DISTRIBUTION SYSTEMS OF HEALTH SERVICES WITH APPROACH SUPPLY CHAIN MANAGEMENT ON CV.INSAN MUTIARA

Puji Sulastri[1], Tati Harihayati Mardzuki[2]

[1,2]Teknik Informatika – Universitas Komputer Indonesia
Jl. Dipatiukur 112 – 114 Bandung
E-mail : pujisulastri665@gmail.com[1], tati.harihayati@email.unikom.ac.id[2]

ABSTRACT

CV.Insan Mutiara is a company that is engaged in the business of health care supplies for the needs of the hospital laboratory and radiology equipment specifically, like a syringe, infusion sets, lancets, needle, ultravist, x-ray, USG and urinary drainage bag. CV.Insan Mutiara also provides medical tool rental services with the term KSO (Operational Partnership), where KSO is a way of providing a medical tool without having to buy the item. Problems that often occur in the CV. Insan Mutiara is the head of procurement section procurement based on intuition and done in a two-week period that resulted in lack or excess inventory stock in the warehouse as well as head of the Department transportation and technician of airfreight in doing to fulfill orders of goods to customers allows the occurrence of errors in estimating the time and track the shipment and allows delivery delays. CV. Insan Mutiara require a distribution system of health care equipment using the supply chain management. method to do planning ordering goods using single moving average. The methods used in the analysis of monitoring inventory items namely safety stock, as for scheduling of delivery products using the business rules of the company. Results of the testing system that is built testing the blackbox, UAT (User Acceptance Testing) and end user acceptance scenarios it can be concluded that the system is already helping the head of Procurement in determining the amount of products to be ordered to the supplier on the basis of the existing stock in the warehouse, and allows the head of the Department transportation and technician preparation of the schedule of delivery products.

Keywords : procurement, distribution, supply chain management, make-to-stock, single moving average, safety stock.

1. INTRODUCTION

CV.Insan Mutiara is a company engaged in the business of healthcare equipment for the needs of hospitals and laboratories, especially radiological equipment, such as syringe, infusion set, lancets, needle, test tube, tube rack, ultravist, mikropipet, x-Ray, ultrasound film, and urinary drainage bag. CV.Insan Mutiara also provides medical equipment rental services under the term KSO (Oprational Partnership), where this KSO is a way of providing medical equipment without having to buy the goods, the cooperating party only need to provide room with the standard required by the tool.

CV.Insan Mutiara using make to stock strategy is the procurement of goods to suppliers made to make stock of goods in the warehouse as a stock before order from customers received. Based on the interview with Mr. Prasetyo Putra as Head of Procurement Department stated that at this time CV.Insan Mutiara has five medical equipment suppliers consisting of PT.Jayamas Medika Industri, PT.Zaprihos, PT.Cahaya Restu Pratama, PT.Rajawali Medika Mandiri, And PT.Indolab Utama, but there are some suppliers who send different types of goods with brands, for example ultrasound film supplied by PT.Zaprihos with Agfa brand and PT.Cahaya Restu Pratama with the brand of Century, between the two brands have different quality, so Resulting in the accumulation of certain brands of goods, while in the procurement of goods to suppliers made intuition based, procurement of goods carried out with a period of two weeks once a month, so both of them have an impact on stock inventory in the warehouse becomes excessive or lack.

Based on the results of interviews with Mr. Muhammad Yusuf as Head of the Department of Technician and Transport stated that CV.Insan Mutiara has two units of vehicles consisting of one unit of box cars and one motorcycle unit, the distribution of goods to customers is done every working day with two shipment ie morning And afternoon. The Head of Technician and Transport Department shall arrange the delivery schedule to fulfill the customer's order and in the process of arranging the delivery schedule allows for a mistake in estimating the time and delivery path so that it may be detrimental to Technician and Transportation Section in the delivery of goods, as happened in June 2016 Section of Technician and Transportation made a mistake in arranging the delivery schedule, resulting in the delay of delivery time and the Section of Technician and Transportation is required to make the delivery outside the operational hours of delivery of

goods and get some complaints from the regular customers CV.Insan Mutiara.

Based on the problems that exist then needed a development of distribution system of health care equipment with Supply Chain Management approach on CV.Insan Mutiara. Based on the problems studied, the purpose of this final project is to build Distribution System of Health Service Equipment with Supply Chain Management Approach on CV.Insan Mutiara.

