requirements and progressing through planning, modeling, construction, and deployment, culminating in the ongoing support of completed software.

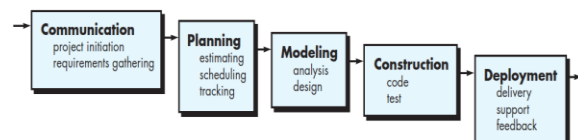


Figure 2. Waterfall Model

The following is an explanation of the Waterfall Model which is in.

a. Communication (Project Initiation & Requirements Gathering)

Time to start technical work, the developer must meet with customers to establish communication, to understand and achieve the goals of the system to be achieved. The result of this communication is the initialization of the project, such as the need for functional characteristics of each user in the system, analyzing the problems faced, and collecting the necessary data.

b. Planning (Estimating, Scheduling, Tracking)

The 2nd (two) next step is the planning stage which describes the estimation of the technical

tasks to be carried out, the risks that may occur, the resources needed to create the system, the work products to be produced, the work plans that will be carried out, and the tracing of the system work processes.

c. Modeling (Analysis & Design)

Step 3 (three) is the stage of designing and modeling system architecture, with a focus on designing data structures, software architecture, interface displays, and program algorithms. The goal is to better understand the overall picture of what will be done.

d. Construction (Code & Test)

Stage 4 (four) of the process of translating the design form into program code or changing the result of the design to a machine-readable language. After the coding is complete, testing is carried out on the system and also the code that has been created. The goal is to find errors that might be corrected later.

e. Deployment (Delivery, Support, Feedback)

The fifth stage (five) stages of software implementation to customers, software repair, software evaluation, and software development are based on the feedback given so that the system can continue to run and develop according to its function.

RESULTS AND DISCUSSION

The following is a discussion of system development using the Waterfall Model. Each stage of the discussion will follow the flow of the Waterfall Model stage.

Communication (Project Initiation & Requirements Gathering)

The following is a specification of the needs of each user of the raw material inventory information system.

1. Purchasing Section

- Can log into the system
- Can manage product data
- Can Manage Supplier Data
- Can Manage Purchase Order Data

2. Warehouse Section

- Can log into the system
- Can Manage Incoming Items
- Can Manage Outgoing Goods

Planning (Estimating, Scheduling, Tracking)

1. Estimating

Implementation of estimates in planning the technical tasks to be carried out, the risks that may

occur, the resources needed to create the system, the work products to be produced

- Analyst System. In charge of carrying out system analysis to be built
- Programmer. In charge of translating the results of analysis and design that have been made in code with a programming language that suits the needs and objectives to be made

- Tester system. In charge of testing the application that is built whether it runs by the planned functional needs

2. Scheduling dan Tracking

Figure 3 is the implementation of work plans that will be carried out in the construction of an Inventory information system and also tracking work. Implementation for 16 (sixteen weeks).

Inventory Information System Planner

Select a period to highlight at right. A legend describing the charting follows.

