DEVELOPMENT OF SCM INFORMATION SYSTEM AT PT. SERENA HARSA UTAMA

Adhy Kartansa[1], Rani Susanto[2]

Teknik Informatika - Universitas Komputer Indonesia
Jalan Dipatiukur No.112-116 Bandung
E-mail : adhykartansa@gmail.com[1], rani.susanto@email.unikom.ac.id[2]

ABSTRAK

PT.Serena Harsa Utama is a company that moves in meat proccessing food that have been there since 2001 at Padalarang, kabupaten Bandung. PT.Serena Harsa Utama produce meat proccessed food that is meatball which marked such as SK, IPTB, and JM and already spread to entire Java. With production that reach 6.000.000 pieces every month just for one kind of product SK. Up unti now, the order from the consumer is cannot be predicted, this makes the Production Team troubled to guess the number of material that needed to fullfil every order that comes. The Distribution team also having a trouble to schedule the distribution procceess using the vehicle that they have for every purchase that the consumer makes, this make a delay on the distribution and even the consumer canceling their order that make loss of profit for the company.

Based on the issues to resolve these problems is by building a SCM Information System that can help the company to decide how many material that need to buy and help the distribution scheduling procceess of product to the consumer. The forecasting method that will be used is single moving average and mean square error method to evaluate the mistakes of the forecasting, meanwhile to determine the amount of raw material needed using the safety stock method.

Based on the test results, it can be concluded that this system can help the Production team in deciding the amount of raw material that needs to be provided and make the distribution scheduling procceess of product to the consumer easier for the Warehouse and Distribution team.

Key Word : Supply Chain Management, Single Moving Average, Safety Stock

1. INTRODUCTION

PT.Serena Harsa Utama is a company established on January 25, 2014, with the deed of establishment No.61, is the development of other units within the business group engaged in cattle fattening, meat trade and meat processed meat production that has started since 2001 in the region City and Regency Bandung. The company stands with a building area of approximately 3,500 m2 above ground 5,500 square meters. PT. Serena Harsa Utama is engaged in the production of processed meat foods in the form of baso whose products are marked with codes such as SK, IPTB, and JM spread to various regions in Java with production amount up to 6,000,000 bullet points per month for only one SK product.

Based on the interview with Mr. Ferry Ferdian as Production Manager who also served as Factory Manager, he explained about the business processes that occurred in the company, PT. Serena Harsa Utama has a total of 8 suppliers for raw materials with 1 supplier for flour, 1 ice cube supplier, 3 seasoning suppliers, and 3 meat suppliers sent regularly every week. Every month PT. Serena Harsa Utama can spend an average of 156 quintals of beef, 65 quintals of spice, 104 quintals of wheat flour, and 39 tons of ice cubes.

In the supply of raw materials, PT. Serena Harsa Utama has its own policy of Production section to check the amount of raw materials used every week and report the estimated amount of raw materials to be purchased to Purchasing section, then Purchasing Section will order the raw material to the supplier based on the report. Mr. Ferry Ferdian as Production Manager admitted difficulties related to determine the amount of raw materials to be purchased to meet the order in the next period, because the amount of raw materials purchased is not always in accordance with the number of real orders in the next period resulting in shortage or excess stock of products, as happened In the month of ramadhan in 2016 which experienced a spike of orders to 6,945,700 items from the average order of 6,079,114 points in the year resulting in a loss of profits that should be obtained in the month.

Based on interviews with Mrs. Annis Fany Silvia as Warehouse & Distribution Manager, he explained about the process of ordering and distributing products at PT. Serena Harsa Utama. PT. Serena Harsa Utama currently has 7 distributors spread in Lembang, Bogor, Cirebon, Cikarang, Tasikmalaya, and 2 in Bandung. In the process of Sales will record each order made by the distributor, then the Sales Department to contact the Warehouse & Distribution Section to check the availability of product stock and the estimated time of product distribution. Distribution is done by using 6 units of

box cars owned with capacity of 40500 grains per vehicle.
Based on the problems that exist in PT. Serena Harsa Utama, the purpose of this research is to build SCM information system at PT. Serena Harsa Utama.The goal to be achieved in this research is

1. Assist Production Manager in determining the amount of raw materials that must be purchased to the Supplier to fulfill the order in the next period.
2. Assist Warehouse & Distribution Manager in scheduling the process of distributing products to Distributors.

