DEVELOPMENT OF INFORMATION SYSTEMS SUPPLY CHAIN MANAGEMENT IN PT. POPULAR DAENONG INDONESIA

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ABSTRACT

PT. Popular Daenong Indonesia is a company engaged in textiles that already have some fabric products. The first problem of the marketing department is sometimes wrong in estimating the order so that what has been agreed from the beginning with the customer is not appropriate. The second problem in the purchasing head is in the procurement of raw materials, where the head of production sometimes careless in determining the amount of raw materials needed and also in handling the depreciation of the fabric. The third problem in the production part of the production scheduling, which is based on the time of receipt of the materials. In addition EXIM part difficulties in monitoring the delivery schedule due to limited media information systems in the company. The solution of the above problems is to build supply chain management information system. Supply chain management is a series of activities that include coordination, scheduling with Critical Ratio (CR) techniques, and control over procurement, production, inventory and product delivery. In the procurement of raw materials also apply the method just in time for the company can control the raw materials well. The results of the test can be concluded that the built system is user-acceptable and works well and has been helpful.

Keyword : *Suplly Chain Management, Just In Time, Penjadwalan Critical Ratio*

1. *PRELIMINARY*

1.1 *Background Issues*

PT.Popular Daenong Indonesia is a company engaged in textiles and located in the district Margaasih Bandung regency. This company has been established since 2009. PT. Popular Daenong Indonesia has many consumers from all over Indonesia to foreign countries such as Vietnam, Japan and some countries in Latin America. Over time, the company is growing and gradually adding some other types of cloth, including rayon, spandex, cotton combed, and others. PT. Popular Daenong Indonesia can produce fabrics as much as 17,333 Kg per day or 520.000Kg per month, with the ability of the company in production so as to make this company has many consumers. But the company set the limit of the order with a minimum ordering of cloth as much as 100Kg.

This company is a company that apply make to order strategy in its business, where company will only do the process of procurement of raw materials and production process if there have been order from consumer. With the implementation of make-to-order strategy, the company does not store raw material inventory and finished products, because it is considered cost burden. In the process of ordering the customer will be given information on the completion of the workmanship and delivery of finished products are ordered but sometimes the information is not in accordance with the initial information that has been agreed as the order is estimated to be completed on 16 February was completed on 17 February.

Based on the interview with the company that is with Mrs. Tuti as head of purchasing, explains that during this time any order from consumer purchasing part often difficult in calculation for procurement amount of raw material sometimes not in accordance with raw material needed for every order, this because of mistake, negligence and inaccuracies in the process of calculation while the demand for fabrics from these customers is uncertain and sometimes increased sharply. Other than that shrinkage of heavy fabrics in the production process that makes the occurrence of deficiencies in raw materials that have been prepared. With the existence of the problem, in this company often happened deficiency or excess of raw material so that will have an effect on addition of production cost and hampering production process.

Another problem encountered is the scheduling of production activities by the production section based on the time of receipt of the ordered raw materials. This resulted in the production activities take a long time, so that the production schedule that has been set since the beginning to be not run and not regularly while the product to be produced still a lot. In addition, the delivery schedule will also be disrupted, coupled with the due date of the consumer which makes it look for other companies if PT Popular Danong Indonesia is not ready. In addition, the company also has other policies with consumers in the event of delays.

From the problems above, then PT. Popular Daenong Indonesia needs a tool that can manage the information that handles the problem. Supply Chain Management (SCM) is a complete chain management cycle from suppliers, operational activities in the company, continues to distribution to the consumer, so that problems are solved and can be minimized by applying Supply Chain Management, where PT. Popular Daenong Indonesia can work with its business partners because the Supply Chain Management function itself is to integrate business processes ranging from raw material supplier ie supplier to end user ie consumer. The goal is that the flow of information that is in the company ranging from acceptance of ordering from consumers, raw material procurement, raw material acceptance to distribution or delivery of finished products to consumers will create synchronization and consistency. Therefore it is necessary to build an information system Supply Chain Management (SCM) in the company of PT. Popular Daenong Indonesia.

