SCHEDULING SYSTEM ON GOODS ORDER AT PT XYZ USING ECONOMIC ORDER QUANTITY METHOD

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ABSTRACT

A company in doing their production is highly affected by level of sales and purchasing raw materials or good to be sold the next day or the month after. Therefore, computerized order scheduling process is highly necessary for some companies. The same problem have occurred in several companies which are still doing raw material or goods order without scheduling first, they consequently often find over or under stock. Besides that, spare part order scheduled planning systematically is very needed to minimize stock expenses. Method used to scheduling order is Economic Order Quantity (EOQ method). Application made is web based using PHP program language and MySQL database. End result of this research is an application that can display raw materials or goods scheduled order needed in the next month sales period for 1 (one) year ahead.

Keywords: Scheduled Order Syste, Economic Order Quantity, Stock.

INTRODUCTION

The using of system and technology is not limited on distribution model and data processing at ongoing process, but existing system must be able to analyze the probability of company capabilities in the future. In other word, company must be a ble to predict condition and situation, of goods inventory, labour or profits that will be obtained. (Himawan, 2011)

The making of information system of goods inventory management is essential to facilitate monitoring quantities of spare part stock stored in the warehouse, sales and purchasing transaction, data collection in and out, and filling. The existing commerce system now is still using goods collecting in and out written in a ledger collection stocks and not using supply system application yet. A good company must be able to maintain raw materials supply, so

production process can be maintained smoothly, and most importanly be able to meet customer demand.
(Agustian, 2012). Transaction is also still using book keeping and sales notes, so it is vulnerable to calculation error due to less accurate filling on result report phase. Besides finding inventory collection data is taking a long time.
Processing inventory of goods and raw materials require scheduled order of raw materials and goods to minimize inventory expenses. Method used in this research is Economic Order Quantity methods. According to (Riyanto, Basic Company Spending, Fourth Edition, Seventh Mold, 2001), Economic Order Quantity (EOQ) is number of goods quantities obtained by minimal expenses or it is common to say optimum number of spending. As the research done by (Anom & friends, 2013) in a journal entitled "EOQ (Economic Order Quantity) Model on Chain Supply Management to Solve Inventory Problems in a Company" it is said that Economic Order Quantity method is used to perform goods inventory planning which consist of determine number of goods of each orders, order frequency in a year period, and delivery time of each order. With a raw materials inventory policy applied in a company, the expenses supposed to be pressed in the least minimum number. To minimize the inventory expenses, analysis "Economic Order Quantity" (EOQ) can be used. EOQ is volume or total sales of most economic done for every purchase (Agustian, 2012).
This information system weaknesses at Still process master data contents of manual
as well as the absence of a barcode system in master data, and information systems by using the EOQ method is able to determine the approximate number of items per order in the booking period of one year
Based on described background, the writer can formulate the problem which is how to build a scheduled order system using Economic Order Quantity method on management infomation system.
Also the purpose of this research is applying Economic Order Quantity method to schedule order on management information system.

LITERATURE REVIEW

Management Information System

(Murdick, 1991) Management Information System is a group of people, a set of guidelines, a set of data processor, sorting, keeping, processing and regain data (operating data and inventory) to reduce uncertainty in making decision (looking for a joint purpose) by produce information for manager to be used in the most efficient time (produce information based on time reference)
(Burt & friends,1983) declared that management information system is a formal system about reporting, classifying, and spreading the information to the right people on a organization.
According to (Davis, 1985) a management information system consist of physical elements such as belows:
a. Computer hardware
b. Software, consists of common software system, common applied software and application software.
c. Database (stored data in computer storage media)
d. Procedure
e. Operational officer.

According to (Jalaludin, 2007) in order to make management information system runs effectively in an organization , it is necessary to pay attention on several important elements such belows:

a. Needed data
b. When the data is needed
c. Who need it
d. Where the data needed
e. In form of what the data is needed
f. Priority given from various data
g. Procedure/mechanism used to process data
h. How to manage feedback

RESEARCH METHODS

Economic Order Quantity

According to (Riyanto,2001) Economic Order Quantity (EOQ) is a total inventory quantities that can be obtained by minimal expenses or frequently said as optimum spending quantity.

While according to (Jay & friends,2005) Order Quantity is one of the oldest and wide famous technic to control inventory. This inventory control method is the answer of two important questions, when to order and how much we must order.

Economic Order Quantity calculation concept is also based on quite logical and simple reasoning as the more often inventory refill done, rate of inventory will be smaller, and it cause inventory supply expenses be smaller too.

