DEVELOPMENT OF INFORMATION SYSTEM USING SUPPLY CHAIN MANAGEMENT IN PT. SARHIF BROTHERS

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ABSTRACT

PT. SARHIF BROTHERS (SHB) is a Commerce Company that runs on commerce and manufacturing product such as coffee seeds and black paper. Based on the interviews, the Head office of the warehouse faces difficulties in determining the amount of raw materials need due to lack of materials in such seasons and the head officer has to wait a supply of the materials from the supplier to sells the materials. This made the input of the raw material is hung in the balance. Besides that, the Administration and Finance manager face difficulties in determining the shipping schedule due to the high of the demand in a contract and the limited access of vehicles.

Bsed on the problem happening in the company, the solution suggests by the researcher is how to build an information system using *supply chain management* approach. The SHB Company used *make-to-stock* strategy which means that they always do the process of saving the stock of materials or products. The determination of the amount of the materials is using forecasting method named *single exponential smoothing*, and for observing the material stock, they used *safety stock* as an act of determining on the stock security.

Based on the test on the *Black Box*, UAT (*User Acceptance Test*), dan *Beta*, it is found that the system is sufficient to help them in determining the amount of raw materials they need in the next period, and help them in determining the shipping schedules of the materials that fits with the errand of the buyer.

Keywords: *Information System, Supply Chain Management, make-to-stock, Single Exponential Smoothing, Safety Stock*

1. INTRODUCTION

PT. SARHIF BROTHERS (SHB) is a Commerce Company that runs the manufacturing products such as coffee seeds and black paper. The products that is produced are coffees with *DEF 80*, *DEF 120*, *20/25*, *40/45*, *30/35*, *60/65*, *80/85* quality that comes from the *asalan* coffee (the coffee that still mixed with the skin, bunches, and having so much water contents) that has been through some processing. The SHB Company is doing their marketing of the product directly to the companies who made coffee and products that has sigining the contract first. The SHB Company used their *make to stock* strategy. It means that they always doing either stock-saving process or shipping products.

The results of the interview with Mister Ghany as Head officer of the warehouse proved that the process of supplying the raw materials in SHB Company is done directly to the buyer without any reservation first, which means that the *supplier* comes directly to the company to sell their products. The *Supplier* is basically comes from the farmer and the trade agent who comes from the same region or from outside the city. The quality of the products brought by the *supplier* are going to be checked first to determine which materials that are going to be bought.The materials such as *asalan* coffee and *asalan* blackpaper are seasonally, so that the amount of materials from the supplier are fluctuative. When the harvest season hasnot come, the amount of material supply is decreasing. For example, from January to April and from November to December of 2016 when the harvest season has not come yet, the average of material supply of the coffee are 109 ton per month while the average of materials supply whe the harvest season is still going can be reach until 2216 Ton. Besides of the seasonal reason, another factor that made the decreasing of material supply is the basic fare (the local sale fare) is decreasing and the stock material processing comes from the suppliers who sell their product. This thing made the amount of material supply can not fullfiled the uncoming high demand.

The results of the interviews with Miss Lilis as an Administration & Financial manager who

handle the demand and ship process directly to the buyers using company's vehicle. The vehicles owned by the SHB company is 8 trucks of *Colt Diesel Double* with the maximum load of 10 Ton, and 6 trucks of *Fuso* with maximum load of 20 Ton. The shiping process can be seen from the expiry of the contract with the time limit of the nearest shiping place. When the demand is high, the amount of demand frkm the buyers can be reached 10 until 1000 Ton in one contract, so that to fulfill the contract, they need about 2 until 7 days or more to ship the products. For example, the contract with PT. Olam Indonesia (contract COFF/DIFF/OL/16-005) is at 1000,63 Ton, they need 10 days of shiping from 27th of July 2016 s.d 5th of August 2016. The contract with PT. Olam Indonesia (Contract COFF/DIFF/OL/16-008) is at 500 Ton, they need 9days of shipping from 27th of August s.d 4th of September 2016, while in the contract, the time limit of the shipping are from 27th of August s.d 3rd of August. This thing made the company has to delay the shipping due to the high demand can be happening and made the fare sale is decreasing or the contract is terminated by the buyers.

