

IMPLEMENTATION OF SUPPLY CHAIN MANAGEMENT INFORMATION SYSTEM (SCM) IN CV. ELASTICO7

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ABSTRACT

CV. Elastico7 is one of the companies engaged in the convection. CV. Elastico7 use strategies that make to stock their production process prior to booking. Company CV. Elastico7 produce four types including Baselayer Baselayer Long Sleeve, Short Sleeve, Long Pants and Short Pants. Baselayer is the flagship product from CV. Elastico7. Based on sales data in the CV. Elastico7 experienced ups and downs or fluctuating, it is due to the uncertainty of customer ordering. Marketing department stated that the process of distributing the product often experience problems with the amount of product needed longer than the time which had been estimated earlier resulting in delays in the delivery process. Single Exponential Smoothing (SES) is a forecasting method that can be used to forecast product orders for the subsequent period which can be used to calculates the raw materials needed for production. Safety Stock as a safety margin to calculate the raw materials used for the supply of raw materials, to overcome delays when shipping companies limit the time for ordering a product that does not happen keterlamabatan for sending a predetermined order creates the synchronization and consistency.

Keywords : Supply Chain Management, single exponential smoothing, Safety Stock, Information Systems.

1. PRELIMINARY

CV. Elastico7 is one of the companies engaged in the convection. CV. Elastico7 use strategies that make to stock their production process prior to booking. Company CV. Elastico7 produce four types including Baselayer Baselayer Long Sleeve, Short Sleeve, Long Pants and Short Pants. Baselayer is the flagship product from CV. Elastico7.

CV. Elastico7 has 8 suppliers for raw materials with details of fabric, yarn, plastic, and paint (printing) .In the raw material ordering CV. Elastico7 has its own policy which is part of the warehouse to monitor the raw materials used every 1 month and report the number to the procurement of raw materials

and parts procurement will request approval for the procurement of raw materials to the owner for ordering raw materials to suppliers based on the report. In view of the data existing stocks of raw materials frequent vacancies and shortage of raw materials to meet production needs where product availability is influenced by the supply of raw materials in the warehouse. Ordering raw materials to suppliers committed to the supplier has a lag time of 1-3 days from the start of the booking is made up of raw material received by CV. Elastico7, after the raw material is received by the CV. Elastico parts warehouse provides raw materials to the production of manufactured into finished goods that will be given to the warehouse for the goods to be monitored, after the goods according to the warehouse will give the item to the shipping department for packing and shipped to customers.

The procurement process is done by monitoring the stock of existing supplies of raw materials warehouse. Based on sales data baselayer all size period June 2017 - November 2017 (Appendix A) that the sales data experienced ups and downs or fluktuatuif, this was due to the uncertainty of the booking of customers, sometimes the customer demand increases and sometimes decreases. At the time of the booking of customers rose to a shortage of raw material supply to the contrary at decreasing customer demand can lead to excess stocks of raw materials.

Marketing departments are no difficulties in the process of distributing the products often experience problems with the amount of product to be delivered often have a mismatch with customer demand. Due to the number of products made at time of booking holidays and deliveries are made during working hours. This resulted in the delivery of the required duration longer than the time that has been estimated previously that delays in the delivery process.

These problems can be overcome by using a system of Supply Chain Management, Supply Chain Management for the function itself is a complete processing cycle chain from the suppliers, the operations of the company, continued to distribution

to end users. The aim is that the management of product flow or the raw material and the flow of information in the company, from the receipt of the booking of customers, product procurement, acceptance of the products until their delivery to the customer will create the synchronization and consistency.

2. CONTENTS OF RESEARCH

2.1 Information System

The information system is a system within an organization that brings Daily transaction processing needs that support the operations function managerial organization of the activities of an organization to be able to provide to outside parties specified by the report - laporan required [1].

2.2 Supply Chain Management

Supply Chain Management is a method or an integrative approach to managing the flow of products, information, and money through the supply chain involving parties from upstream to downstream consisting of supplier, factories, distribution networks and logistics services. Supply chain there are usually three kinds of streams that must be managed. The first is the flow of goods flowing from upstream (upstream) to downstream (downstream) [2].