On the other side, more often inventory refill is done then order expenses will be bigger too. Therefore the most economic balance must be found or the most optimum of two opposite things. To find this balance point is the meaning of Economic Order Quantity formula (Richardus & friends,2003)

According to (Khasanah,2010) this method is also called lot sized method which is used for independent demand inventory management and based on these asumption:

a. Speed of fixed and continuos demands
b. Time between order until delivery arrives (lead time) must be steady
c. Never stock out
d. Order material in package or lot and come on the same time still intact in package form
e. Fixed price per unit and there is no price reduction even for large quantity transaction
f. Carrying cost nominal dependent equivalent to number of inventory
g. Nominal of set up cost is fixed for each ordered lot and no dependent on number of item of each lot.
h. Item is a one type of product and not related with other product

Scheduling Order

To determine number of order or optimum purchasing, it is necessary to calculate economic optimum purchasing for each order or Economic Order Quantity. The steps are as below:

a. Determine Economic Order Quantity.

$$Q^* = \sqrt{\frac{2SD}{hC}}$$

Description :
Q* = number of most economic order or Economic Order Quantity (unit)
S = order expenses (IDR/order)
D = number of inventory request (unit)
H = inventory storage expenses (% due to goods price)
C = price per unit (IDR)

b. Determine order frequency.

$$F^* = \frac{D}{Q^*}$$

Description:
F* = order frequency (times/period)
D = number of inventory needs (unit)
Q* = number of most economic order or Economic Order Quantity (unit)

c. Determine delivery time of each order.

$$T^* = \frac{\text{Jumlah hari kerja dalam setahun}}{F^*}$$

Description:
T* = time range between orders (days)
F* = order frequency (times/period)

System Design Analysis

This research have several system requirements such as:

1. Supplier Data
2. Spare Parts Data
3. Income Goods Data
4. Outcome Goods Data
5. Return Purchasing Data
6. Scheduled Order Data
7. User Data

From above user needs then the system will get 2 user which are "Owner" and "Warehouse Admin", whereas the owner can only monitoring all transactions which have been conducted by warehouse officer, while warehouse admin can manage inventory data, supplier, income goods data, outcome goods data, goods return, and scheduled order. To count number of order, user must input spare parts price, order expenses, number of spare part requested in a year period and goods storage expenses on scheduled order form. Then system will give output in form number of raw materials order, order frequency, period and schedule.

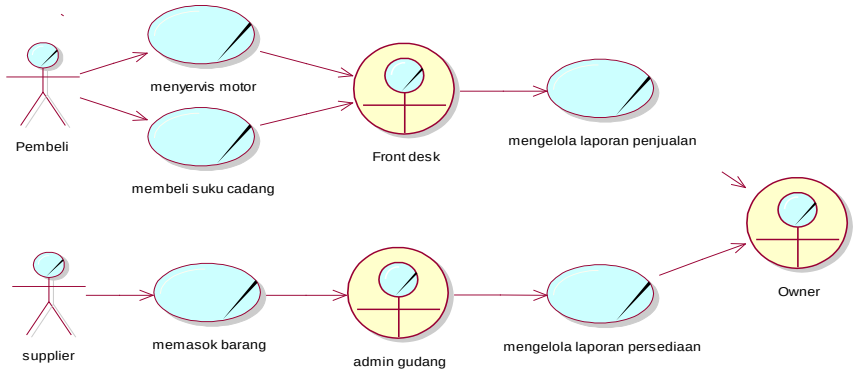

Figure 1. ***Business Use Case Diagram***

Business use case have used attributes which are actor, worker, and business use case. In this system, the involved actor is buyer, while worker is Storage Admin, Owner, and Front Desk. Next is picture of Business Use Case for management stock inventory process at PT.XYZ. After acknowledge Business Use Case Diagram above, then writer is focusing on bookkeeping of in and outcome of goods which involves storage admin and owner.

