DEVELOPMENT OF SUPPLY CHAIN MANAGEMENT SYSTEM AT CV. SAMIJAYA

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ABSTRACT

CV. Samijaya is a printing company that located in Bandung, West Java. CV. Samijaya produce digital printing, banner, cutting sticker, acrylic glass and wood printing. Currently the ordered product from costumers every month is uncertain, this causes the warehouse staff feel troubled when determining raw material that should be provided as consideration to determining amount of product's stock and the production staff also feel troubled when making product distribution schedule to customers who have ordered the product.

The purposes is to make the warehouse staff easier when determining raw material that should be provided as consideration to determining amount of product's stock and make the production staff easier when making product distribution schedule to customers who have ordered the product. The strategy of Supply Chain used is Pull Supply Chain, because based on compatibility from the current supply chain at the company which is using make-to-order strategy. This supply chain system is developed from upstream to downstream. The forecasting method for requirements of raw material used is single exponential smoothing. The prediction calculations of raw material availability in the warehouse used is Safety Stock.

Based on blackbox and beta testing, can be concluded that this system has helped the warehouse staff when determining amount of raw material that should be ordered from supplier to complete the requirements of production process and make the production staff easier when making product distribution schedule to every customers.

Keyword: Supply Chain Management, Single Exponential Smoothing, Safety Stock, Pull Supply Chain, Make-to-order

1. PRELIMINARY

CV. Samijaya is one company that is engaged in the printing industry. The company serves digital printing, banners, sticker, print acrylic glass and wood. CV. Samijaya have many customers who are spread in the region and outside the region Bandung Bandung. CV.Samijaya using strategies make to order and make to stock. Strategy make to order used to order products from the customer to the company, while the strategy make to the stock used for some raw materials in stock such as raw materials and frontlite glossy CMYK dye. The company has a partnership with several suppliers in Bandung, including Media Vision shops, stores and shops Nowadays we Nurindo. And because customers are located in areas outside the region Bandung and Bandung, the necessary web-based system to make it easier for customers to order products. Based on the interview with Mr. Agi as Parts Warehouse in CV Samijaya, states that currently contained in the upstream activities of the company that is doing the procurement of raw materials to suppliers to meet the needs of products ordered by customers. request the number of products where customers do not inevitably lead to the process of procurement of raw materials do sometimes is not calculated and predicted correctly that could complicate the warehouse in determining the raw materials to the supplier. if there is an error in the calculation of procurement of raw materials could lead to voids or excess raw material inventory in the warehouse that impact can inhibit the production process.

In addition, based on interviews with Mr Arifin as Production Department, stated that the activities that are downstream, namely distribution of products to customers. Distribution of products is done every working day, the product is usually diditribusikan to several areas in the city and outside the city of Bandung. Delays in receiving raw materials can lead to the production planning and the production process does not go smoothly, so that the production of the difficulty in determining the schedule for distribution of products to customers.

Based on the background of the problems that have been submitted, the problems that occur in the CV. Samijaya is how to build a system Supply Chain Management (SCM). Objectives to be achieved in this research is:

1. Facilitate Parts Warehouse in determining the starting materials should be provided as consideration for determining the amount of inventory to production.
2. Facilitate the Production Department to schedule the distribution of products to every customer who has placed orders for products.

2. CONTENTS OF RESEARCH

2.1 Understanding Information Systems

According to Jacob, "The system is a network of procedures interconnected, gathered together to perform an activity or a particular purpose." [1] Meanwhile,

according to HM Jogiyanto "The system is a set of elements that interact to achieve a certain goal."[2] Meanwhile.

according to Kusrini and Andri Koniyo "Information is data that has been processed into a form meaningful to the user, which is useful in the current decision-making or supporting resources." [3] By definition Jacob, Jogiyanto, Kusrini and Andri Koniyo authors conclude information system is a set of activities to collect, process, store, analyze, and disseminate information to the user for a particular purpose.