Based on the problem found in the SHB company, they need a system that can manage the information of their *supply chain*. Therefore, the *Supply Chain Management* (SCM) can be a right decision to solve the problem because the function of SCM itself is to integrate the business process from the supplier to the customers. Thus, it necessary to build the Information system with the *Supply Chain Management* approach that can help and give solution to solve this problem.

Based on the problem that has been researche, the aims of this research is to build information system using *Supply Chain Management* approach in PT. SARHIF BROTHERS.

Meanwhile, the purpose of this research can be seen as follows:

a. Helping the head officer of the warehouse in supplying the materials.
b. Determining the amount of materials need to fulfill the upcoming demand.
c. Helping the Administration & Financial manager in determining the schedule of shipping and determining the vehicles used to ship the products to the buyers.

2. CONTENT

2.1 Information System

The system is a network from connected procedures, gathering together to do activities to aim certain purpose [1].

Generally, information is processing data to be s useful and meaningful form for the receivers that would be used to take decision later on for the present or the future. The fun tion from the information is to reduce the uncertainity in the process of taking decision in certain situation.

Thus, the meaning of information system is a collection of connected components and pull together to collect, process, save, and distribute the information concerned to support the process of taking a decision, coordinating and controlling what inside of it [1].

2.2 *Supply Chain Management*

Supply Chain is a system where the organization can channelize the production of the products and its service to the customers. This chain is also a network or media from various organization that are connected and having similar purpose of organizing the suplly or the shipping of the products [2].

The concept of *supply Chain* is a new concept in observing the logistic problem. The old concept tend to look into logistics as a intern problem of each company and the problem-solving process is focusing on each company. Whereas, in this new concept, the logistic problem seen as a wider problem starting from the raw material to the results of the materials used by the last costumers that would be a eye chain of supplying the products. Thus, it can be said that *supply chain* is *Logistics Networks*.

In this case, there are some main player that company has an having the same interest, namely [2]:

a. *Suppliers*
b. *Suppliers – Manufacturer*
c. *Suppliers – Manufacturer – Distribution*
d. *Suppliers – Manufactures – Distribution – Retail Outlets*
e. *Suppliers – Manufactures – Distribution – Retail Outlets – Customer*s

2.2.1 Supply Chain Management components

Supply Chain Management has 3 main components that support on processing business that can be seen as follows [3]:

a. Upstream Supply Chain
The part of *Upstream*, the whole activities of manufacture company with its distribution or the relationship of a distributor can be widen to be in some level. The main activities in this *Upstream Supply Chain* is supplying the materials [3].

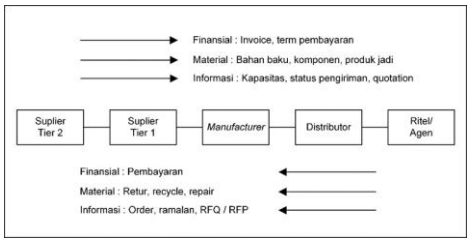
b. Internal Supply Chain
The part of *Internal Supply Chain* is a process of shipping to the warehouse. The main activity in *Internal Supply Chain* is

production management, manufacturing, and controlling the stock [3].

c. *Downstram Supply Chain*
The *Downstream supply chain* covers the whole activities involved in the ship of the products to the customers. In the *downstream supply chain*, the focus is on the distribution, warehouse transportation and *after-sale service* [3].