2.3 Forecasting

According to Spyros Makridakis Forecasting (forecasting) is predictive values of a variable based on the known value of the variable or variables related. Predict can also be based on skills assessment, which is in turn based on historical data and experience.

If viewed in terms of time, the purpose of forecasting can be seen as follows [4]:

1. Short-term (Short Term)

Determining the quantity and timing of the items used as production. Usually daily or weekly and are determined by Low Management.

2. Medium Term (Small Term)

Determining the quantity and timing of production capacity. Usually monthly or quarterly and is determined by the Middle Management.

3. Long Term (Long Term)

Planning the quantity and timing of the production facilities. Annual usually 5 years, 10 years, or 20 years and are determined by the Top Management.

Classification of forecasting is the identity of the forecast itself. Forecasting has two classifications forecasting of them as follows [4]:

1. Forecasting based completion techniques include:

a. Qualitative Forecasting Techniques

Forecasting involving personal opinion, expert opinion, Delphi method of market research and others. Aiming to combine all the information obtained logically, unbiased and systematically linked to the interest factor of decision makers.

b. Quantitative Forecasting

Quantitative forecasting used at past data is available. Some quantitative technique that is often used as Time Series Models and Causal Model.

2. Forecasting Based on Time Horizon Grouping

a. Long-Term Forecasting

Forecasting forecasting a period longer than 24 months, for example forecasting required in relation to the production budget.

b. Medium-term forecasting

Forecasting the forecasting period between 3-24 months, for example forecasting for sales planning, planning and production budget.

c. Short-Term Forecasting

Forecasting the forecasting period less than 3 months, for example forecasting in conjunction with materials purchase planning, work scheduling and assignment.

2.3.1 Single Exponential Smoothing

Single Exponential Smoothing Methods used in conditions where the weight of the data in the period differs from the data in the previous period and form exponential function. This method always follow every trend in the data is actually because he can do no more than regulate the upcoming forecast by a percentage of the last error. A determine the optimal approach requires several experiments [4].

If a historical data series X_t for $t = 1, 2, 3, \dots, N$ the exponential forecast data for the time data t is F_t . Exponential smoothing method developed from a simple moving average method. If data from observation t eat predictive value at time $t + 1$ can be calculated using equation (2.1) and (2.2) while for exponential calculations for N can be seen in equation (2.3).

$$F_{t+1} = \frac{x_1 + x_2 + \dots + x_t}{t} + \frac{1}{t} \sum_{i=1}^t x_i = 1 \times 1 \quad (2.1)$$

$$F_{t+2} = F_{t+1} + \left(\frac{1}{t} X T_{-1} - X_1 \right) \quad (2.2)$$

Exponential methods for N observations are as follows:

$$F_{t+2} = F_{t+1} \left(\frac{x_t}{N} - \frac{x_{t-N}}{N} \right) \quad (2.3)$$

Suppose a long observation X_{t-N} not available and should be replaced with a value approach (approximation). One possible replacement is the forecast value of the previous period F_t so it can be calculated by equation (2.4) and (2.5).

$$F_{t+1} = Ft + () \frac{Xt}{N} - \frac{Ft}{N} \quad (2.4)$$

$$F_{t+1} = () \frac{1}{N} Xt + (1 -) \frac{1}{N} Ft \quad (2.5)$$

So the forecast value at time $t + 1$ depends on the weighted value of the observation time t , the weighting value and the forecast is $1 - a$ a value between 0 and 1. When the $1 / N = a$, it can be calculated by equation (2.6).

$$F_{t-1} = aX_t + (1 - a)F_t \quad (2.6)$$

Information

F_{t+1} = Result forecast for period $t + 1$

a = Constant smoothing

X_t = Data demand Actual for period t

F_t = Forecast in period t

Data Exponential smoothing method a value can be determined freely, meaning there is no sure way to get a optimal value. a value, the election was done by trial and error. a magnitude lies between 0 and 1.