While the objectives to be achieved in this study are:

1. Facilitate the Head of Procurement Division in determining the amount of goods to be ordered to the supplier based on existing stock in the warehouse.
2. Facilitate the Chief Technician and Transport in the preparation of delivery schedule of goods.

1.1 Information System

There are several definitions of information systems, information systems are a combination of working procedures, information, people, and information technology organized to achieve goals within an organization. Information Systems is a set of formal procedures in which data are grouped, processed into information, and distributed to users.[2]

From some of these definitions, it can be concluded that the information system includes a number of components (human, computer, information technology, and work procedures), there is something processed (data into information), and is intended to achieve a goal or goal.[2]

1.2 *Supply Chain Management*

Supply chain is a network of companies that work together to create and deliver a product to end users. These companies usually include suppliers, factories, distributor or retail stores. [3]

1.3 Supply Chain Management Flow

There are 3 Flow in the supply chain are: [3]

1. The flow of goods flowing from upstream (downstream) to downstream (Downstream).
2. The flow of money and the like that flows from downstream to upstream.
3. The flow of information that can occur from upstream to downstream or vice versa.

The following is a simplified supply chain model:

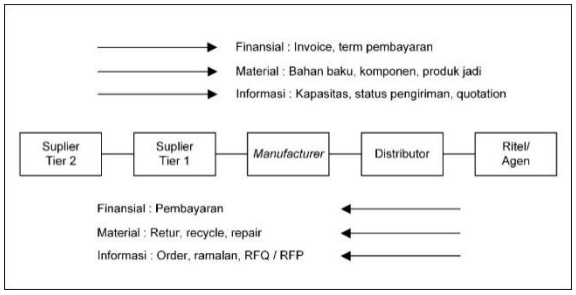


Figure 1 Simplification of supply chain model and 3 kinds of managed flow

1.4 Distribution

Distribution is delivering the product to reach the customer's hands at the right time and place. Delivery of products to customers or end users certainly involves transfortation activities. Which companies Providing transportation services, warehousing, etc. are often referred to as 3PL or thrid party logistic service providers. Scope of distribution activities, companies should be able to design the right distribution network. Decisions on the design of distribution networks should consider tradeoffs between cost aspects, flexibility aspects, and responsiveness to customers. [3]

1.5 Forecasting

Forecasting the demand for future products and services and their units is critical in production planning and supervision. A forecast has many meanings, so the forecasting needs to be planned and scheduled so that it will take a period of time of at least within the time period required to make a policy and establish some things that affect that policy. Forecasting is required in addition to predict what will happen in the future as well as decision makers need to make the planning.

1.5.1 Single Moving Average

Single Moving Average or single moving average method uses some actual data of new requests to generate predictive values for future demand. This method will be effectively applied if we can assume that the market demand for the product will remain stable over time. This method has two special properties that is to make forecasts require data.
Historically over a period of time, the longer moving averages will result in a smoother moving average, a systematic moving average can be calculated by equations 1.1.

$$S_{t+1} = \frac{x_t + x_t - 1 + \cdots + x_t - n + 1}{n} \quad (1.1)$$

Information:

S_{t+1} = *Forecast* for period *t+1*.
Xt = Data in period t.
n = Duration Moving Average Mean Squared Error (MSE)

1.5.2 Calculating Forecasting Errors

Accuracy or precision is a criterion for testing the performance of a forecasting method. To test the performance of forecasting that will be used required forecasting error size. The best forecasting method is the method that gives the least error rate compared to other methods. There are many models for calculating forecasting errors. The following best forecasting selection criteria consists of:

1. Mean Squares Error (MSE)

Mean Squared Error (MSE) is the mean of forecasting error squared and can be seen in equation 1.2.

$$MSE = \frac{\sum(|X_t - F_t|)^2}{n} \quad (1.2)$$

MSE = Value of mean squared error

X_t = Actual data in period t

F_t = Forecast data of the model used in period t

n = Many predicted data

1.6 Safety Stock Technique

Security inventory or safety stock serves to protect errors in predicting demand during lead time. The security supply will work if the actual demand is greater than the average value [3]. To get an idea of how uncertain the demand during the lead time is, the company needs to collect data to get its distribution. The formula to find the value of safety stock can be seen in equation 1.3.