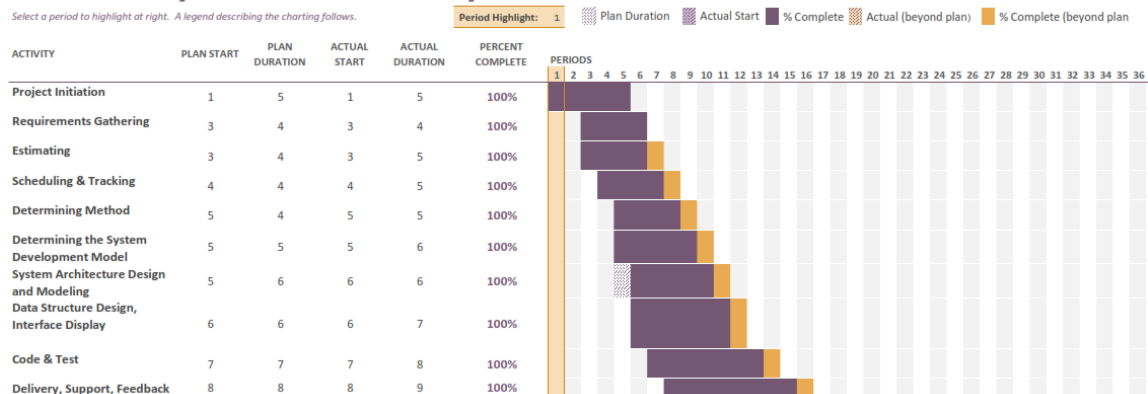


Figure 3. Inventory Information System Design

Modeling (Analysis & Design)

Some modeling for information systems analysis using UML will be discussed by describing Use Case Diagram modeling.

a. Use Case Diagram Inventory Information System

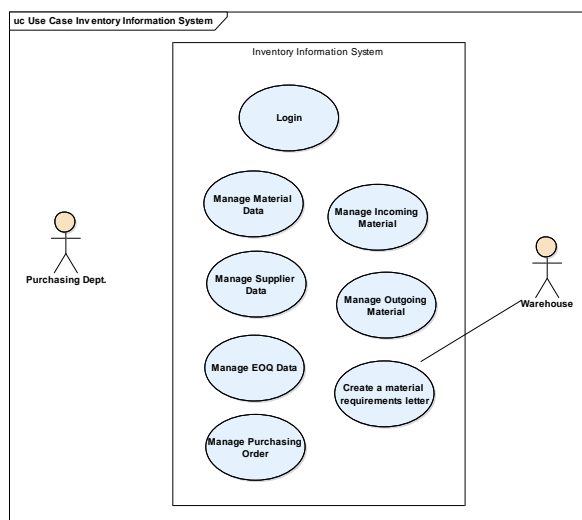


Figure 4. Use Case Diagram Inventory Information System

Table 1 explains, one of the Use Case Manage EOQ Data in Figure 4.

Table 1. Use Case Manage EOQ Data Scenarios

Use Case Name	: Manage EOQ Data
Use case Description	: Purchasing Dept. manage EOQ data, by adding, update, deleting, and printing data.
Actors	: Purchasing Dept.
Pre-Condition	: The system must be connected to an intranet network. Purchasing Dept. must be logged in
Post - Condition	: After successful login, a successful message is displayed for EOQ data

Main Scenarios	Serial No.	Step
Purchasing Dept	1	Click Add to input EOQ data
	2	Click View Data to display material data
	3	Click Edit Data to change material data
	4	Click Clear Data to change material data
	5	Permit Accessing System By access rights
Extensions	1a	The added EOQ data form appears
	2a	The EOQ data view form appears
	3a	The EOQ data edit form appears
	4a	Clear EOQ data message appears
	5a	Print EOQ data will appear

b. EOQ Data Browse Design

Figure 5 is an EOQ data browse plan, which displays the overall EOQ data. Purchasing Dept. can

manage EOQ data, such as: add, view, edit, delete and print data.