2. RESEARCH

2.1 Information System

Information system is a system in an organization that reconcile the needs of daily transaction processing that supports organizational operational functions that are managerial with the strategic activities of an organization to be able to provide to certain outsiders with information needed for decision making. Information systems in an organization can be said as a system that provides information for all levels in the organization whenever necessary. This saving system takes the transform of processing and communicates the information received by using information systems or other system tools.

2.2 *Supply Chain Management*

Supply Chain Management is an integrative method or approach for managing an integrated flow of products, information, and money that involves parties from upstream to downstream. An important principle in SCM is the transparency of information and collaboration between the internal functions of the company and with the parties in the company along the supply chain. Supply Chain is the physical network, ie companies involved in supplying raw materials, producing goods, or sending it to end users. These companies usually include suppliers, manufacturers, distributors, agents and support companies such as logistics services.

2.2.1 Supply Chain Management Coverage

When referring to a manufacturing company, the main activities included in the SCM classification are:

1. Activities to design new products (product development)
2. Activities get raw materials (procurement, purchasing or control)
3. Planning activities of production and inventory (planning & control) Activities of production (production)
4. Planning activities of production and inventory (planning & control) Activities of production (production)
5. Activities of delivery / distribution (distribution)
6. Activity Management of goods / goods returns (*return*)

2.2.2 Supply Chain Management Component

Supply Chain Management has three main components that support the running of a business process as follows:

1. Upstream Supply Chain
   Upstream Supply Chain is the whole activity of a manufacturing company with its distribution or distributor relationship can be extended to several levels. The main activity in Upstream Supply Chain is the procurement of goods.
2. Internal Supply Chain
   Internal Supply Chain is a process of distributing goods to the warehouse. The main activities in Internal Supply Chain are production management, manufacturing, and inventory control.
3. Downstream Supply Chain
   Activities within the Downstream Supply Chain involve the distribution process to end consumers. The main activities in the Downstream Supply Chain are the distribution of goods, warehouses, transportation.

2.3 Forecasting

Resolving future problems can not be ascertained, people are always working to resolve them with models of approaches that match the actual behavior of the data, as well as in forecasting. Forecasting of demand for future products and services and units is critical to production planning and supervision. A forecast has many meanings, so the forecasting needs to be planned and scheduled so that it will take a period of time of at least within the time period required to make a policy and establish some things that affect that policy. Forecasting is needed in addition to predict what will happen in the future as well as decision makers need to make the planning.
Forecasting varies greatly in the forecasting time horizon, the factors that determine the actual results, the pattern type and various other aspects. To deal with such widespread use, several techniques have been developed. One of the techniques in forecasting is the Smoothing Method (Smoothing) which includes short-term forecasting.

According to Gaspersz (1998), based on the time horizon, forecasting can be grouped in three parts namely:

1. Short-term forecasting, This Forecast covers a period of up to one year but is generally less than 3 months.

2. Medium-term forecasting, generally covering a monthly count of up to 3 years.
3. Long-term forecasting, generally for planning 3 years or more.

Quantitative methods are based on sufficiently manipulated historical data available and without the intuition or subjective judgment of the person forecasting, this method is generally based on statistical analysis. Quantitative forecasting can be applied when the following three conditions are met, ie.

1. Information about the situation in the past is available.
2. The information can be quantified in the form of numeric data (numbers).
3. It can be assumed that some aspect of the pattern in the past will continue to the time it will come (called the continuity assumption).