2.2 *Supply Chain Management*

Supply Chain (supply chain) is a system where an organization distributing goods production and services to its customers. This chain is also a network or networks of various organizations that are interconnected which share the same goal, which is the best possible conducting procurement or distribution of goods. [4] Meanwhile, according to I Nyoman Pujawan and Mahendrawati "Supply Chain Management (SCM) is a method or an integrative approach to manage the flow of products, information, and money in an integrated manner involving parties from upstream to downstream, consisting of suppliers, factories, distribution networks and services logistics-services. "[5] According to I Nyoman and Mahendrawati on the supply chain there are usually three kinds of streams that must be managed. Three kinds of streams that must be managed pad a supply chain is as follows: [5].



Figure 2.1 Supply Chain Management Process

Figure 2.1 shows that supply chain management is the coordination of material, information and financial among participating companies.

1. First is the flow of goods flowing from upstream (upstream) to downstream (downstream).
2. The second is the flow of money and the like that flow from downstream to upstream.

Third is the flow of information that can occur from upstream to downstream or vice versa.

2.2.1 Component *Supply Chain Management*

Supply Chain Management has three main components that support the passage of a business process as follows [5]:

1. *Upstream Supply Chain*

Part of the Upstream (upstream), the overall activities of manufacturing companies with distribution or distributor relationship may be extended to the several levels. The main activity in the Upstream Supply Chain is procurement.

2. *Internal Supply Chain*

Internal Supply Chain Part of this is the delivery of goods to the warehouse. The main activity in the Internal Supply Chain is a production management, manufacturing, and inventory control

3. *Downstream Supply Chain*

Downstream (downstream) supply chain includes all activities that involve the delivery of products to end customers. In the downstream supply chain, attention is directed to the distribution, warehousing transportation and after-sale service.

2.2.2 Coverage Supply Chain Management

SCM has important principle that SCM is transparency of information and collaboration between internal functions that exist in the company or that of the parties are on the outside companies that are in the scope of supply Chain. When referring to a manufacturing company, the main activities included in the classification SCM is [5]:

1. Activities to design new products (Product Development)
2. Activities to obtain raw materials (proceurement, purchasing, control)
3. Activities planned production and supply (planning & control)
4. Activities undertake the production (production).
5. The activities do delivery / distribution (distribution)

The fifth classification is usually reflected in the form of division of a department or division with activities that are usually performed. Shape division and activities common to manufacturing companies can be seen in Table 1 [5].

Table 2.1 Top Five Part SCM Area Coverage

Part	Event coverage
product development	Conducting market research, designing new products, involving suppliers in the design of new products.
Procurement	Select suppliers, mengavaluasi supplier performance, make the purchase of raw materials and components, monitors the supply risk, foster and maintain relationships with suppliers
Planning and Control	Demand planning, demand forecasting, capacity planning, production planning and inventory
Production / operation	Execution of production, quality control
Shipping / Distribution	Distribution network planning, delivery scheduling, finding and maintaining relationships with the company shipping services, monitor service level at each distribution center.

2.2.3 Supplies Security (Safety Stock)

Orders an item until the item comes required time period varies from a few hours to months. The time difference between when the book until the goods come 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. Grace period of uncertainty resulted in a shortage of goods, for example due to the use of goods greater than previous estimates, and therefore required a persediaaan safety (safety stock). Safety Stock If set too low, supplies will run out before acceptable replacement supplies so that production can be disrupted or customer request can not be met. The raw product inventory planning has been taken into account yet often raw product inventory is not sufficient because often meloncatnya supplies production of the company or supplies were damaged and does not meet the standards to meet consumer demand. Safety stock formula (safety stock) can be calculated with Equation 2.1.

Safety Stock = Usage Average Period Previous x Lead Time (2.1) Where: Lead Time = timeout [8].