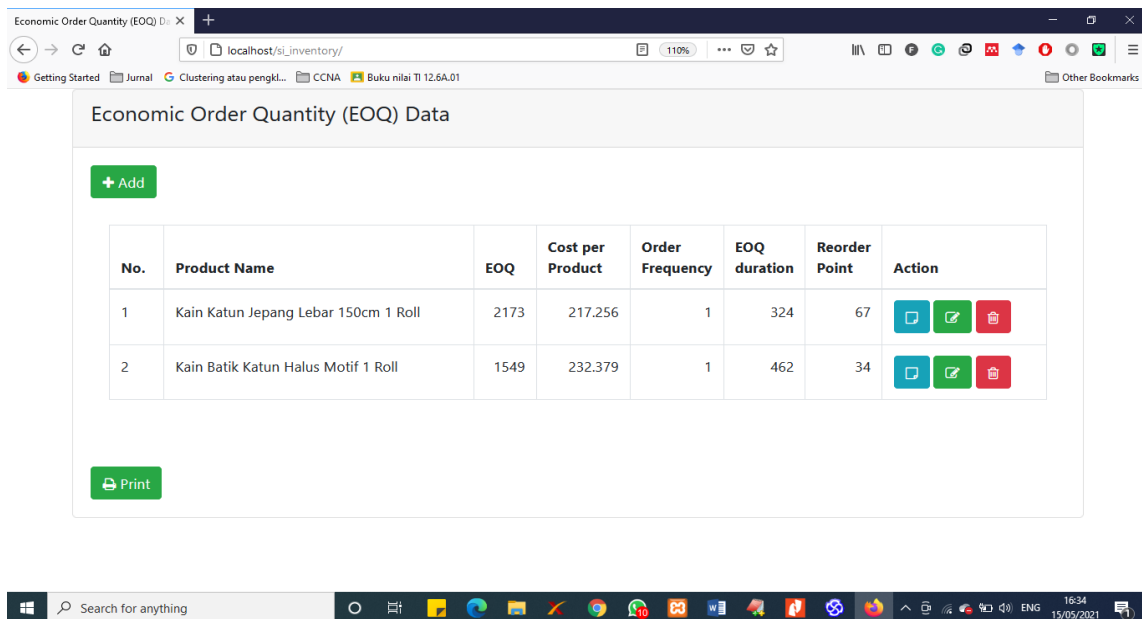


Figure 5. EOQ Data Browse Design

c. EOQ Data Input Design

Figure 6 is the form used to add EOQ data, some field items that must be inputted by the Purchasing Dept.

Figure 5. EOQ Data Browse Design

Construction (Code & Test)

a. Economic Order Quantity Algorithm Design

The following algorithm is written for an inventory information system application.

```

BEGIN
    NUMBER r, s, p, l
    INPUT r
    INPUT s
    INPUT p
    INPUT l
    INPUT hpt

 $\sqrt{(2 * r * s) / p} \rightarrow eoq$ 
 $(p * eoq / 2) + (r * s * eoq) \rightarrow tc$ 
 $s / eoq \rightarrow frq$ 
 $hpt / frq \rightarrow dh\_eoq$ 
 $l * d / hpt \rightarrow rop$ 

    OUTPUT eoq
    OUTPUT tc
    OUTPUT frq
    OUTPUT dh_eoq
    OUTPUT rop
END
    
```

b. Economic Order Quantity Function

The following functions will be used in the inventory information system.

```
public function eoq($r,$s,$p){
    $eoq=round(sqrt((2*$r*$s)/$p));
    return $eoq;
}
public function tc($r,$s,$p,$eoq){
    $tc = round(($p*$eoq/2)+($s*$r/$eoq));
    return $tc;
}
public function frq($r,$eoq){
    $frq = round($r/$eoq);
    return $frq;
}
```

```
public function durasi($jhk,$frq){
    $durasi = round(($jhk/$frq));
    return $durasi;
}
public function rop($l,$r,$jhk){
    $rop = round(($l*$r)/$jhk);
    return $rop;
}
```