1.2 *Problem Formulation*

Based on the background of the issues raised background, then the problems that occurred in PT. Popular Daenong Indonesia is how to build a Supply Chain Management (SCM) system to handle the needs in raw procurement, menagani shrinkage cloth, menanganni scheduling production process and menagani delivery schedule.

1.3 Purpose and Objectives

The purpose of this thesis is to build information systems Supply Chain Management (SCM) in the Company PT. Popular Daenong Indonesia.

While the objectives in the study, are as follows:

1. *Help the head of marketing to estimate order times.*
2. *Assisting the purchasing head to predict the procurement of raw materials from consumer demand and depreciation during the production process using the Just In Time method.*
3. *Assist the head of production-related scheduling of the production process sequence for goods that must be processed first using critical ratio techniques.*
4. *Assist the head of EXIM in monitoring the delivery scheduling to make it easier.*

1.4 Metodologi Penelitian

Research Methodology is the process of studying, understanding, analyzing, and solving problems based on existing phenomena and is also a series of long and systematically related processes. We can see the steps taken in this study into a groove as can be seen on.

Picture below:

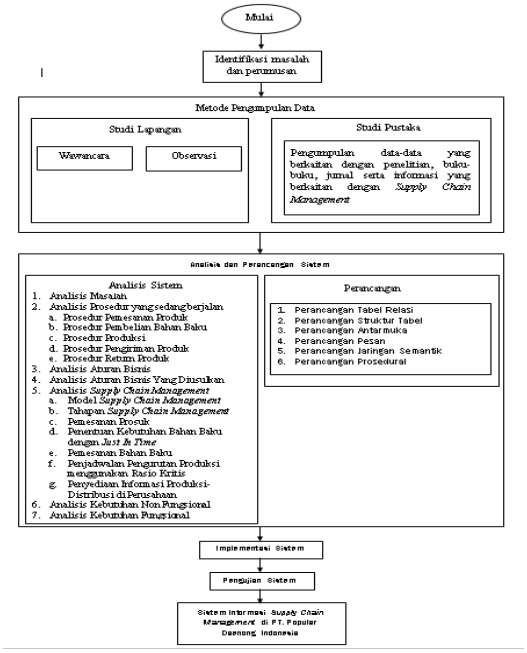


Figure 1. 1 Stage of Research Flow

2. *RESEARCH CONTENTS*

Theoretical basis aims to provide an overview of the sources and studies of theories related to the development of supply chain systems. Theoretical basis will discuss about supply chain management, Just In Time method, database, database system, databases management system, entity relationship diagrams, data flow diagrams, HTML, PHP, JavaScript, CSS, MySQL and XAMPP.

2.1 Supply Chain Management

Supply Chain Management SCM originated from military logistics activities that are

instrumental in determining the victory of war. Logistics techniques are then used in goods delivery activities and there is cooperation between goods delivery companies with warehouses. [6]

Companies are beginning to look for ways to decrease production costs. Multinational companies move factories to other countries that have cheaper production costs. At the advent of information technology, logistics is growing more rapidly and more efficiently through communication and collaboration so as to reduce production costs, improve quality and reduce human error. [6]

2.2 Push and Pull Supply Chain

Push Supply Chain is the production strategy of make to stock. This strategy is the opposite of the Pull Supply Chain which is more popular because its production system is based on forecasting and generates a large amount of output that will be incorporated into the company's inventory before it is fully channeled to the customer. [6]

This strategy focuses on the efficiency of activity and standardization, so that product development in the case of product variation is limited. As more companies have less product variation, this strategy is suitable for use. Push strategy bias connoted with lean supply. But for products with changing market circumstances, the use of push systems will bring some losses, such as: [6]

1. *The inability of companies to meet the changing market demands.*
2. *The accumulation of inventory is a waste of time and requires a lot of storage space.*
3. *Large production batch.*
4. *Risk of absolute large product.*

As for Pull Supply Chain is a make to order production strategy whose main benefit is to avoid waste time inventory and eliminate inventory. This strategy is used for the company where the production will be done if it has received the order request from the customer, and the condition of the product can be based on the specifications of the customer. [6]

2.3 Just In Time Method

JIT (Just in Time) is a business philosophy that specifically discusses how to reduce production time in both manufacturing and non-manufacturing processes. In addition, in his book Hamming, the JIT (Just in Time) production system is a duty regulation strategy that applies the concept of improving the return on investment ratio of a business by reducing inventory and costs associated with inventory. Inventories include inventories of raw materials, work in progress, and the supply of finished goods.