2.2.2 Supply Chain Management process

The process of *supply chain management* is a processing product starting from raw materials, semi-finished products until the finised products sale through various facility connected to the chain along the way with the products and materials. If it was pictured in the form of diagram, the dispkay would be seen as follow [3]:



Picture 1. The *Supply Chain* process and 3 3 kind of current managed by the organization [3]

Picture 1 shows that *supply chain management* is a coordination from the materials, information nad financial between the participate companies.

a. First, the current of the product that stream from the *upstream* to the *downstream*.
b. Second, the current of money and the similar type that stream from the upstream to the downstream.
c. Third, the current of information can be happening from the upstream to the downstream or the other way.

2.3 *Safety Stock*

The stock can be classified into various way, one of them is based on its function. Safety stock is one of the examples of stock based on its function as a protection toward uncertain demand or supply. The company is usually save more from what they predict during one certain period so that the need can be fulfilled and they do not need to wait. Determining on the amount of safety stock is a very hard thing to do. The amount of safety stock depends on the stock fee and *service level* [3].

The amount or *safety stock* (SS) secara can be defined generally in the equation as follow:

$$SS = Z \times S_{dl} \quad (1)$$

:

Z = the value from the normal distribution standard connected with certain probability. The value of Z is usually connected to *service level*.

S_{dl} = The deviation standard of demand during *lead time*.

The value in S_{dl} can be search with collecting demand data directly during the lead time for one period that quite long, or can be obtained by getting the average data first and the deviation standard from two components,namely the demand per period andl ead time. By getting these 4 parameters, the value of S_{dl} can be calculate as follows in equation 2:

$$S_{dl} = \sqrt{(d^2 \times S_{;}^{\ 2} + l \times S_d^{\ 2})} \quad (2)$$

Explanation:

d^2 = The average of demand
$S_{;}^{\ 2}$ = The deviation standard of lead time
l = Lead time
$S_d^{\ 2}$ =The deviation standard of demand per period.

2.4 Forecasting

The forecasting is a thought on a thing, for example, the sale on one or some products for the next period. Generally, the forecasting can only be known as a guess. However, by using certain techniques, the forecasting can be more than just a forecasting. The forecasting can also be known as educated guess. Each decision taking related to the situation in the future, there must be a forecasting based on that decision which is taken [4].

2.4.1 *Single Exponential Smoothing* predition method

The forecasting based on the *exponential smoothing* method is generallt used to predict the sales of the products individually. This method is oftenly reputed as a better method than previous method such as *simple average* and *single moving average* because of its ability in using the past data and giving the weight based on the present data. The present data is given the bigger weight compared to the previous data. The assumption is the present data and always have an impact compared to the old data [4].

The formula for the *single exponential smoothing* can be seen in equation 3.

$$F_{t+1} = aX_t + (1-a)F_t \quad (3)$$

Explanation:

F_{t+1} = The results of forecasting for t-1 period
α = The smoothening of the constant ($0 \leq \alpha \leq 1$)
X_t = The actual sales data for t period
F_t = The forecasting on t period

2.4.2 The calculation in forecasting error method or *Mean Squares Error* (MSE)

Mean Square Error (MSE) is the average from wrong forecasting that is being quadrate and can be seen in equation 4.

$$MSE = \frac{\sum(|X_t - F_t|)^2}{n} \quad (4)$$

Explanation:

MSE = The value of *mean squares error*
X_t = The actual data from t period
F_t = The forecasting data from the model used on t period
N = the amount of data from the results of forecasting

Calculating the wrong forecasting used to find out the exact of the results of the forecasting that has been done towards the actual data. There are a lot of model to do the wrong calculation in forecasting. The method used to calculate the *Forecasting error* is MSE (*Mean Squares Error*). MSE is the average of the fare different quadrate from the value that is being predicted with the calculation that is being observed. [4] MSE used with producing the *errors* shows how big the differences between the estimated results with the destination. This thing made it different because there is a random data or due to the estimated which is more accurate.