c. System Performance Testing

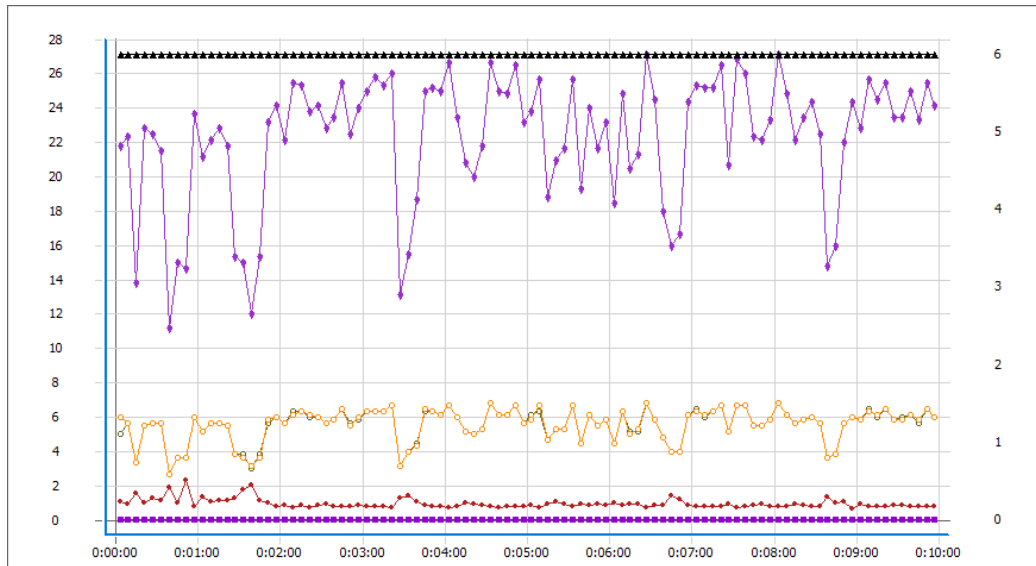


Figure 6. System Performance Testing

Testing system performance in Figure 6, users involved as many as 8 users. The response time from the initial minute to the last minute of testing was set for 10 minutes of listening testing, averaging 0.92 seconds, reading PDF data files an average of 1.03 seconds. Average response time with page reading of 0.92 seconds.

Deployment (Delivery, Support, Feedback)

The main purpose of this stage is to explain how software is implemented into hardware, also to visualize how software interacts with hardware to carry out its functionality..

a. Delivery

After completing the development of the inventory information system, the developer then submits it to the end user to be installed on the company's server.

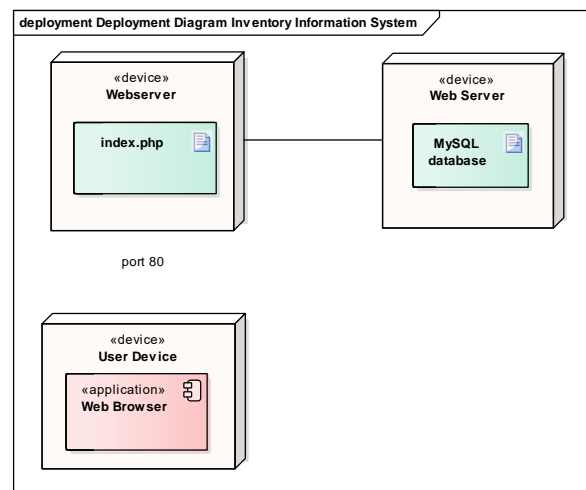


Figure 7. System Performance Testing

In Figure 7, it can be concluded that the minimum specification for running an inventory information system application is that on the server side it requires a webserver, namely Apache web server, with the application installed on the webserver by accessing index.php. The database management system used by MySQL database. On the client-side,

using devices that are not limited to PCs, can also be tablets, smartphones, laptops. When accessing it with a web browser.

b. Feedback

Feedback in table 2, in the form of a user acceptance test, is information on the results of the end user's reaction to the inventory application, someone's performance on an assignment, etc. which is used as a basis for improvement.

Tabel 2. User Acceptance Test

No	A list of questions	Percentage
1	Is the EOQ data management dashboard easy to operate	91%
2	Is EOQ data input understandable and easy to use?	93%
3	Is change EOQ data understandable and easy to use	93%
4	Does appear data EOQ understands and is easy to use	95%
5	Is the calculation process as expected?	93%
6	Is the process of accessing this inventory application fast?	92%
7	Is the data access process in this inventory application fast?	92%
8	Is this inventory application sufficient?	96%

Table 2, is the stage for testing user acceptance of, in general, users who test the inventory information system accept this application.

CONCLUSION

In general, this inventory information system can help users implement the company's existing inventory of incoming and outgoing goods. The application of the EOQ method can determine the volume and frequency of material orders needed to meet production needs and reduce the cost of each order.

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