2.4 Implementation Goals of Jus In Time

The main goals of Just In Time is:

1) *Zero defect*
2) *Zero Inventories*
3) *Zero setup time and lot size of one*
4) *Zero lead time*
5) *Zero Part Headling*

2.5 Persediaan Just In Time

According Firdayanti inventory in just in time is inventory designed to get goods by the time. Just-in-time inventory requires removing inventory requirements because there is no production that results in stockpiling or wasteful purchases. In Just-Time system (JIT) is aimed at applying to buy inventory only in the required quantity only.

According to Sofyan, the focus of the steps of implementing just in time lies in waste elimination and contionous process improvement.

Just-in-time implementation steps on inventory by hustanto

1) *Create a plan for raw materials*
   The formula for determining the plan for raw material needs can be seen in the equation:
   Raw Materials Requirement Plan = Company production plan x raw material requirement
2) Calculate the cost of purchasing raw materials
   The formula calculates the cost of purchasing raw materials:
   Cost of purchase of raw materials = Price of raw materials x raw materials needed.
3) Calculate and set the booking fee
   Order cost formula:
   Order Fee (JIT) = *The cost of corporate orders x raw materials needed*
4) Calculate storage costs
   Storage costs consist of warehouse costs, electricity consumption and cleanliness
5) Total inventory cost
   Inventory cost = Purchase cost + booking fee + storage fee
   .

2.6 *Schedulling*

Scheduling is the timing of an operating activity. Scheduling includes the activities of allocating facilities, equipment or labor to an operating activity to carry out a set of tasks within a certain period of time. In the decision-making hierarchy, scheduling is the final step before commencement of operations. The purpose of the scheduling itself is to minimize processing time, subscription time, and inventory levels, as well as efficient use of facilities, manpower and equipment. [3]

Various techniques can be used or applied for scheduling. The techniques used depend on the volume of production, product variation, operating circumstances, and the complexity of the work itself and the control required during the process.

To reduce problems arising from scheduling can be done as follows:

1. Reduce the amount of product variation.
2. Reduce the number of component variations.
3. Implement work extension.
4. Sub-contracting.
5. Reduce organizational units.
6. Improve work discipline.
7. Work location close to the marketing area.
8. Working location close to raw material suppliers.

The scheduling method to be used is the Critical Ratio (CR) method of work which the ratio of due date to the smallest working time gets priority to minimize production delay. Thus expected consumer demand can be met on time. [3]

Critical Ratio

Critical Ratio (CR) is a number of indices calculated by dividing the processing time, with the remaining working time. CR tends to have better performance than FCFS (First Come First Served), SPT (Shortest Processing Time), Longest Processing Time (LPT), or EDD (Earliest Due Date) on the criteria of average job lag. Critical ratios give priority to work to be done in order to keep the schedule. [5]

If: CR <1, then the work is late from schedule.
CR = 1, then work according to schedule.
CR> 1, then the work precedes the schedule.

Formula: $\frac{\text{Working time left (days)}}{\text{processing time}}$

or

$: \frac{\text{Deadline - current date}}{\text{processing time}}$

2.7 Problems Analysis

Based on the interview with Mrs. Tuti as part of purchasing and observation that have been done, that problem exist in company is as follows:

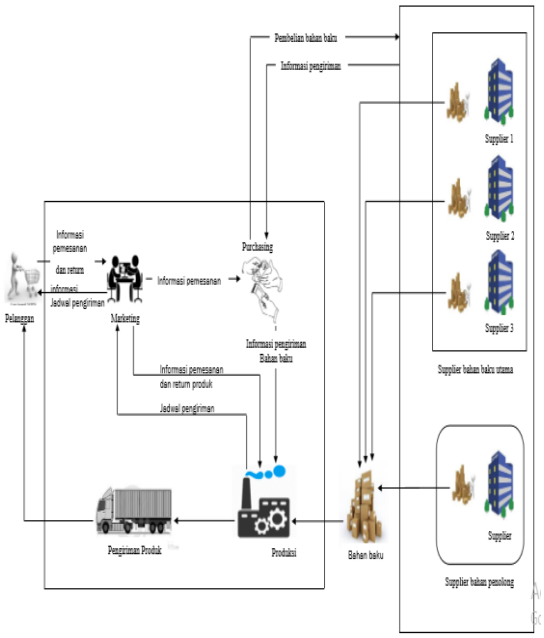
1. *Head Marketing often mistakes in estimating the time of completion of the order.*
2. *Head Purchasing finds difficulty in determining the amount of raw materials needed for procurement and handle shrinkage of cloth, so that the production process is inhibited.*
3. *Head of Production is often difficult in determining the scheduling of the production process sequence that must be done so often hampered the production process.*
4. *Head of EXIM difficulties in monitoring the delivery schedule.*

Judging from the existing problems, need a Supply Chain Management system that is able to assist the purchasing and production parts in the procurement of raw materials and production scheduling so that there is no delay in producing products that can cause losses to the company.

2.8 Supply Chain Management Analysis

PT. Popular Daenong Indonesia is a company that applies make to order method in carrying out its production activities, make to order is the process of production and purchase of raw material is done only if there is order from customer.

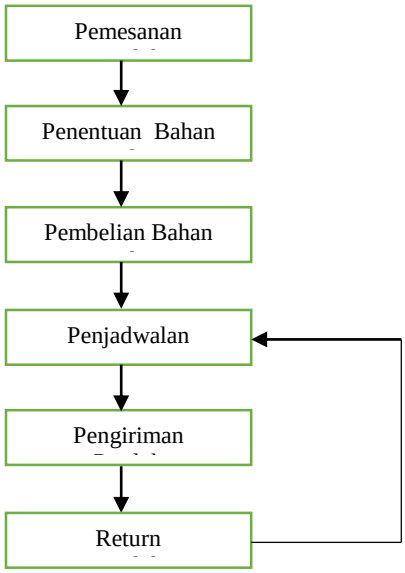
Supply Chain Management Model at PT. Popular Daenong Indonesia is as follows :



***Picture* 1** *Supply Chain Management Model*

2.9 Supply Chain Management Stages

The stages of Supply Chain Management at PT. Popular Daenong can be seen in the picture below:



***Picture* 2.** *Supply Chain Management Stages*

1. *Product Ordering*

In this phase to analyze the purchase planning of raw materials, the data to be sampled is order data of Poly Cotton Frenchterry and Cotton Combed 30s on 13 February 2017 with product code PCF-58 and CC-30 By 3 companies. By calculating the estimated cost of the reservation using the equation:

Total Price = Number of orders x Price of fabric of kilogram union

Table 3 *Product Ordering*

No	Tanggal	Pemesan	Kode Produk	Nama Produk	Jumlah	Harga	Total Harga	Tanggal Selesai
1	13-02-2017	PT. Daenong Global	PCF-58	Poly Cotton Frenchterry	10.260Kg	Rp. 18.900	Rp.193.914.000	16-02-2017
2	13-02-2017	PT. Sinar Ezzer	PCF-58	Poly Cotton Frenchterry	5.680Kg	Rp. 18.900	Rp.107.352.000	15-02-2017
3	13-02-2017	PT. Samsan Internasional	CC-30	Cotton Combed 30s	17.250Kg	Rp. 16.120	Rp.278.070.000	16-02-2017

Table 4 *Estimated Ordering time*

No	Pesanan	Masuk		Bulan Februari						
				Tanggal						
		13	14	15	16	17	18	19	20	21
1	PT. Daenong Global									
2	PT. Sinar Ezzer									
3	PT. Samsan Internasional									
Jumlah Pesanan(Kg)				5.680	11653	5597	10260			