2.3.2 Mean Square Error (MSE)

Mean Squared Error (MSE) which is the average of the squared forecasting error and can be seen in equation (2.11).

$$MSE = \frac{\sum(Xt - Ft)^2}{n} \quad (2.11)$$

Information

X_t = The actual data in period t

F_t = Data predictions of the model used in period t

n = Lots forecast yield data

2.4 Monitoring

Monitoring is the collection of information continuously and regularly to help answer questions about the project or activity. Monitoring helps remind when something goes wrong and help keep the work on track [5].

2.5 Safety Stock

Booking an item until the item came necessary period of time varying from a few hours to months. The time difference between when the book until the item came known as the grace period (Lead Time). Lead times are influenced by the availability of goods ordered and the distance between the location of the buyer and supplier. Erratic grace period resulted in a shortage of goods, for example due to the use of goods is greater than previously thought, and therefore requires a persediaan safety (safety stock) [6].

Safety Stock If set too low, supplies will run out before acceptable replacement supplies so that production can be disrupted or customer demand can not be met.

Formulas safety stock (safety stock) can be calculated by equation (2.13).

$$SS = \text{Pemakaian rata - rata periode sebelumnya} \times LT \quad (2.13)$$

Information :

SS = Safety Stock

LT = Lead Time (procurement of products from the supplier to the company)

2.6 Entity Relationship Diagram (ERD)

ERD is a graphical notation in conceptual data modeling that describes the relationship between storage (table). ERD used to model data structures and relationships among the data, we can examine the data by ignoring the process that must be done, and can know what data we need, and how these data can be interconnected.

2.7 Data Flow Diagram (DFD)

Data Flow Diagrams or what is often referred to as the Data Flow Diagram, is a logical model of data or processes are created to describe where the origin of the data and where the purpose of the data coming out of the system, where data is stored, what processes generate data and interaction between the stored data and processes imposed on the data.

DFD describe in detail the sequence of steps of each process described in the data flow diagram. DFD is synonymous with a bubble chart, graph transformation, and process models.

2.8 Analysis of the Problem

Problems that exist in the CV. Elastico7 among others:

1. Procurement Section assist in planning the procurement of raw materials to the supplier so that customer requests are met, as well as avoiding excess and shortage of raw material stocks.
2. Assist the Marketing Department in transferring product in order to avoid delays.

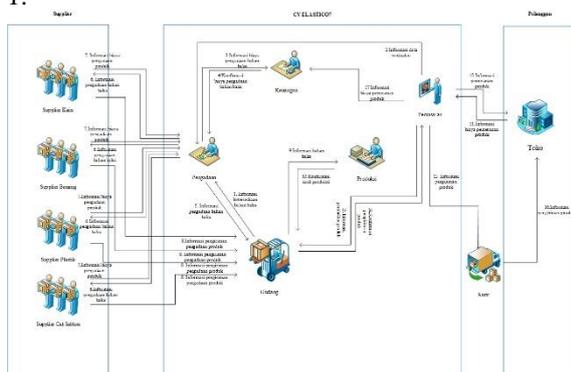
2.9 Analysis of Supply Chain Management

There are two streams that occur in the CV. Elastico7 namely the flow of goods and information flow. In the flow of goods there is a flow of raw materials and products. In information flow are the flow of product delivery or distribution of CV. Elastico7 to customers, delivery or distribution of the flow of raw materials from Supplier to CV. Elastico7, the flow of product orders from PelangganCV. Elastico7 and procurement of raw materials flow from CV. Elastico7 to Supplier. Within this scope CV. Elastico7 monitoring product inventory to determine the safety limit the number of products in warehouse, inventory control order to avoid shortages or void stock, monitoring the status of the order to the Customer and CV. Elastico7 can know pesenan status in the message from the customer, monitoring status is distribution. Distribution status is to determine whether the product is in transit or have been accepted. Things to do stage monitoring product inventory to warehouse safety stock that is using the

method to determine the safe limits which should be available in warehouse. The procurement of information flow that uses forecasting methods in order to estimate the number of products that will be made will not be missed.