2.3.1 *Single Moving Average*

The single moving average method uses the average of all forecasting data. Moving average is more used to predict the next period. The formula for singlet moving average can be seen in the following equation:

$$Yt + 1 = \frac{Yt + Yt-1 + \ldots + Yt-k+1}{k} \qquad (1)$$

The moving average for the time period t is the arithmetic mean of the latest observation c. In a moving average, the load is the same for each observation. Any new data is included in the available average, and the earliest data is discarded. This model does not handle trends or seasonally very well. Although it is better than the simple average method.

2.3.2 *Mean Square Error (MSE)*

Mean Squared Error (MSE) is the mean of forecasting error squared and can be seen in the equation (2).

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

Keterangan:
MSE = mean squares error value
Xt = Actual data in period t
Ft = The Divination Data of the model used in the period t
n = Many predicted data

2.4 Safety Stock

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

Safety Stock = Z x S_{dl} (3)

Dimana,

Z = *Service Level* (The ability of companies to serve the demand or translated from management decisions)

S_{dl} = determined from the uncertainty of demand with the provisions can be seen in Fig 1.1

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

Figure 1.1 Safety Stock Choosing

2.5 Monitoring

Monitoring is a continuous and regular collection of information that will help answer questions about a project or activity. Monitoring helps alert when something goes wrong and helps keep the job on track.

Monitoring aims to remind the effectiveness and efficiency of a project or organization and is based on defined goals and plans. Monitoring enables us to determine whether our resources are sufficient and well used and serve as a useful basis for evaluation and knowing our capacity is feasible and sufficient.

2.6 Inventory Control

This method uses the basis of mathematics, statistics, and optimization as the main tool to answer the quantitative problems that occur within the inventory system. In essence, this method seeks to find the optimal answer in determining the inventory policy, the policies relating to the determination of economical order lot size, when the order is made, as well as security reserves (Safety Stock) in need. The approach used is to make mathematical modeling of alternative answers to the problem can be determined optimally analytical answer.

So in Inventory Issues encountered using Inventory Probabilistic contained When the order is made and How much security reserve (*Safety Stock*).

2.7 Data Flow Dagram (DFD)

Data Flow Diagram (DFD) is a diagram that uses notations or symbols to describe the network system

work among the functions associated with each other with the flow and data storage.

DFD is often used to describe an existing system or a new system that will be developed logically without considering the physical environment in which the data flows or where the data will be stored. One of the advantages of using data flow diagrams is to facilitate users (users) who lack the control of the computer to understand the system to be done.

2.8 Entity Relationship Diagram (ERD)

ERD is a model to explain the relationship between data in the database based on the basic objects of data that have relationships between relations.ERD to model the data structure and relationships between data, to describe it used some notations and symbols.

Entity Relationship Diagram (ERD) has two main components namely Entity (Entity) and Relation (Relation). Both of these components, each equipped with a number of attributes that present all the facts that exist in the real world. This ERD can be described systematically using symbols.

2.9 Flowmap (Flowchart)

Defines the relationships between parts (process actors), processes (manual / computer-based) and data flow (in the form of output and input documents). The system procedure diagram is a widely used tool for determining the documents involved, the part that creates the document and receives the document, determines the process and the document.

2.10 Analisis Pemetaan SCM

Supply chain business process is divided into three sub elements of work namely demand management (demand management), procurement (procurement), and distribution (delivery). In demand management is the process of ordering product ordering from distributors which will be used to forecast the ordering of products of the next period, then procurenment is the process of procurement of raw materials required if there is demand for product ordering from consumers or when the lack / void stock of raw materials in raw material warehouse , while the distribution is the process of delivering finished products from the company to the distributor.