From the table above can be seen the date of order and the number of products ordered. The ordering date will be used to determine the order of production, then the quantity of ordered products will be the parameter for the determination of the raw material to be ordered to the supplier. After knowing the number of products ordered, the next step will be done is to determine the needs of raw materials

2. Determination of Raw Materials

Next is to calculate the amount of raw material needs, the calculation of the number of raw material needs plan using the method Just In Time (JIT), which calculation of raw material procurement with Just In Time (JIT) always in accordance with the standard requirements for production. Calculation is done by using equation:

Raw Material Requirement Plan

= Company production plan x raw material requirement

Table 5 *Raw Material Needs Plan for PCF-58 Code Products*

No	Nama Bahan Baku	Jumlah Bahan yang diperlukan	Jumlah produk yang diproduksi	Total Jumlah yang diperlukan
1	Benang Polyester	5 gulung	15.940	79.700 gulung
2	Benang Cotton	2,5 gulung		39.850 gulung
3	Benang Spandex	1 gulung		15.940 gulung

The calculation of raw material procurement by the method of just in time is required always in accordance with the needs of production orders (point 0) or at least at a level that is not significant, so the company will not incur additional costs or waste and eliminate storage. Just in time method will give priority to quality and accuracy of production, considering the raw materials needed do not have reserves, employee performance companies must work hard to produce good products and minimize errors in the production process so as not to add raw materials that have been provided. PT. Popular Daenong own Indonesia pull-pull chain system, so the minimum amount of inventory can still be owned.

To handle the depreciation of fabric then used the following equation:

Raw Material Requirement Plan

= Company production plan x raw material requirement x 3%

Table 6 *Depreciation of Raw Materials*

No	Nama Bahan Baku	Jumlah per-kgm	Jumlah yang diproduksi	Jumlah yang diperlukan	Penambahan 3%
1	Benang Polyester	5 gulung	15.940	79.700 gulung	82.091
2	Benang Cotton	2,5 gulung		39.850 gulung	41.750
3	Benang Spandex	1 gulung		15.941 gulung	16.411

2. *Purchase Of Raw Material*

After the need of raw materials is known, the next step is the stage of ordering raw materials to suppliers.

***Table 7** Purchase of Raw Material*

No	Tanggal Pengiriman	Supplier	Kode Barang	Nama Bahan Baku	Jumlah (Kg)	Harga Total
1	14-02-2017	PT. Indorama Teknologies	PT45S	Benang Polyester	9.404	Rp. 143.056.446
2	14-02-2017	Weifang Shengfeng Textile	CM45S	Benang Cotton	4.064	Rp. 70.315.880
3	14-02-2017	PT. Indorama Teknologies	SP30S	Benang Spandex	2.472	Rp. 24.246.855

Then based on the data in table 7 it can be seen that the cost required for the purchase of raw materials is Rp. 237.619.181 + Rp. 1,500,750 = Rp. 239.119.931,00

3. *Production Schedulling*

Production scheduling is done to arrange production schedule. An order will enter production schedule when its status has been paid and production activity will commence when raw material for ordering is available. Here are the orders on February 13, 2017:

Description:

Job A = Order A
Job B = Order B
Job C = Order C

***Table 8** Jobs to be Produced*

Pemesan	Pekerjaan	Tanggal Masuk	Tanggal Pengiriman Bahaan Baku	Batas Waktu *(Due Date)*	Waktu kerja sisa
PT. Daenong Global	A	13-02-2017	14-02-2017	16-02-2017	2
PT. Sinar Ezzer	B	13-02-2017	14-02-2017	15-02-2017	1
PT. Samsan Internasional	C	13-02-2017	14-02-2017	16-02-2017	2

Calculation of production schedule is done by using the formula of critical ratios. This scheduling process will be done after the information delivery of raw materials required from suppliers.

The following equations are used:

Lp = 1 + Wt

Description:

Lp = Old Order
1 = Day of purchase after order
Wt = Waiting time of raw material from suppliers

Lp = 1 day + 0 days = 1 day

So after the time of completion of the ordering of raw materials or the time of receipt of raw materials, the next stage is to sequence the production process with the priority of the workmanship. The formula to be used is to use the critical ratio rule:

If: CR <1, then the work is late from schedule.
CR = 1, then work according to schedule.
CR> 1, then the work precedes the schedule.

