SUPPLY CHAIN SYSTEMS DEVELOPMENT IN CV. CETRA MERU BY USING SUPPLY CHAIN MANAGEMENT APPROACH

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ABSTRACT

CV. Cetra Meru is a company engaged in the service of convection design and digital printing that concept in the field of sublimation printing, especially for polyester fabric. As a company that runs in convection of course, makes the stock enough products to anticipate the purchase order of products by customers. CV. Cetra Meru has six suppliers of raw materials, among others, suppliers of raw materials drifit fabric, sublimation paper supplier, supplier of sewing thread, buttons shirt supplier, and the supplier of raw materials of ink sublime and suppliers of raw materials fleece fabric.

Process of ordering products in CV. Cetra Meru often experience delays and cancellations due to stock delivery erratic contained in the warehouse. And the process of procurement of raw materials in the CV. Cetra Meru intended for the production process at CV. Cetra Meru, providing raw materials carried by the warehouse often wrong in determining the amount of procurement of raw materials in the production so that it can affect any coordination between the production sector and lead to delays in the production sector duties towards others. From previous problems then arise the problems found in the process of product distribution is often a delay in the delivery process. It is interrelated because the production process is delayed effect on the distribution of products that are also late.

Based on the problems - problems that exist in the current CV. Meru Cetra it takes a determination information systems development production plans, the amount of raw material procurement and facilitate coordination between the production sector and improve its distribution process in order to facilitate the production and ordering products in the CV. Cetra Meru.

***Keywords**: Supply Chain Systems, Production Event Planning, Procurement Raw Materials, Interagency Coordinating Production Sector, CV. Cetra Meru, Forecasting.*

1. PRELIMINARY

CV. Cetra Meru is a company engaged in the service of convection design and digital printing that concept in the field of sublimation printing, especially for polyester fabric. The place area company at Setra Dago Indah 1 No. A3 Bandung. As a company that runs in convection of course, makes the stock enough products to anticipate the purchase order of products by customers. CV. Cetra Meru strategy make-to-stock, namely the production process before their booking. CV. Cetra Meru had six raw material suppliers include suppliers of raw materials drifit fabric, sublimation paper supplier, supplier of sewing thread, buttons shirt supplier, and the supplier of raw materials of ink sublime and suppliers of raw materials fleece fabric. Fabric is a key raw material in the production process.

Based on the interview with Mr. Usep as part of the warehouse, according to him, it is known that the planning of the production activities carried out by the warehouse is now done regularly, consequently becomes a problem when demand is high booking a shortage of stock on the warehouse. For example in January 2015 when the demand for high product reached 238 products, and products available in the warehouse is only 180, and vice versa when demand fell in June 2015 as demand for the product is only 163, the resulting product buildup.

Based on the interview with Mr. Agus Resmana as part of production. Problems were found in the production process is the lack of coordination between the production sector. Production sectors involved include part design printing, press, operational, sewing, qc / packing. If one production sector to do its job unfinished would delay the task to other production sectors. This resulted in the production process is not going well, such as the buildup of semi-finished products.

Before the production process, the warehouse must first make a plan of production activities to determine the amount of product that will be in production. One way to facilitate the creation of a technique of planning is forecasting (forecasting).

Forecasting is a prediction, projection or estimate of the level of an uncertain event in the future and are important aids in planning, forecasting the level of production plans in the upcoming period taking into consideration the past, the results forecasters are expected to determine the proper planning in determining plan production activities.

Based on previous problems then arise the problems found in the process of product distribution is often a delay in the delivery process. It is interrelated because the production process is delayed effect on the distribution of products that are also late.

Pursuant to the problems that exist today in the CV. Cetra Meru, then in support of activities that are in good company running the information system needed a construction supply chain web-based system that can manage production planning and inventory management, coordination between sectors of production and product distribution method approach, Supply Chain Management.

While objectives to be achieved in this study are:
a. Facilitate the warehouse in determining planning production activities in order to avoid shortages and excess inventory of products so when there is increased demand, product shortages do not occur and when demand falls no buildup and excess product.

b. Assist coordination between the production sector, so avoid the accumulation of tasks and production activities can be run well.

c. Assisting the marketing department to distribute products to no longer be a delay in the delivery process to the customer.

2. RESEARCH CONTENTS

2.1. System Of Supply Chain

Based on expert opinion about the system and supply chain authors conclude supply chain system is a system in the supply chain that has the objective of creating mutually beneficial cooperation in controlling, regulating and improving the flow of material and information of a product from the supplier to the end user. Construction supply chain system in CV. Cetra Meru in the construction supply chain management approach.