In addition to the production system used by the CV. Elastico7 is push-based supply chain. Production systems, as this is a production system in which companies determine all of the products that will be produced before the booking, so the company made the production of the finished product to make stock or can be referred to as the make to stock and production processes that exist in the company is strongly influenced by the stock (inventory) existing product raw materials warehouse.

Based on the description of streams and production systems owned by CV. Elastico7 it can be suggested the use of supply chain management method on a system that will be created. In the method of supply chain management has a framework which is a component in the construction of the system being designed. The flow of Supply Chain Management at CV. Elastico7 can be seen in Figure 1.



Picture 1.Flow Supply Chain Management at CV. Elastico7

The information systems strategy Supply Chain Management approach that will be built in the CV. Elastico7 consists of several steps that can be seen in Figure 2

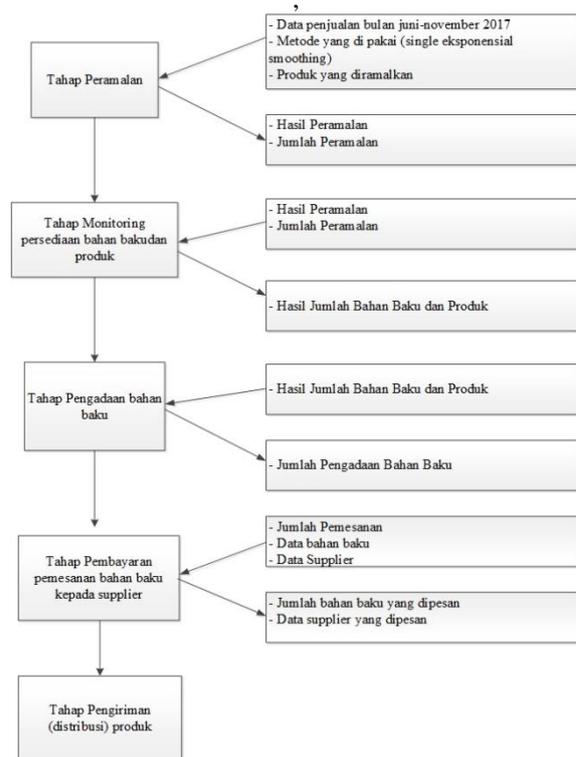


Figure 2.Stages of Supply Chain Management at CV. Elastico7

Based on Figure 2 on the state of supply chain management in the CV. Elastico7, then do an analysis of each of the stages in the company's Supply Chain Management CV. Elastico7 which is as follows:

1. stages Forecasting
CV. Elastico7 manage data demand products ordered by customers and foresee for the procurement of raw materials in the next month of product demand data 6 months earlier which requires a data request, using the method that will be used (single exponential smoothing). In addition the company will provide for production scheduling that will result in the timely production.
2. Stage monitoring inventories of raw materials and products
After doing the forecasting stage, enterprise monitoring product inventory in warehouse and determine what the safe limits of products should be available in warehouse. In addition, the company conducts control product inventory to avoid shortages / vacancy stock for the warehouse.
3. Phase Procurement of raw materials
After conducting phase raw material inventory, the company procures raw materials to the Supplier in accordance with the amount that has been predicted.
4. Stage payments to suppliers of raw materials
The Company determines the amount of raw materials to be ordered and the officer will determine Supplier ordered. And the finance

department will pay in accordance with the data that has been determined.

5. Stage delivery (distribution) to the customer
The company carries out delivery of products using a 3rd party services and adjust orders from customers that will be sent to the customer receives the product as per booking.

2.9.1 Stages of Sales Forecasting

Baselayer in predicting sales, there are several steps that must be done, namely as follows:

1. The smallest MSE value which will be used as a forecasting results for the next period.

Baselayer sales summary data in June 2017 until November 2017 is shown in Table 1.