2.5 The analysis of the problem

The analysis of the problem is the assumption from the problems that are explained in the prcedures of processing the data on the programs in constructing the information system using *Supply Chain Management* approach in the SHB company. The analysis of the problems from the system that are still used in the company is explained as follows:

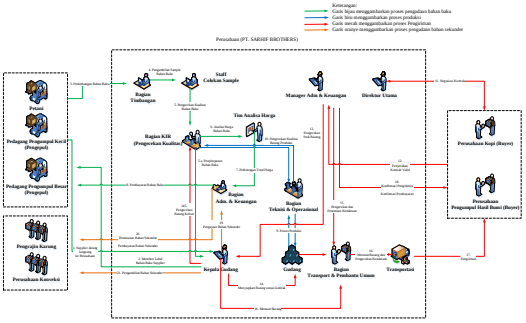
a. The raw materials that is seasonal and the supply of the materials are usually comes from the supplier who come for selling the materials and they have to wait for them so that the amount of supply from the supplier is uncertain or fluctuative. This made the head officer of the warehouse having difficulties in deciding the amount of materials that is needed to fullfiled the upcoming demand.
b. The amount of high demand from each contract and the limitation of vehicles the company have have an impact in shpping process because it took so long and having the delay shipping have an impacr of the decreasing sales or the cancelation of contract by the buyers. This thing is also made the Administration & financial manager is having the difficulties in determining the vehicles to ship the demand from the buyer.

2.6 The analysis of *Supply Chain Management*

The analysis of *Supply Chain Management* used to apply the *Supply Chain Management* approach for the system which would be build.

2.6.1 The Supply Chain Management Model in SARHIF BROTHERS COMPANY (SHB)

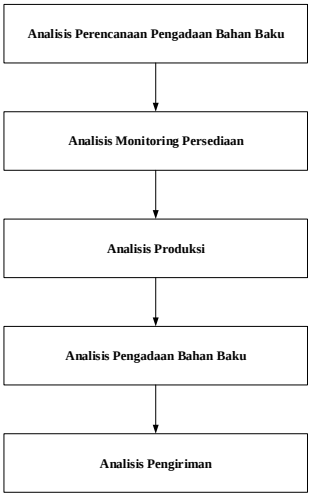
The Supply Chain Management model in SHB company can be seen in picture 2.



Picture 2. The *Supply Chain Management* model in SHB company

2.6.2 The procedures on *Supply Chain* in SHB Company

The analysis of procedures in *supply chain* is done to describe the s*upply chain management* process that would be build in SHB Company based on *supply chain management* model in picture 2. The procedures of *supply chain* in SHB Company can be seen in picture 3.



Picture 3. The *Supply Chain* procedures

a. The analysis of planning in supplying the materials

The analysis of planning in supplying the materials is done to determine the amount of materials needed on the certain period.the decision can be done by using the *Single Exponential Smoothing* forecasting method based on the previous actual sales data of the products The results of the forecasting used as a reference of consideration to determine the amount of materials needed to fullfiled the upcoming demand as a *safety stock* forecasting on the upcoming period.

b. The analysis of supply monitoring

After deciding the amount of materials needed, the next step is monitoring the supply of materials and deciding on the safety stock that has to be in the warehouse so that there is no minus, empty, or the accumulation of materials. The method used is *Safety Stock* method.

The observation of supplying products can be served with showing the fare different between the available stock in the company with the results of supply planning of supply materials or stock and giving the status whether the condition is safe or not. The supply status is safe if the warehouse stock is equal or more from the amount of supply needed.

Besides, the observation of stock and *safety stock* supply, observing the goods mutation is also very important to find out the movement of income and outcome producrs in the company so that the stock in the system and the stock in the warehouse has no different.

c. The analysis of production

The analysis of production can be done based on the production process done by the technical and operational staff. The production activities can be done in working hour everyday. The amount of products that will br produce determined based on the results of forecasting that has been done before and divided to the amount of working hours in a month and the amount of maximum production that can be done.