2.2. Supply Chain Management

Supply Chain Management is a method or an integrative approach to managing the flow of products, information, and money in an integrated manner involving parties from upstream to downstream. An important principle in SCM is transparency of information and collaboration between the company's internal functions as well as with the parties in the company along the supply chain. Supply Chain is a physical network, the companies involved in supplying raw materials, produce goods, and deliver it to end users. Such companies typically include suppliers, manufacturers, distributors, retail as well as companies such as supporting logistics services company.
The term Supply Chain Management first proposed by Oliver & Weber in 1982. So SCM is not only oriented to the internal affairs of a company, but also for external affairs concerning the relationship with the partner companies. Because the companies that are in a supply chain at its core consumers want to satisfy the same end, they must work together to make a cheap product, deliver it on time, and with good quality. Idelnya, the relationship between the parties to an ongoing long-term supply chain. Long-term relationship allows all parties to create a better trust and create efficiencies. Efficiency can be created for long-term relationship means reducing costs to get a new partner company. [3].

2.3. Types Supply Chain

Here are the types of supply chain are common:

a. ***Integrated Make-to-stock***

Supply chain this model may discover customer demand for a time, so the production process can procure goods inventory efficiently. This can be overcome by using an integrated information system. By using the integrated information system, the company can find information about customer demand in a timely manner, so that the information can be used to develop and modify the planning and production schedules.

b. ***Continuous Replesnishment***

In this model the supply chain, procurement inventory conducted on an ongoing basis. This type is very suitable for corporate environments that customers demand a stable pattern.

c. ***Make-to-order***

In the supply chain model, assembly of the finished goods is done when the customer has made a request or order to such articles.

d. ***Channel Assembly***

Channel assembly is a modification of the model Make-to-order. Supply chain this model, the process of assembling the goods occurs when the movement of goods in the distribution line.

2.4. Forecasting Theory (forecasting)

According to Hery Prasetya and Fitri Lukiastuti "Forecasting is an attempt to predict the

circumstances in the future through the testing conditions in the past." [10].

Meanwhile, according to Spyros Makridakis "Forecasting (forecasting) are 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. "[11].

2.4.1 Single Exponential Smoothing Method

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 the exponential function. This method greatly reduced the data storage problems because they do not need to store historical data. The influence of the size of α in the opposite direction to the effect of entering the number of observations. 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 determines the optimal approach requires several tries.

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

Information :
F_{t+1} *= The results forecast for the period t-1*
a *= smoothing constant*
X_t *= Actual demand data for the period t*
F_t *= Forecast for the period t*

2.4.2 Mean Square Error (MSE)

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

$$MSE = \frac{\sum(X_t - F_t)}{n}$$

Information:
X_t *= The actual data in the period t*
F_t *= Data prediction of the model used in the period t*
n *= Much of the data forecast results*

2.5 Problem Analysis

Problem Analysis is an assumption of the issues that will be described in the procedures of data processing on program development Supply Chain Systems CV. Cetra Meru approach Supply Chain Management. Analysis of problems of the current system at this time is:
1. Frequent shortages and excess inventory of products and raw materials because of the lack of planning efficient production.
2. Lack of coordination among production sectors related to the internal supply chain relationships. Which causes the accumulation of tasks in other production sectors and the buildup of semi-finished products on the production line.
3. Scheduling product distribution is sometimes hampered due to problems of inter-related with the production of parts that influence the distribution of products that are also late.

2.6 Analysis System Running

Analysis of the current system is one step to figure out a system that is running on the company that will be associated with the suitability of the construction of the system.

2.6.1 Determination of Production Plan Based Forecasting Results

The process of production plan based on the results of forecasting, done by forecasting demand for products based on actual data of the previous product demand. Forecasting results obtained are used to determine the next production plan. The part that is responsible in this stage is part of the production.
Analysis forecasting stages that will be done is to predict product to the production process. Forecasting needs of the product aims to meet the needs of production whereby when product demand is high then the product has been available. Forecasting technique used is quantitative forecasting techniques, due to the availability of past data adequately met.
Forecasting method used is Single Exponential Smoothing because it is based on the pattern of the data found that the data pattern Horizontal or Stationary indicating fluctuating uniformly with an average value that does not change over time.
The first step in forecasting is to collect data that will be sampled to determine the forecasting results. Data to be sampled ie Jersey product demand data from the month of January 2015 until December, 2015.