2.3 Forecasting

Forecasting is thinking on a large scale, for example, a request to one or several products in the coming period In essence forecasting is only an estimate (guess), but by using certain techniques, then forecasting becomes more than just an estimate. Forecasting can be regarded as a scientific estimates (educated guess). Every decision concerning the situation in the future, then there must be forecasting that underlies the decision. When viewed in terms of time, the purpose of forecasting can be seen as follows:

a. Jangka Pendek (*Short Term*)

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

b. Jangka Menengah (*Small Term*)

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

c. Jangka Panjang (*Long Term*)

There are several types of forecasting used. Forecasting the type used are as follows [8]:

1. *Times Series Model*

Method of time series forecasting methods quantitatively using the time as the basis for forecasting.

2. *Casual Model*

Forecasting method using a causal connection as an assumption, namely that what happened in the past will be repeated at this time.

3. *Judgemental Model*

When the time series and causal models rely on quantitative, on a judgmental covers to incorporate quantitative factors / subjective into forecasting methods. In particular useful when subjective factors are expected to be very important when accurate quantitative data already acquired.

2.3.1 *Single Exponential Smoothing*

Forecasting is based on exponential smoothing method (exponential smoothing) is generally used to estimate the sales of individual products. This method is often considered better than the two previous methods are simple averages and a single moving average because of its ability to use past data by assigning weights based on the present data. More data are now given greater weight than the previous data. The assumption is that more data is now always have a stronger influence on the forecasting results are compared with data more obsolete [8].

The formula for single exponential smoothing can be seen in equation 2.4

$$Fn_{+1} = \alpha X_n + (1 - \alpha)F_n \quad (2.4)$$

Where :

Fn + 1 = forecasting results in the period n + 1

Fn = forecasting results for previous periods

α = smoothing constant where $0 \leq \alpha \leq 1$

Xn = actual value for the previous period

2.3.2 *Mean Squared Error* (MSE)

Mean Squared Error (MSE) which is the average of the squared forecasting error and can be seen in equation 2.6.

$$MSE = \frac{\sum(|X_t - F_t|)^2}{n} \quad (2.6)$$

Information:
MSE = mean value squeres error
X_t = The actual data in period t
F_t = Data forecast from the model used in period t
n = Lots of data forecast results

2.4 EOQ (*Economic Order Quantity*)

EOQ (Economic Order Quantity) is a simple model that can be used to determine the size of the economic order. This model considers two inventory costs and expenses the cost of the message store. The cost of the message in question are fixed costs that come out every time the reservation is made and is not dependent on the size or volume pesanan.Sedangkan costs is the cost savings that result from the company store goods for a specific period. EOQ method created by a number of assumptions. That is, this model can only be used quite well if a number of these assumptions are met or at least come close.

The first assumption is the demand for an item is continuous at a uniform rate. That is, these items are needed for the same amount of time. In fact, this assumption has never met, but the model is still good enough to use as long as the variation of demand from time to time is not too large. On the field a lot of cases where a request or need an item is relatively fixed from time to time. [9]

EOQ model can be used to determine the order quantity that minimizes inventory costs and inventory storage costs directly opposite (inverse cost) ordering supplies. [16] Formulation EOQ that can be used are:

$$EOQ = \frac{\sqrt{2DS}}{H} \quad (2.9)$$

Information:
D: The use or demand estimated per time period
S: Booking Fee (preparation of orders) per order.
H: The cost of storage per unit per year

Here is how to determine the number of bookings is expected during the year (N) and the estimated time between orders (T), which can be seen, among others:

The number of orders is expected to = N = $\frac{Permintaan}{Kuantitas\ pesanan} = \frac{D}{Q*}$ (2.10)

Waktu antara pesanan yang diperkirakan = T = $\frac{jumlah\ hari\ kerja\ per\ bulan}{N}$ (2.11)

2.5 Analisis Masalah

Berdasarkan penelitian yang dilakukan di CV. Smijaya terdapat beberapa masalah internal yang terjadi yakni

1. Bagian Gudang kesulitan dalam menentukan bahan baku yang harus disediakan sebagai bahan pertimbangan untuk menentukan jumlah persediaan untuk produksi.
2. Bagian Produksi kesulitan dalam menjadwalkan pendistribusian produk ke setiap pelanggan yang telah melakukan pemesanan produk.