Table 1. Sales recapitulation Baselayer

Month	total sale
June	124
July	294
August	416
September	186
October	366
November	684

For example, the calculation will be made in July 2017, then at least entered data is data for June 2017. Forecasting is done by taking the baselayer sales data in June 2017 to the month of November 2017 is shown in Table 1. The first step that must be performed to calculate the forecasting methods single Exponential Smoothing that determine the value of $\alpha = 0.1$ constants and forecast the demand for the 2nd time. The values of variables are taken from baselayer sales data in Table 1, and then distribute those values into the formula (2.6) it will get calculated as shown below:

The prediction for $\alpha = 0.1$:

Based on sales data baselayer in Table 1 and the prediction formula (2.6) in chapter 2, calculate the sales forecast for the month of July 2017. It is known that:

Baselayer sales in June 2017 (X_t) = 860 210 packaging and forecasting results in July 2017 (F_t) = 124,

So based on the formula (2.6) in chapter 2 obtained calculated as shown below:

$$\begin{aligned} F_{\text{juli}} &= (0.1 * 124) + (1 - 0.1) * 124 \\ &= (12.4) + (111.6) \\ &= 124 \text{ pcs} \end{aligned}$$

$$\begin{aligned} F_{\text{agustus}} &= (0.1 * 294) + (1 - 0.1) * 124 \\ &= (29.4) + (111.6) \\ &= 141 \text{ pcs} \end{aligned}$$

Having obtained the forecasting results, the next step is to look at the accuracy in predicting that has been done before. There are several methods to

calculate the accuracy of the error rate. One was used in this research is the MSE (Mean Square Error) formula (2.11) which has been described in CHAPTER 2. The results of MSE calculations for $\alpha = 0.1$ are as follows:

$$\begin{aligned} \text{MSE} &= (X_{\text{July}} - F_{\text{July}})^2 \\ &= (294 - 124)^2 \\ &= 28\,900 \end{aligned}$$

For the calculation error and $\alpha = 0.2$ to 0.9 is done in the same way.

2.9.2 Stages Raw Material Inventory Monitoring

Monitoring supply of raw material products aim to monitor and control the inventory of existing warehouse. This monitoring aims to avoid shortages and stock outs of existing products in warehouse owned by CV. Elastico7. The following methods were used for inventory monitoring Baselayer CV. Elastico7. Forecasting results for the month of December 2017 CV. Elastico7 must Baselayer production of 327 pcs. In production Baselayer require Fabrics, Yarn, Paint Sablon, and plastic as raw material.

Implementation methods *safety stock* or serves to protect the security of inventory errors in predicting demand during lead time. Application of Safety stock is used for this research is to forecast the supply of raw materials for the next month to be counted are the raw materials of the product types Baselayer such as fabrics, yarn, paint and plastic stencil drawn from the data ordering raw materials to suppliers previously. Calculation of safety stock can be seen in equation (2.13) described in chapter 2. Here's an example of using safety stock calculations.

- a. Calculation of the fabric raw material inventory.

Raw material usage previous period: 151 meters

Lead time: 3 days

Safety stock = average usage of the previous period x Lead time

$$\text{Safety stock} = 151 \times 3$$

$$\text{Safety stock} = 453 \text{ meters (in months)}$$

$$\text{Safety stock} = 453/30 = 15.1 \sim 16 \text{ meter (in days)}$$

So safety stock or inventory reserves of raw material fabric that should be available for the month of December 2017 amounted to 453 meterdalam warehouse 1 month or 16 meters per day.

- b. Raw material inventory count yarn.

The use of raw materials prior period: 9 pcs

Lead time: 3 days

Safety stock = average usage of the previous period x Lead time

$$\text{Safety stock} = 9 \times 3$$

$$\text{Safety stock} = 27 \text{ pcs (in months)}$$

$$\text{Safety stock} = 27/30 = 0.9 \sim 1 \text{ pcs (in days)}$$

Thus Safety stock or inventory reserves yarn materials should be available for the month of December 2017 by 27 pcs warehouse in 1 month or 1 pcs per day.

- c. Calculation of raw material inventory stencil paint.

The use of raw materials prior period: 2 grams

Lead time: 3 days

Safety stock = average usage of the previous period x Lead time

Safety stock = 2 x 3

Safety stock = 6 grams (in months)

Safety stock = 6/30 = 0.2 grams (in days)

Thus Safety stock or inventory reserves of raw materials paint stencil should be available for the month of December 2017 amounted to 6 grams warehouse in 1 month or 0.2 grams per day.