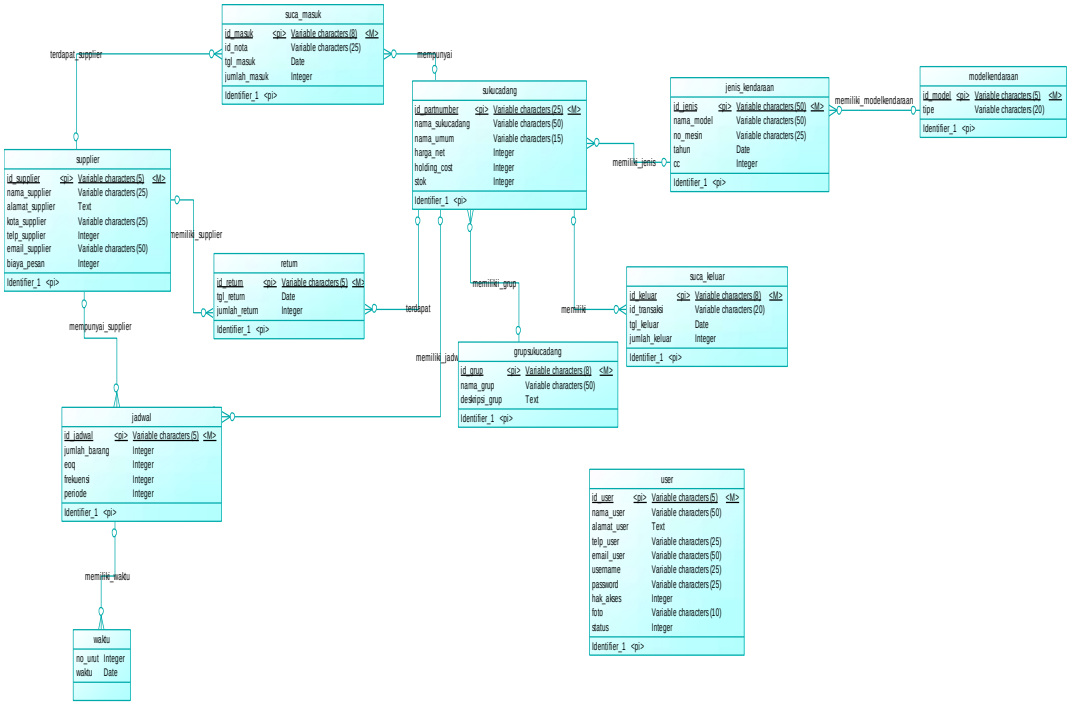

Figure 2. ***Conceptual Data Model***

Based on picture above, here is explanation of each entity and relation between in the system :

a. *User*

User entity is an entity contain of user data involves in the system, that is id_user stand for users' id, nama_*user* for user's name, alamat_*user* for user's address, telp_*user* for user's telephone number, email_*user* for user's email address, username contain of id used by user to enter system, password for password used by user to enter system with username, access right is right granted to user (Storage Admin and Owner), photo consists of photos' url of each user and status contain of activity status of each user (active and inactive). User entity stands alone or include strong entity because it does not depend on another entity.

b. Supplier

Supplier entity is an entity contained with goods supplier data which is id_suppplier (primary key) which contains supplier code, nama_supplier contains of suppliers' name, alamat_supplier contains of supplier's full address, telp_supplier contains supplier's telephone number, email_supplier contains supplier's email address, and order expenses contains of delivery fee price from supplier to workshop. Supplier entity stands alone or include as strong entity because it does not depend on another entity. Supplier entity have many relation with other entity, one of them relation named one to many with entity suca_masuk (incoming goods data collecting) because one supplier can supply one or many goods related to supplier or relation name one to many with return entity (return purchasing record) because one supplier can involves in return process once or more, and relation get supplier or relation name one to many can have one or many order scheduling because one supplier can supply many goods.

c. Spare Part Group

Entity for spare parts groups or spare part group is an entity which contain of spare part group data, that is id_grup (primary key)which contain group code of spare part and groups' description contain of description of spare parts group.

d. Vehicle Model

Entity for vehicle model or vehicle model

Is entity contain of vehicle model data which is id_model (primary key) contain of vehicle model code and type contain of type of vehicle

e. Type of Vehicle

Entity for type of vehicle of vehicle type

is an entity contain with vehicle type data which is id_jenis (primary key) which contain of type of vehicle code, nama_model contain of name of vehicle type, no_mesin contain of engine code of the vehicle, year for year of the vehicle, and cc for number of cc of each vehicles.

f. Spare Parts

Entity for spare parts or spare part that is entity contain with spare parts data which is id_partnumber (primary key) which contain spare part code, nama_sukucadang for spare parts name, nama_umum for market term for spare parts, harga_net for selling price of spare parts, stock for number of spare parts available in the storage, and holding cost contain of storage expenses percentage of each spare parts including storage admin expenses and spare parts maintaining expenses. Spare part entity is not independent or include in weak entity for dependent on other entity such as having relation on type of vehicle entity and have group from entity _sukucadang.. Spare part entity also becoming parent entity for other entities such as

relation having or relation one to many with suca_keluar entity (out goods record) because one goods can have one or more out goods data, having relation _jadwal or relation one to many with schedule entity (order schedule record) because one spare parts can have ome or more order schedule for next periods, relation having or relation one to many with return entity (return spending record) because one spare part can involve in return process once or more and relation having or relation one to many with suca_masuk entity (in goods record) because one spare part can be supplied by supplier once or more.