2.6 Analysis of Supply Chain Management (SCM) in the CV. Sami Jaya

Analisis *supply chain* dilakukan untuk menggambarkan proses *supply chain management* yang akan dibangun di CV. Adapun analisis *supply chain* di CV. Samijaya dapat dilihat pada Gambar 2.1.

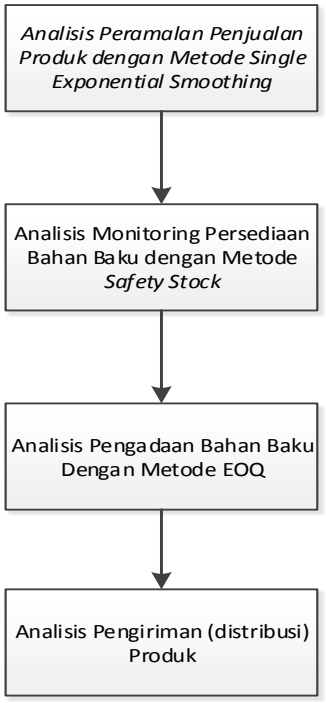


Figure 2.2 Supply Chain Management at CV. Samijaya

2.7 Analysis of Product Sales Forecasting

In the forecast sales of the product, there are several steps that must be done, namely as follows:

1. Setting up the sales data from the previous period to be processed as input data
2. Calculate the value of the forecast on sales data by using a method or technique Single

Moving Average, Moving Average Weight and Single Exponential Smoothing.

3. Finding the MSE of the three forecasting techniques above to find out the results of the smallest.
4. The MSE smallest of the three methods that will be used as a forecasting results for the next period.

2.8 Analysis of Raw Material Inventory Monitoring

After forecasting, production monitoring inventory that aims to monitor and control the supply of products and raw materials in the warehouse. Inventory control monitoring process by looking at the historical data of inventory every month. Monitoring functions in order to avoid shortages of raw materials or a vacancy in the CV. Samijaya.

a. Calculation of raw material inventory CMYK dye. Value Z = 95% in the form of inverse = 1.645
Sd = 10500 grams (sd = raw material consumption CMYK dye before)
l = 5 days (l = Lead time Time wait for the arrival of raw materials)

Sdl = Sd x √ (l)
Sdl = 10500 x √5
Sdl = 23478.71376

Safety Stock = Z x Sdl
Safety Stock = 1.645 x 23478.71376
Safety Stock = 38622.48414 gram (in months)
Safety Stock = 38622.48414 / 30 = 1287.416138 grams (in days)

Thus Safety stock or inventory reserves of raw materials CMYK dye that should be available for the month of July 2016 the warehouse of raw materials amounting 1287.416138 grams per day.

b. Calculation of raw material inventory frontile glossy. With the value of Z = 95% with normal form inverse = 1.645

Sd = 11200 gram sd = Use of raw material fabric previous month
l = 5 days l = Lead Time (waiting time of arrival of raw materials)

Sdl = Sd x √ (l)
Sdl = 11200 x √5
Sdl = 25043.96135
Safety Stock = Z x Sdl
Safety Stock = 1.645 x 25043.96135
Safety Stock = 41197.31642 gram (in months)
Safety Stock = 41197.31642 / 30 = 1373.243881 grams (in days)

Thus Safety Stock or inventory reserves of raw materials frontile glossy that should be available for the month of July 2016 in the warehouse of raw materials amounting 1373.243881 grams per day.