Safety Stock = Z x Sdl (1.3)

Where,

Z = Service Level (Company's ability to serve requests or translated from management decisions)

Sdl = determined from the uncertainty of demand with the provisions can be seen in Figure 2

variabel		
Permintaan	Sdl = $Sd \times \sqrt{(l)}$ *Safety Stock* ditentukan oleh ketidakpastian permintaan.	Sdl = $\sqrt{(d^2 \times Si^2 + l \times sd^2}$ *Safety Stock* ditentukan oleh interaksi dua ketidakpastian.
konstan	Tidak diperlukan *safety stock*, situasi deterministik ($S_{dl} = 0$).	Sdl = $d \times sd$ *Safety Stock* ditentukan oleh ketidakpastian *lead time*.
	konstan	variabel
	Lead Time	

Figure 2 Interaction between demand and lead time on the determination of safety

1.6.1 Make To Stock

Make to stock is a system where DP is in the last process, that is delivery of goods to the customer. The make-to-stock system will be suitable for functional products of slight variation and uncertainty of relatively low demand. Because the environment make to stock customers buy directly from the available stock, the level of customer service is determined from the presence or absence of stock of goods. A key aspect that needs to be taken into account in managing the supply chain operating in the make-to-stock environment is the determination of how and where the final product inventory should be stored and how the mechanism or delivery rules of the finished product to a marketing area. [3]

1.7 Database

The database is a collection of data that are interconnected with each other, stored on computer hardware and used software to manipulate it. The data needs to be stored in the database for the purpose of providing more information. Data in the database should be organized in such a way, so that the resulting information quality. [4]

2 RESEARCH CONTENTS

2.1 Model Supply Chain Management on CV.Insan Mutiara

Result of the analysis *supply chain management* that has been explained, as for the model *supply chain management* on the CV.Insan Mutiara can be seen at Figure 3.

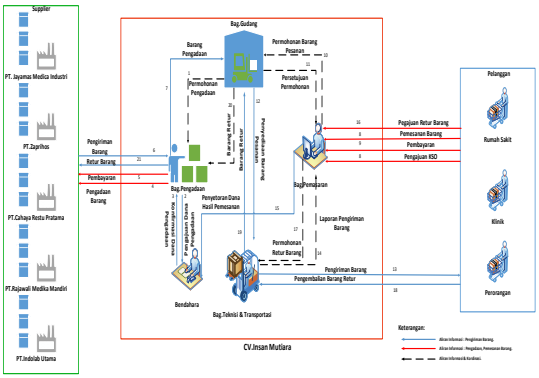


Figure 3 Model *Supply Chain Management*

2.1.1 Analysis *Supply Chain* on CV.Insan Mutiara

Analysis *supply chain* done to describe the process *supply chain management* to be constructed on the CV.Insan Mutiara based on model previously created.

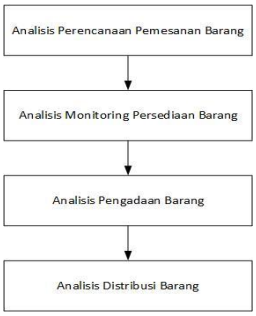


Figure 4 Analysis Supply Chain on CV.Insan Mutiara

1. **Analysis planning for the reservation items**

Analysis planning for the reservation items done based on the actual data sales of goods the periode July to December 2016. Items used in this analysis, there are three types of Ultravist, Film USG, dan X-Ray Film 35x35 cm CP-U, with brand Agfa and Century because that items the higest level of sales. Forecasting method does is single moving average. Part of responsible at this stage is part of procurement.

Table 1 Sales Data Ultravist

No.	Periode Penjualan	Data Aktual Penjualan Ultravist Merk Agfa	Data Aktual Penjualan Ultravist Merk Century
1.	July	10 box	21 box
2.	August	10 box	-
3.	September	-	10 box
4.	Oktober	10 box	20 box
5.	November	18 box	-
6.	December	-	15 box

Forecasting results for January 2017 sale of goods Ultravist with Agfa brand is a period of 3 months 10 boxes 5 month period 8 boxes, as well as forecasting the sale of goods Ultravist with the Century brand is a period of 3 months 12 boxes 5 month period of 5 boxes.

2. Inventory Monitoring Analysis

Analysis of inventory monitoring used on CV.Insan Mutiara that is using safety stock, with result of calculation of CV.Insan Mutiara must provide safety stock of ultravist goods with agfa brand that is 1 box.

3. Procurement Analysis

Procurement analysis on CV.Insan Mutiara is done based on monitoring result of goods inventory. Procurement Section must make procurement to supplier. Procurement results conducted during the period of January 2017 that can be seen in Table 2.