g. Out Inventory Data

Entities for out goods data or suca_keluar is entity contain out goods data which is id_keluar (primary key) consist of out goods data code, id_transaksi contain receipt code, tgl_keluar for date when the goods is out and jumlah_keluar for number of out goods on that date. Entity suca out is not independent or include weak entity because it is dependent on other entity such as having relation with spare part entity.

h. In Inventory Data

Entity for in goods data or suca_masuk is entity contain with in goods data which is id_masuk (primary key) which contain of in goods data code, id_nota for purchasing notes code, tgl_masuk for in goods dates, and jumlah_masuk for number of goods enter store. Suca_masuk entity is not independent or include in weak entity because it is dependent on other entity such as having relation with entity sukucadang and relation with _supplier of supplier entity.

i. Return Purchasing

Entity for purchasing return data or return is entity contain of purchasing return data which is id_return (primary key) which consist of purchasing return data code, tgl_return for dates of purchase return, and jumlah_return for number of purchase return item. Return entity is not independent or include in weak entity for it depend on other entity such as relation with sukucadang entity and having relation with _supplier from supplier entity.

j. Schedule

Entity for order schedule data or schedule is entity contain with order schedule data which is id_jadwal (primary key) which contain of scheduled order data, jumlah_barang for number of needed goods on scheduling process, eopq which contain calculation result of Economic Order Quantity or number of order for each order, frequency consist of number of order frequency in a period and period consist of interval of each order. Schedule entity is not independent or include in weak entity because it depend on other entity such as having relation with _jadwal from sukucadang entity and having relation with _supplier from supplier entity. From scheduling, there is order time in form of dates, so that schedule entity also be parent entity for another entity such as having relateion with _waktu or one to many relation with time entity.

k. Time

Entity for time of scheduling order or

time is entity contain with time details of scheduled order which is id_jadwal (foreign key) which consists of scheduled data code, no_urut for scheduling serial number, and time contain time of each order in dates. Time entity is not primary key and is not independent or include in weak entity because it depend on other entity such as having relation _time with schedule entity.

Testing Scenario

Steps of Economic Order Quantity methods will be described in this research as follows:

1. Set of datas which will be testing as below

a.Goods name data
b. Goods detailed purchasing price
c.Order expenses
d. Storage expenses percentage
e.Number of spare part needed in one year period

2. Next step is counting number of order (Q*)
using spare part purchase price variable, order expenses and number of spare part needed in a one year period.
3. After counting Q*, next step is counting
order frequency (F*).
4. Last phase is counting periode or time
range between orders (T*)

RESULT AND DISCUSSION

Method Testing Using System

In this case order schedule is using Economic Order Quantity method. Net is an example of order schedule case using Economic Order Quantity method which will be implemented into program:

Problem sample

In next year, the xyz company need Gear Comp Kick Spindle raw materials as much as 240.000 unit to a supplier PT Degan Hijau. Price of the raw materials per unit is Rp.2.000, order expenses for each order is Rp 150.000, while storage expenses is 25% of average value per spare part.

a. How many number of most economic order ? (*Economic Order Quantity*)?
b. How many order must be made in a year?
c. How many days once a year company do order (with work days asumption a year = 366 days)?

Based on case sample above, then user
must input suppliers' name, spare part, and number of items in to added data formthen system will take price of spare part from in goods data, order expenses from supplier data, and goods storage expenses percentage from spare part data for calculation method. After that system will give output in form of number of spare part order, order frequency, period of order and schedule order. For added data form can be seen in Figure 3.