able 2.2 Monitoring raw materials inventory product banners

Jenis Bahan Baku	Stok Bahan Baku	Safety Stok	Status
Pewarna CMYK	45761.23114	38622.48414	Persediaan Aman
Frontile glossy	21896.11543	41197.31642	Persediaan Tidak Aman

2.9 Raw Material Procurement Analysis

Based on the monitoring of raw material inventory in Table 2.2 when the status is not secure, then the company must perform raw material procurement to products banners. then the amount of raw materials to be ordered to the supplier are shown in Table 2.3**.**

Table 2.3 Total Raw materials What to Order

Nama Bahan Baku	Qty	Stock Yang Ada	Safety Stock	Jumlah Bahan Baku Yang Dipesan
Pewarna cmyk	340 gram	45761.23114 gram	38622.48414 gram	-
Frontile glossy	260 gram	21896.11543 gram	41197.31642 gram	5692.99001

2.10 Analysis of Delivery (Distribution) Products

Distribution analysis was conducted based on the process of distribution or delivery process contained in the supply chain. Distribution occurring in the scope of supply chain in the form of activities - activities that comprise the monitoring activities on delivery status serves to determine the status of the delivery that has been done and determine whether the products have been up to the customers or are still in the process of delivery. Scheduling activities on deliveries made to customers with the schedule agreed with each other, delivery scheduling can be determined by looking at the estimate workmanship in every order produced, usually the company will immediately deliver a product that has been ordered by the customer, then the company determines the vehicle to be used on time of delivery.

2.11 Analysis Database

atabase analysis on supply chain management information system in CV. Surya Nedika Isabella which will be built using Entity Relationship Diagram (ERD). ERD is a data model built using some notation to describe the data in the context of the entities and relationships described by the data. The diagram is illustrated in Figure 2.3.

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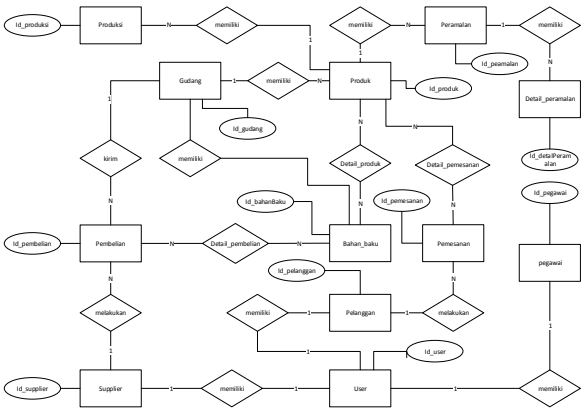


Figure 2.3 Entity Relationship Diagram (ERD) Supply Chain Management Information System at CV. Samijaya

2.12 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 the system can be seen in Figure 2.4.

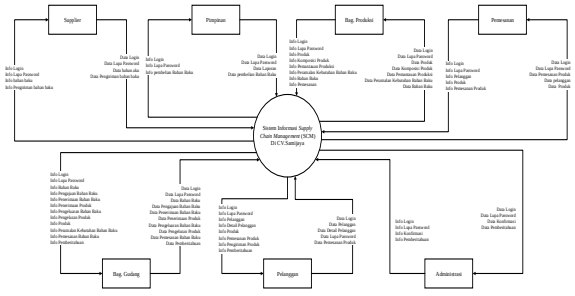


Figure 2.4 Diagram Context supply chain management in the CV. Sami Jaya

2.13 DFD Level 1

Data Flow Diagram shows how the flow of data outlining the processes that occur in the system to process more detail. In such a context diagram Figure 2.4 can be decomposed into several DFD.

DFD Level 1 Supply Chain Management Information System CV. Samijaya in Figure 2.5 describes the general process of what to do in the supply chain management information system.