Supply chain management component has five sub elements of work namely product ordering forecasting, planning and controlling raw materials, delivery, workflow structure / work activities, and structure of communication and information flow facilities. Product ordering forecasting is an explanation of demand management because the application is to forecast product ordering for the next period. Planning and control of raw materials is a business process of its application procurenment ie the company plans the raw materials to be ordered to the supplier and control the raw materials so as not to the occurrence of void raw materials in raw material warehouse to be able to fulfill every incoming order. Delivery is an explanation of the distribution business process where the company estimates the time required for product delivery and delivery of products based on existing orders, whereas for the workflow structure and the structure of the communication flow facility is a working sub element of the entire process contained within the framework SCM from start to build cooperation to make communication and information between company, supplier, and distributor.

2.11 *Single Exponential Smoothing Analytic*

Forecasting calculations require product demand data several previous periods. The data to be used is the demand for SK baseball products for the period of September 2015 - August 2016. Recapitulation of the demand for baseball SK products for the period September 2015 - August 2016 is presented in table 1.1

Table 1.1 SK Product Demand

No	Month	Demand (pcs)
1	September 2015	6.051.000
2	Oktober 2015	6.070.400
3	November 2015	6.029.600
4	Desember 2015	6.024.900
5	Januari 2016	6.041.000
6	Februari 2016	5.980.000
7	Maret 2016	6.180.600
8	April 2016	5.875.200
9	Mei 2016	6.033.200
10	Juni 2016	5.820.200
11	Juli 2016	6.945.700
12	Agustus 2016	6.236.000
Total		**79.603.800**

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Based on the comparison of simple average forecasting method, single moving average, and simple exponential smoothing which has been done before then selected single moving average with 4 month indicator because it has the smallest error value among other methods.

Furthermore, forecasting product ordering for September 2016, then the data required is the actual data ordering products from May 2016 until August 2016, the data is presented in the table above. The value of forecasting by using the single moving average method can be found using equation (1), more can be seen below.

$$F_{13} = (6.033.200+5.820.200+ 6.945.700+ 6.236.000)/4$$

= 6.258.775

Thus, the result of product ordering forecast for September 2016 period is 6,258,775 grain of baso SK.

2.12 Analysis of Material Monitoring

Monitoring of raw material inventory aims to monitor and control existing warehouse inventory. This monitoring aims to avoid the occurrence of shortages and depletion of raw materials stock needed for production process can continue to run in PT Serena Harsa Utama. From the results of the forecast for September 2016 PT. Serena Harsa Utama had to do the baseboard production as much as 6,258,775 grains. In its production, SK baso requires meat, spices, flour, and ice cubes as its raw material, the following is a list of the weight of the components required to produce 1 point of SK deck which is described in Table 2.1.

Table 2.1 Composition Each Pieces Product

Component	Weight (gr)	Needs / Grains (gr)
Daging	27200	6,15
Bumbu	1000	0,23
Tepung	1000	0,23
Es Batu	10000	2,16

So if the baso SK that must be produced as much as 6.258.775 items for the raw materials needed to produce it can be seen in table 2.2 below:

Table 2.2 Raw Material Planning SK

Item	Total Product	Material	Needs	Satuan Supplier
SK	6.258.77 pcs	Meat	38.491 Kg	1415.11 blok
		Spices	1439,51 Kg	1439.51 kg
		Flour	1439,51 Kg	1439.51 kg
		Ice	13.518,9 Kg	1351.89 pack

Safety stock Or security inventory serves to protect errors in predicting demand during lead time. Implementation of safety stock method used for this research is to forecast raw material inventory of meat, seasoning, flour, and ice cube next month period. Here is an example of raw material inventory calculations using methods *safety stock* :

a) Calculation of raw meat stock. Z = 95%

Sd = 38351,4 kg,

l = 7 days,

Sdl = $Sd\ x\ \sqrt{l}$

Sdl = 38351,4 x $\sqrt{7}$

Sdl = 101468,27

Safety Stock = Z x Sdl

Safety Stock = 1,645 x 101486,27

Safety Stock = 166.915 kg (Monthly)

Safety Stock = 166.915 / 30 = 5564 Daily

Safety stock calculation aims to determine the number of products declared safe if the stock in the warehouse exceeds the calculation of safety stock numbers. Safety stock is a condition that the company needs to anticipate the shortage of raw materials to conduct production, here is a form of monitoring of raw materials presented.