Table Request Product period January 2015 - December 2015

Month-	Data Request Product Jersey
1	238
2	218
3	211
4	193
5	188
6	163
7	178
8	198
9	173
10	223
11	183
12	193

The first thing to do to calculate the forecasting methods Single Exponential
Smoothing constants that determine the value of alpha (α) = 0.1 and predict orders for the 2nd time. The values of variables are taken from actual data product orders jersey in Table 3.2. Then distribute these values into the formula (2.8) it will get calculated as shown below:
Example:
Based on data from product orders jersey in the table, compute forecasting orders in February.
Noted that:
Orders jersey products in January (Xt) = 238
Alpha (α): 0.1
Because in January have not been predictable so forecasting results obtained from product orders jersey in January 2015. (Ft) = 238.
So we get an example of the calculation as follows:

1. *Calculations for α = 0.1*

*F_ (february) = (0.1 * 218) + (1 to 0.1) * 238*
= (21.8) + (214.2)
= 236

Further calculations for α = 0.2 sample calculation as follows:

2. *Calculations for α = 0.2*

*F_ (february) = (0.2 * 218) + (1 to 0.2) * 238*
= (43.6) + (190.4)
= 234

Forecasting for alpha 0,2 of March and then performed in the same manner, in accordance with the calculation of the demand forecast in February.

After calculating the MSE of the month January 2015 until December 2015, then the next step the entire sum of the MSE results in January 2015 until December 2015.

$$MSE = \frac{\begin{array}{l}324{,}0 + 39{,}7 + 262{,}4 + 20{,}3 + \\ 506{,}3 + 182{,}3 + 324{,}0 + 506{,}3 + \\ 2025{,}0 + 1296{,}0 + 81{,}0\end{array}}{12}$$

= 463.9275

Based on the comparison of forecast error α in the calculation using the MSE, it can be concluded that α with a value of 0.9 to produce the minimum MSE of the value of α others. In Table 3.4 MSE value of α = 0.9 is 5.73. The smallest error value indicates that the accuracy of forecasting higher. Results forecasting product demand jersey for the month of January 2016 are contained in Table 3.3 to the value of α = 0.9, then the CV. Cetra Meru recommended to procure for the month of January 2016 in the amount of 192 pieces. Product demand data jersey in January 2016 that is 205 pieces. The difference between the results of forecasting demand data jersey products are forecasting results in January 2016 reduced the demand data in January 2016 can be seen in Table 3.5

Table 3.5 Difference With Data Results Data Demand Forecasting

Forecasting Result	*Stock Data*	*Difference*
192	*205*	*13*

That is the difference between the value of the product demand data jersey in January 2016, with the result of demand forecasting jersey products in January 2016 had a difference of 13 to the value of the smallest forecast error is 5.73.

2.6.2 Determination of Raw Material Supplies and Procurement of Raw Materials

The process of determining the needs of raw materials and procurement of raw materials to be used in the production process drifit jersey is the fabric, ink sublime, sewing thread, and the sublimation paper. The composition of the raw materials used CV. Cetra Meru to produce one product jersey which can be seen in Table 3.6.

Product Name	***Jersey***	
Product Quality	*JRY-01*	
Size	***Width (cm)***	***Length (cm)***
All Size	*50*	*73*
Composition	1. *Drifit Fabric, 73 (cm)* 2. *Sublimation Ink, 250 (ml)* 3. *Sewing Yarn, 3 (roll)* 4. *Sublimation Paper, 73 (cm)*	

Example Calculation:

By using an equation that is multiplied by the composition of forecasting results, it can be seen each raw material must be in a message to the supplier by calculating the results of forecasting with product composition jersey as follows:

1. Calculation of the amount of raw materials that must be drifit fabric in a message, 1 Kg = 2 Meter.
Total raw material composition x = Result Forecasting
= 192 x 73 (cm)
= 14 016 (cm) = 140.16 (m) = 70.08 (Kg)

2. The calculation of the amount of ink raw materials sublimate should be in the message, 1 liter = 1000 ml.
Total raw material composition x = Result Forecasting
= 192 x 250 (ml)
= 48000 (ml) = 48 (liter)

3. Calculation of the amount of raw materials sewing thread should be in the message, 1 PAK = 6 Roll.
Total raw material composition x = Result Forecasting
= 192 x 3 (roll)
= 576 (roll) = (96 PAK)

4. The calculation of the amount of raw material sublimation paper which should be in the message, 1 meter = 100 cm.
Total raw material composition x = Result Forecasting
= 192 x 73 (cm)
= 14 016 (cm) = 140.16 (m)

Based on calculations that have been done it can be seen that the raw materials must be ordered CV. Cetra Meru to the supplier.

2.6.3 Monitoring Inventory Control

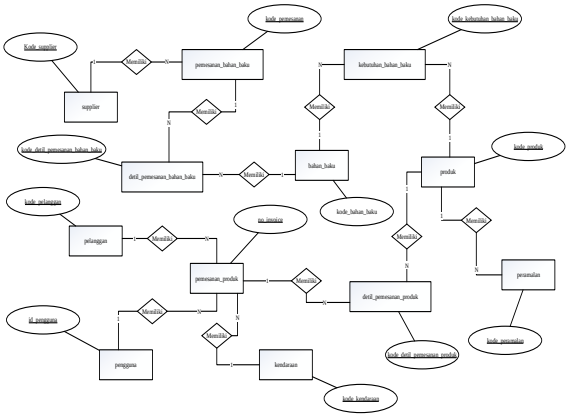
Inventory control monitoring process aims to create a CV. Cetra Meru in monitoring the activities in and out of raw materials and products in the warehouse CV. Cetra Meru. So that the stock of raw materials to be discharged may be underreported. Monitoring inventory control requires an indicator of the stock in order to reduce the risk of running out of supplies. CV. Cetra Meru already have their own calculation of the minimum level of stock of all the raw materials contained in the warehouse.