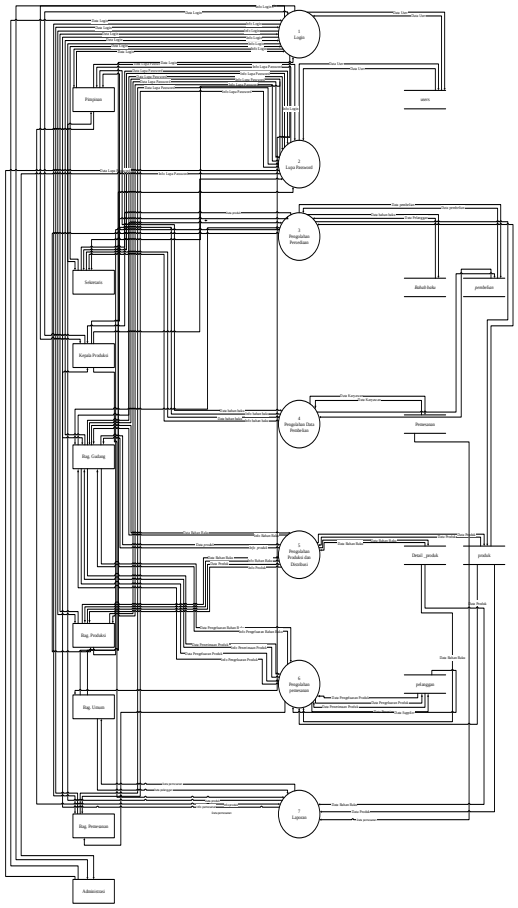


Figure 2.5 DFD level 1 CV.Samijaya

2.14 Table Relationships

Describing the connectedness table in the system in detail or clear, the use of table relationships. Table relationships are described in Figure 2.6.

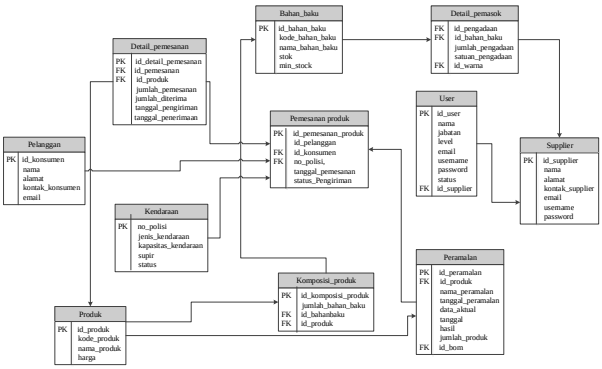


Figure 2.6 Table Relationships

2.15 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 construction porduk information distribution system in PT. Sherish Copyright Interindo using test data based on data provided from some of the data that has been given.

2.16 Black Box Testing

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.

2.17 Beta Testing

Beta testing is testing conducted objectively where tested directly into the field, a company that circumstances regarding user satisfaction with the content of the points that meet the needs of the initial objectives and the interface of the information system of the Supply Chain Management. Beta testing is done through a technique of data collection, namely through interviews.

Interviews were conducted with a beta test for the page of each user consists of the management, production, warehouse, and parts ordering. Tests conducted on beta testing is testing the software directly in the corporate environment or a place to study the CV. Samijaya. This is done in order to know whether the software that was built to provide a solution of some problems faced by the company.

3. CLOSING

3.1 Conclusions

The conclusion that can be drawn from all the processes that have been made in developing the information system are as follows:

1. Information System's built to facilitate Parts Warehouse in determining the starting materials should be provided as consideration for determining the amount of inventory to production.
2. Information System's built to facilitate the Production Department to schedule the distribution of products to every customer who has placed orders for products.

3.2 Advice

Development of Supply Chain Management at CV. This Samijaya can still be developed further with higher system specifications and performance is better.

Here are some suggestions that can be used for a development of this research::

1. Based on the interview interface in future studies expected to be more interesting for the marketing system.
2. The integration with financial systems that are already running with the existing budget data management system supply chain that have been built.
3. Need for the development and maintenance of better the system that has been built, so that the system can be used according to the needs in the future.

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