Table 2.3 SK Meatball Monitoring

Material	Safety Stok	Warehouse Stock	Status
Meat	5564 kg	4300 kg	Tidak Aman
Spices	208 kg	136 kg	Tidak Aman
Flour	208 kg	136 kg	Tidak Aman
Ice	738,6 kg	500 kg	Tidak Aman

In table 2.3 it can be seen that the stock of raw materials owned by PT. Serena Harsa Utama is not safe to meet the estimated orders in the September period 2016.

2.13 Raw Material Procurement Analysis

By looking at which product demand has been counted on September 1, PT. Serena Harsa Utama is experiencing a shortage of inventory for all raw materials with a total of 4300 kg of meat, 136 kg of spices, 136 kg of flour, and 500 kg of ice cubes. Then PT. Serena Harsa Utama has to procure raw materials to make its estimated production in September 2016. After forecasting for raw material inventory in September, the procurement proposal to meet the raw materials of 38,491 kg of meat, 1,440 kg of condiment, 1,440 kg of flour, And 13,519 kg of ice cubes. So to know the optimal amount of raw material procurement in order not to accumulate in the warehouse, the calculation is as follows.

1. Meat Procurement Calculation

Procurement proposal = 38.491 kg

Stock left = 4300 kg

Total = (Procurement proposal + *Safety Stock*) – Stock left

= (1440 + 222) – 136

= 1526 kg

= 38.493 kg

2. Spices Procurement Calculation

Procurement proposal = 38.491 kg

Stock left = 4300 kg

Total = (Procurement proposal + *Safety Stock*) – Stock left

= (1440 + 222) – 136

= 1526 kg

The procurement process for inventories in September 2016 will be presented in table form and can be seen in the table 2.4

Table 2.3 Material Procurement

No	Tanggal	Bahan Baku	Stok Gudang	Safety Stok	Jumlah Disarankan	Satuan Supplier	Jumlah
1	02/09/2016	Daging	4300 kg	5564 kg	38.493 kg	Blok	1497
2	02/09/2016	Bumbu	136 kg	222 kg	1.526 kg	Kg	1548
3	02/09/2016	Tepung	136 kg	222 kg	1.526 kg	Kg	1548
4	02/09/2016	Es Batu	500 kg	784,5 kg	13.803,5 kg	Pack	1402

2.14 *Entity Relationship Diagram* (ERD)

Database analysis on the information system to be built using ERD. ERD is a data model that uses several notations to describe data in the entity context and the relationships described by the data. The diagram is depicted in Fig 2.1

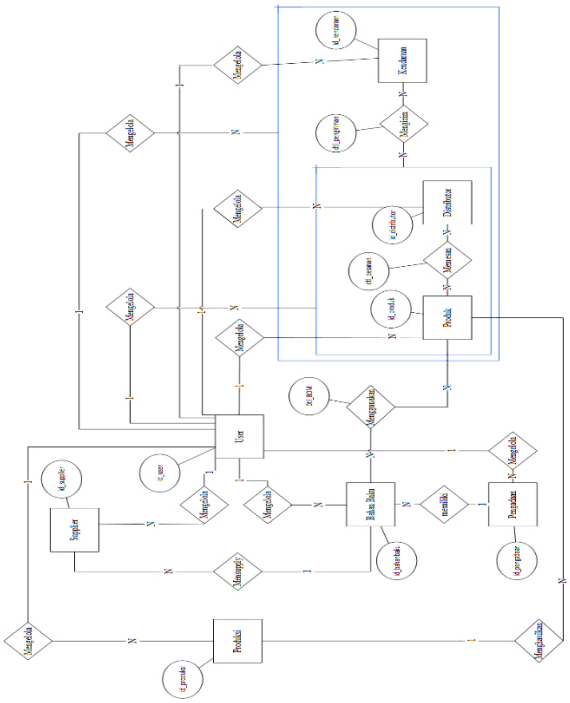


Figure 2.1 Entity Relationship Diagram

2.15 Diagram Konteks

Database analysis on the information system to be built using ERD. ERD is a data model that uses several notations to describe data in the entity context and the relationships described by the data. The diagram is depicted in Fig 2.2.