In this system, the Minimum Stock statutes obtained from CV. Cetra Meru in determining minimum stock of all raw materials and products. Example Minimum Stock CV. Cetra Meru use of sewing thread and the sublimation paper. For example, data on the number of sewing thread raw material inventory in the warehouse is 300 roll while the minimum stock set CV. Cetra Meru which is 700 roll, so that when the raw materials sewing thread is less than the minimum threshold, the system will provide notification that there are supplies that have passed the minimum stock that has been applied by the CV. Cetra Meru.

Monitoring inventory will be presented in tabular form, which will be sorted based on the difference between the amount of stock to the value of Minimum Stock. If the stock of inventory is less than the Minimum value stock, it will be given a red indicator on the chart. While inventories have stock levels above the Minimum Stock values are colored blue indicator on the chart.

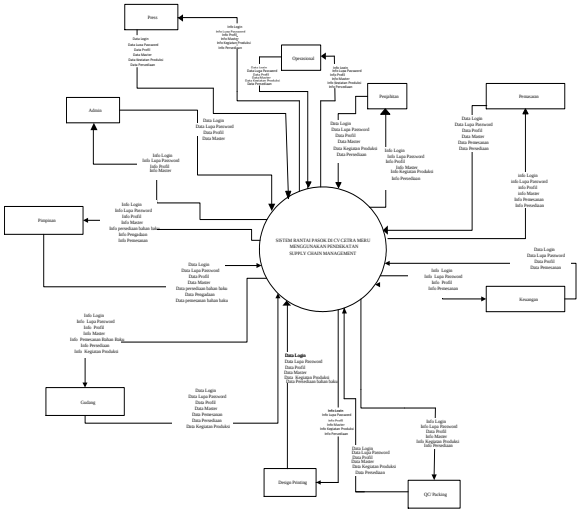
2.7 Analysis Database

Analysis of the data base on supply chain system in CV. Cetra Meru which will be built using Entity Relationship Diagram (ERD). ERD is a data model that uses some notation to describe the data in the context of the entities and relationships described by the data. The diagram is illustrated in Figure 3.12.



2.8 Functional Needs Analysis (Diagram Context)

Diagram context is a global model to explain how the data is used and transformed to the process or describe the flow of data into and out of the system. Diagram context on this system can be seen in Figure 3.13



2.9 Testing System

Testing of the system is the cornerstone that aims to find mistakes or shortcomings in the information system under test. The test intends to determine the information system are made in compliance with the performance in accordance with the design objectives.
Tests are used to test the new system is a black box testing methods. Black box testing focused on testing the functional requirements of information systems.
Test plan will do is to test the system built by Black Box and Beta. Testing of the construction supply chain system in CV. Cetra Meru test data based on data provided from some of the data that has been given.

2.9.1 Black Box Testing

Based on test results with sample test cases that have been done to the conclusion that the process is correct. Filtering processing errors in the form of landing page display messages is fairly maximum. Functional system can already produce the expected output.

2.9.2 Beta Testing

Based on the above beta testing, it can be concluded that:
1. The system is fairly easy to use

2. The system has a user interface which is quite understandable

3. The use of language in this system is quite understandable and quite easy to use

4. The system is quite helpful in the production sector of activity and planning production activities.

5. Features that exist in the system is also enough to help users work.

3 FINISHER

3.1 Conclusion

Based on the results obtained in this thesis, it can be concluded as follows:
1. The information system is built can facilitate Parts Warehouse in CV. Cetra Meru in determining the amount of production activity planning so that when there is increased demand there is no shortage of products. Vice versa when demand is decreasing is the accumulation and excess product.

2. The information system built to facilitate the Production Department at CV. Cetra Meru in coordination between the production sector, so there are often delays the task to other production sectors. Which results in delays in the production process and the resulting buildup of semi-finished materials.

3. The information system built to help the Marketing Department in the distribution of products, so it will no longer be a delay in the delivery process to the customer.

3.2 Advice

Suggestions for the development of information systems are some suggestions that can be done, among others:
1. Make the display / interface more attractive again as selecting text and colors that are easy to read by users because there are still some difficult selection of text to read.

2. Future studies are expected system built to perform management and granularity in calculating the cost for the purchase of raw materials to the Supplier.

3. For further research is also expected to make processing and breakdown in calculating the total cost of ordering products from customers.

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