Table 2 Number of Items to Order

Name of goods	Brand	Forecasting Results	Safety Stock	Remaining stock	Results
Ultravist	Agfa	8	1	10	-
	Century	9		1	9 box
Film USG	Agfa	12	1	4	9 box
	Century	1		8	-
X-Ray Film 35 x 35 cm CP – U	Agfa	3	1	2	2 box
	Century	3		5	-

4. Analysis of Goods Distribution

Delivery of goods is done by order by the customer. Delivery of goods on CV.Insan Mutiara done by Technician and Transportation Section. The number of vehicles in the CV.Insan Mutiara there are 2, namely: one box car with a weight of 1200 Kg and one motorcycle with a payload weight of 20 Kg. If there is an order by the customer then the Technician and Transportation Section will schedule the delivery of the goods.

2.1.2 Entity Relationship Diagram *(ERD)*

Entity Relationship Diagram (ERD) On CV.Insan Mutiara built can be seen in Figure 5.

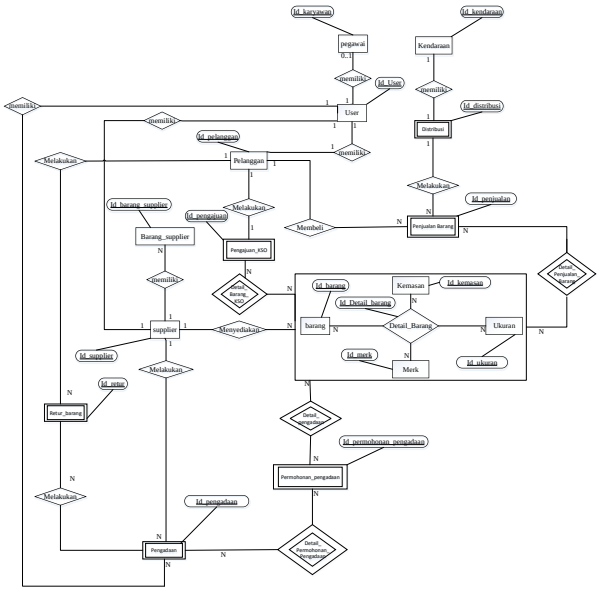


Figure 4 *Entity Relationship Diagram* Distribution System

2.2 Context Diagram

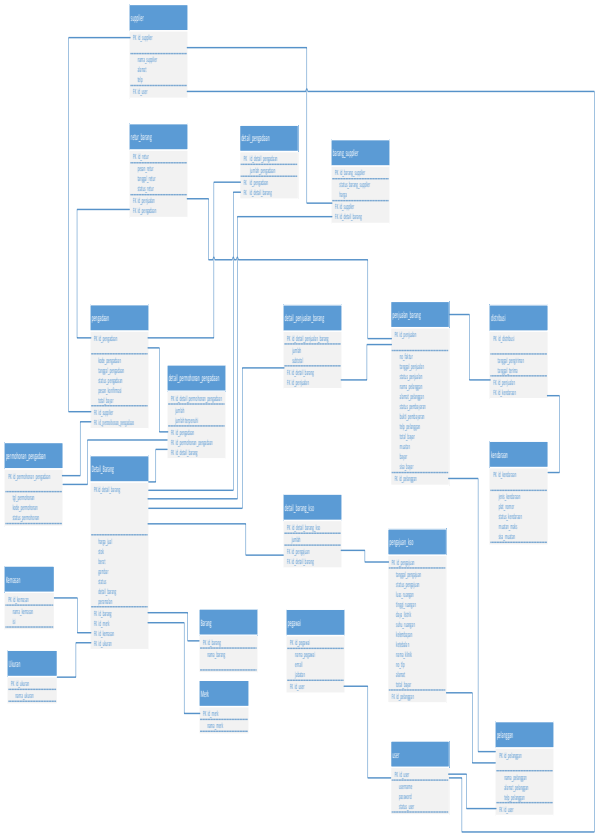
Context diagram is a model to explain the overall flow of data. Context diagram on the system can be seen in Figure 6.