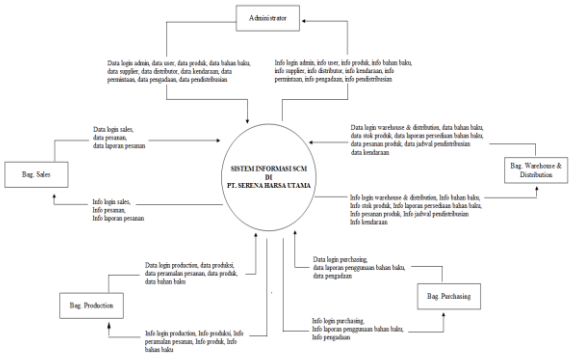


Figure 2.2 Diagram Konteks

2.16 Tabel Relasi

Table relation describes the relationship between data, the meaning of data and limitations. The process of relation between attributes is a combination of attributes that have the same primary key, so that these attributes into a unity that is connected by the key field. Table relation is described in Fig 2.3

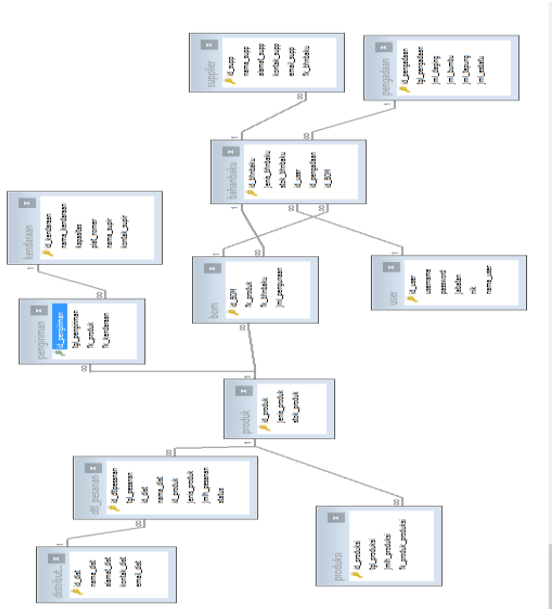


Figure 2.3 Relation Table

2.17 System Testing

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

The test used to test the new system is the black box testing method. Black box testing focused on testing the functional requirements of information systems.

2.18 Alpha Testing

Alpha testing is a functional test used to test systems that have been made with black box testing methods. Black box testing focused on the functional requirements of the software.

2.19 Beta Testing

Beta testing is a direct test in the real environment. Researchers assessed the software using the questionnaire method. From the results of the questionnaire it can be concluded whether the software built has been in accordance with the purpose or not.

Interview were performed on beta testing for each user's page. This beta test is done by doing direct testing in place of research. This research is conducted in PT Serena Harsa Utama, in order to know the extent to which the system built can be a solution of the solution of the problems that have been described previously.

3. PENUTUP

3.1 Conclusion

The conclusions that can be drawn from all the processes that have been done in building this information system are as follows:

1. Supply chain management information system can facilitate the Production Section in terms of determining the amount of raw materials needed each month period.
2. This supply chain management information system can simplify the Warehouse & Distribution Section in scheduling the delivery of the product to the consumer.

3.2 Sugestion

Suggestions for the development of this information system there are several suggestions that can be done, among others:

1. Bring back the existing functions in the system to make it more accurate.
2. In this system does not process data related to finance. It is expected that in the next research can manage the data related to finance for the implementation of supply chain management can be more complete.

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