- d. Calculation of plastic raw material inventory.

Raw material usage previous period: 451 pcs

Lead time: 3 days

Safety stock = average usage of the previous period x Lead time

Safety stock = 451 x 3

Safety stock = 1353 pcs (in months)

Safety stock = 1353/30 = 45.1 ~ 46 pcs (in days)

Table 2. Summary of Results of Safety

Stock

Cain (Meter)	Yarn (Pcs)	Cat Sablon (Gram)	Plastics (Pcs)
16	27	6	46

Table 3. Raw Material Safety Stock Inventory

Raw Material Type	Stock Raw Materials	safety Stock	Status
Fabric	49	16	Secure supplies
Yarn	20	1	Secure supplies
Cat Sablon	11.1	0.2	Secure supplies
Plastic	1219	46	Secure supplies

2.9.3 Stages Raw Material Procurement

After forecasting the next stage of the procurement of raw materials to the supplier. The amount of raw materials that must be purchased to the supplier will be determined based on the results of forecasting has been done before.

Based on the results of forecasting CV. Elastico7 recommended procuring raw materials totaling 109

meters of fabric, 7 pcs yarn, 1.1 grams of paint stencil, and 327 pcs plastic to fulfill orders forecast in December 2017 as many as 327 pcs baselayer. So to determine the amount of the optimal procurement of raw materials in order to avoid the buildup of warehouse, be calculated as follows:

Number of proposed procurement of forecasting results = 654 meters

Time inventory in warehouse = 49 meters

Total procurement = (number of proposed procurement of forecasting results + safety stock) - the rest of the inventory in the warehouse

$$= (654 + 16) - 49$$

$$= 621 \text{ meters}$$

2:10 Entity Relationship Diagram (ERD)

The data will be used in the development process information distribution system in CV. Elastico7, can be seen in figure 3.

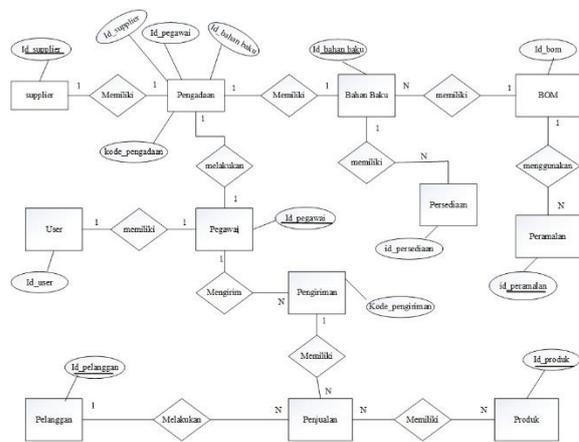


Figure 3.Entity Relationship Diagram Application Information Systems Supply Chain Management (SCM) at CV. Elastico7

2:11 Diagram Context

Context diagram is a diagram which serves to illustrate the flow of data between systems and external entities. Diagram context of this system can be seen in Figure 4.

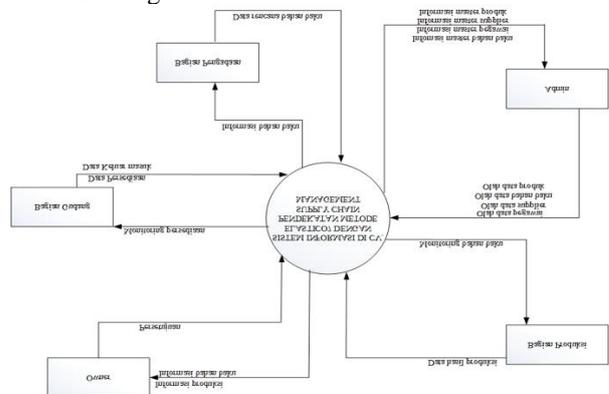


Figure 4.Diagram Context Implementation of Information Systems Supply Chain Management (SCM) at CV. Elastico7