Figure 5 Context Diagram Distribution System CV. Insan Mutiara

2.3 Relation Diagram

Relationship diagram on CV.Insan Mutiara can be seen in Figure 7 as follows :



Gambar 7 Ralation Diagram Distribution System of CV.Insan Mutiara

2.4 Menu Structure Design

The design of the menu structure is used to describe any menu that can be accessed on the system. The menu structure on the system to be created is divided by user, consisting of Director, Treasurer, Procurement Section, Warehouse Section, Marketing Section, Technician and Transportation Section, Supplier, and Customer. The following design of warehouse menu structure can be seen in Figure 8

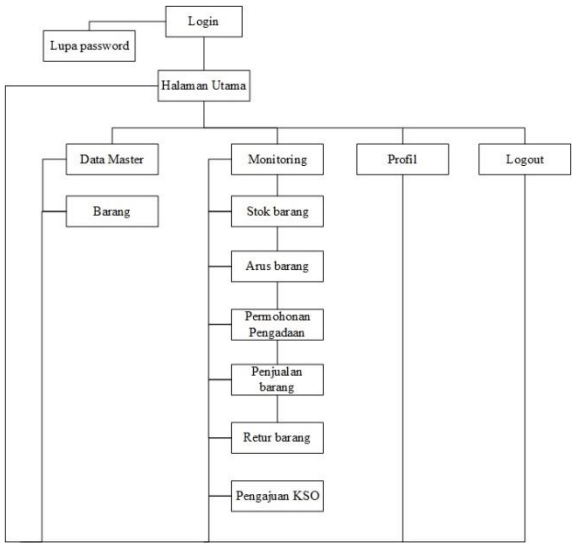


Figure 8 Menu Structure Parts Warehouse of CV.Insan Mutiara

2.5 Procedural Design

Procedural design is used by providing a series of sequential commands. The procedural design on the system to be built can be seen in Figure 9 flowchart login of CV.Insan Mutiara as follows:

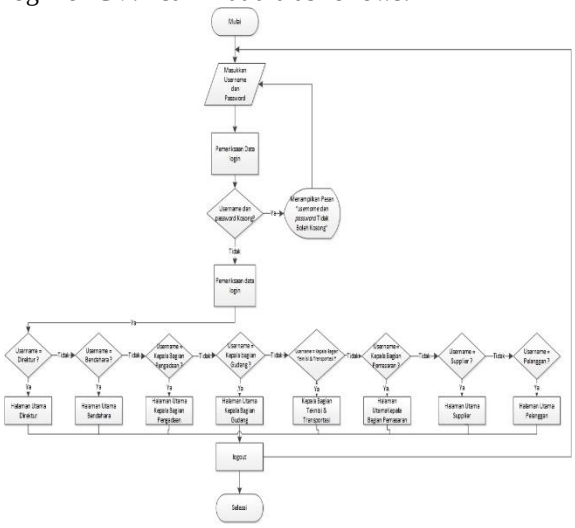


Figure 9 Flowchart Login of CV.Insan Mutiara

2.6 System Testing

The system testing is the most important thing that aims to find errors or deficiencies in the system being tested. Testing intends to know the system created has met the performance in accordance with the design objectives.

The test plan is done by testing the system built functionally (black box). First functional testing (black box) focused on testing the functional requirements of information systems built. Functional testing involves how well the system performs its functions, including user commands, data manipulation, search and business processes, screen users and integration. Both tests are focused on user acceptance by using UAT (User Acceptance Testing) which aims to find new defects not found by the developer and in the process of testing the software involves the potential users who are in the company selected by Developers and accompanied when testing.

2.6.1 Case of Test Result

Testing is done by testing each process for possible errors that occur. Examples of test results can be seen in Table 1 and Table 3 below:

Table 3 Login Testing

Cases and Test Results (True Data)			
Input	**Which are expected**	**Observation**	**Conclusion**
Sample insert Username: Customer Password: Customer	Fill in login data already registered.	The login data is correct and will go into each interface according to login permissions.	[√]be accepted [ ] rejected
Cases and Test Results (Wrong Data)			
Sample insert Username: Users Password: Abcde	Go back to the login menu	The system returns to the login menu	[√]be accepted [ ] rejected
Cases and Test Results (Empty Data)			
Sample insert Username: Password:	A warning message appears to fill in an empty field	A warning message appears to fill in an empty field	[√]be accepted [ ] rejected

3 CLOSING

3.1 Conclusion

Based on the results obtained in the writing of this thesis, it can be concluded as follows:

1. The information system built this can facilitate the Head of Procurement in determining the amount of goods to be ordered to the supplier based on existing stock in the warehouse.
2. The information system built this can facilitate the Head of Technician and Transport in the preparation of delivery schedule of goods.

3.2 Suggestion

Based on the results of testing the system, obtained some suggestions that can be taken into consideration. Suggestions that can be considered for system development include at the time of interview to the the head of the Department transportation and technician of CV.Insan Mutiara argued, among others:

1. The distribution system needs to be developed by showing the delivery location and choosing the delivery route.
2. This distribution system needs to be developed by using e-commerce system.

LIBRARY

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