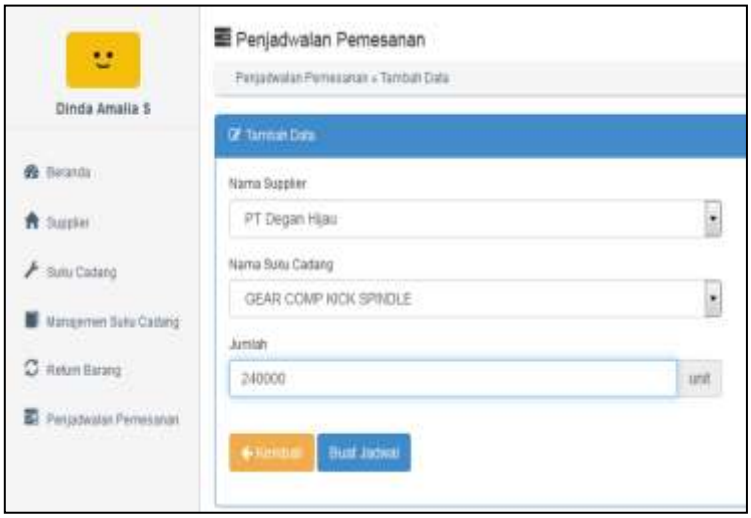

Figure 3. Appearance of Added Scheduled Data Form for Method Testing

Based on Picture above, it is known that selected supplier is PT Degan Hijau by number of order 240.000 unit for Gear Comp Kick Spindle spare part. After user click "buat jadwal" then system will display calculation report and scheduling order as shown on Figure 4.

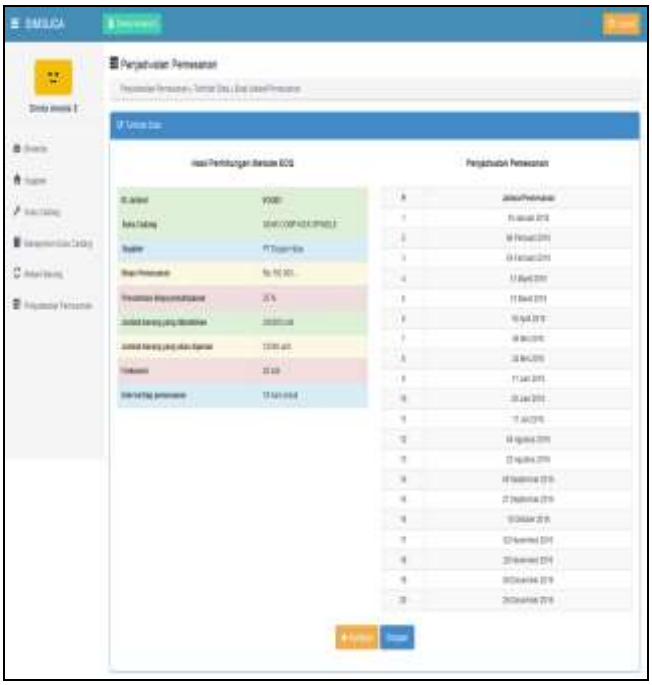

Figure 4. Calculation Result on *Economic Order Quantity* Calculation method and Scheduled Order

Based on picture above, then output of calculation method produced is : *Economic Order Quantity* : 12.000 units.
Order Frequency : 20 times a year.
Period : one in 18 days.

Method Testing Manually

Based on method testing in program as been described above, then it is necessary to test the methods manually using similar data.

Result of Method Calculation Manually is:
S = Rp150.000,-
D = 240.000 units
h = 25% or 0,25
C = Rp2.000,-
Result:

a. $Q^* = \sqrt{\frac{2SD}{hC}}$

$Q^* = \sqrt{\frac{2x150000x240000}{0,25x2000}}$

$Q^* = \sqrt{144000000}$

$Q^* = 12.000$ unit

b. $F^* = \frac{D}{Q^*}$

$F^* = \frac{240000}{12000}$

$F^* = 20$

c. $T^* = \frac{\text{Jumlah hari kerja dalam setahun}}{F^*}$

$T^* = \frac{360}{20}$

$T^* = 18$

So, at PT.XYZ they can do order as many as 20 times a year with interval between order for 18 days and number of order as much as 12.000 unit for each order.
After known that order frequency is done 20 times in a period or interval between order 18 days so first schedule can be done in January 19th 2016 (18 days from January 1st), second schedule is February 6th 2016, third schedule February 24th 2016, fourth schedule March 13th 2016 etc until last schedule is December 26th 2016.

Table 1. Scheduled Order Table

No.	Scheduled Order
1	January 19th 2016
2	February 6th 2016
3	February 24th 2016
4	March 13th 2016
5	March 31st 2016
6	April 18th 2016
7	May 6th 2016
8	May 24th 2016
9	June 11th 2016
10	June 29th 2016
11	July 17th 2016
12	August 4th 2016
13	August 22nd 2016
14	September 9th 2016
15	September 27th 2016
16	October 15th 2016
17	November 5th 2016
18	November 20th 2016
19	December 8th 2016
20	December 26th 2016

Based on table above, it is concluded that method testing result in program suit with method calculation manually.

CONCLUSION

From research discussion done above by using Economic Order Quantity method on Scheduled Order Goods, it is concluded as follows:

a. By using Economic Order Quantity method, goods order process can be done more by scheduling

b. Scheduled order shown by system can be a guide for Storage Officer to conduct goods order to supplier.

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