Formula: $\frac{\text{Working time left (days)}}{\text{processing time}}$

or

$: \frac{\text{Deadline - current date}}{\text{processing time}}$

Description: Duration of work is known because the average production of the company in 1 day can produce as many as 17,333 kg. This data is obtained based on previous production data.

By using the formula of critical ratios then the resulting data as follows:

***Table 9** Production Schedulling*

Pekerjaan	Due Date	Durasi Kerja	Waktu Kerja Sisa	Rasio Kritis (CR)	Urutan Produksi	Tanggal Selesai
A	16-02-2017	1	2	(16 – 14) / 1 = 2	3	16-02-2017
B	15-02-2017	1	1	(15 – 14) / 1 = 1	1	15-02-2017
C	16-03-2017	1	2	(16 – 14)/ 1 = 2	2	16-02-2017

It can be seen in the production scheduling table that, Job A will affect the delay so that job A gets priority to be done first, Works C and B have spare time to work, with each sequence of processes is 2 and 3

***Table 10** Estimated production time*

No	Pesanan	Bulan Februari							
		Tanggal							
		15		16		17	18	19	20	21
1	PT. Daenong Global									
2	PT. Sinar Ezzer									
3	PT. Samsan Internasional									
Jumlah Pesanan		5.680	11653	5597	10260					

It can be concluded that production scheduling has worked well.

4. *Product Delivery*

Product Delivery is done after the production process is completed and will be given to the customer if payment has been paid. To know when the order will be sent then the EXIM section need to monitor.

Lp = 1 + Wt + Wp

Description:

Lp = Old Order
1 = Day of purchase after order
Wt = Waiting time of supplier supplier's supply
Wp = production process time

Lp = 1 day + 0 days + 2 = 3 days

It means that the order C is completed on the 16th and ready to be sent to the consumer if the payment has been paid.

Information :

- *Product weight <12,000 Kg*
  = using an ankle truck
- *Product weight> 12,000 Kg*
  = using container truck

From several stages that have been done, it can be known when the delivery process can be done.

***Table 11** Product Delivery*

No	Pesanan	Tanggal Selesai	Tanggal Pmgiriman	Berat Produk	Truk
1	Pesanan B	16-02-2017	17-02-2217	10.260 Kg	Kontainer 1
2	Pesanan C	15-02-2017	16-02-2017	5.680 Kg	Engkel 1
3	Pesanan A	16-02-2017	17-02-2017	17.250 Kg	Kontainer 1

5. *Return of Product*

Return of product can only be done in case of errors from the company such as mismatch and damage due to delivery. Should the defect occur after the product has been received by the subscriber, the product can not be reset. Similarly, the same with the purchase of raw materials to suppliers.

2.9 *Fuctional Testing*

Functional testing using the black box method focused on the functional requirements of the built system. Black box testing scenario for supply chain management information system. Based on the test results with the test sample case that has been done, obtained the conclusion that the processes on the system is correct. Functional system can already produce expected output.

3 CLOSING

This chapter discusses how the conclusion of the final results of the research is from the analysis, design and implementation, design, and testing of the Development of Supply Chain Management Information System at PT. Popular Daenong Indonesia.

3.1 *Conclution*

Based on the results of the tests and discussions that have been made then got the following conclusion:

1. *Supply chain management information system can help the head of marketing in estimating the completion time order to customers.*
2. *Supply chain management information system can help the purchasing head in determining the amount of raw materials needed and handle the depreciation of raw materials in the production process.*
3. *Supply chain management information system can assist the production in the determination of production schedule.*
4. *Supply chain management information system can assist the EXIM in determining the delivery and monitoring schedule.*

3.2 Future Works

Future Works that can be given to the development of supply chain management information system that has been made for further development can be explained as follows:

1. *Supply chain management information system can be developed by adding some features to be better such as adding a function to print data or in terms of appearance.*
2. *For the security of existing data within the system, it is better to have someone responsible for handling the security field*.

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