d. The analysis of materials supply

The analysis of these supply of materials has been done based on the materials supply process that is done by the SHB company. The party that is involved in supplying the materials is the head officer of the warehouse, the weights staff, the sample staff, KIR research staff, the price analyst, and Administration & finance. The process of supplying the materials is done directly without any order. The supplier comes directly to the company and sells their products. When the supplier comes to the company to sell their products, the head officer of warehouse checked the products first and giving the material label and point it out to the weighing staff for the weighing process. After the weighing process, the sample staff took a sample from the materials and gives it to the KIR researcher for quality process (KIR process). If the products that has been analyzed has qualified with the standard, then the materials or the products will be bought and will be deposited in the warehouse and if the product s are not qualified, they will informed this matter to the supplier party. After the KIR process is done, the price analyst team has a role as a team who determine the price of sales based on the results of KIR process and negotiating with the supplier. If the supplier agrees with the price, the next process is the payment that would be done in Administration & finance staff. The sales on each supplier have never been the same due to the basic fare that can be changed everyday and also because of the various qualities of materials.

The SHB Company has policy. It contains the statement that if the supplier wants to sell the product but the price are still not in a *deal* situation with the sales price, it can be done by the deposit process. This processs is a situation where the supplier sells the products without putting the same price or the price would be delay first because the price is still waiting the agreement with the supplier. The deposit materials is the SHB property but in the process of payment has not been completed.

Based on the monitoring on the supply of the materials, *safety stock* used as reference, and the addition on collecting the materials needed to fulfill the planning that has been made before. The amount of materials needed is the results of

forecasting and the addition of *safety stock* and the minus of the stock on the warehouse.

e. The analysis of shipping

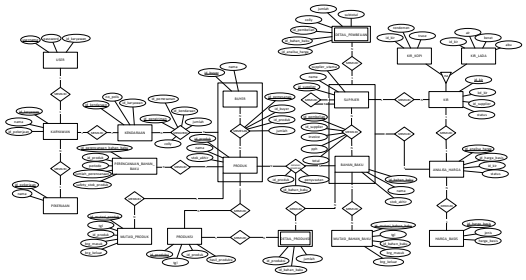
The analysis of shipping is done based on the products shipping process to the buyer that has been ordered or contracted. The shipping process includes the activities such as the vehicles that would be used for shipping and the monitoring process that aims to find out the shipping status that has been done whether the products have been arrived to the buyer or still on the shipping process.

The SHB Company used their vehicles property to do the shipping. The vehicles that the company has are 8 turcks with *Colt Diesel Double* type with the maximum load of 10 ton, and 6 truck *Fuso* type with maximum load of 20 ton. The shipping schedule is done everyday (Monday to Saturday) at 03.00 AM in the morning.

The product shipping process to the buyer can be seen from the time limit of the nearest shipping time includes in the contract. Meanwhile, the distance between the buyer location has not calculated yet because the majority of the buyer position at the present time has been in the same zone such as *Teluk, Bandar Lampung*. The payment process done when the products that are ship has arrived to the buyer and the buyer paid the products based on the amount of products shipped. If all of the products has been sent matched with the contract, then the payment would be paid fully.

2.7 The analysis of basic data

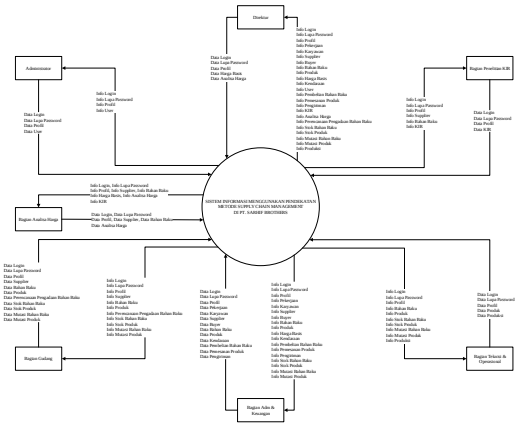
The analysis of basic data on the information system using *Supply Chain Management* approach in SHB Company would be build using *Entity Relationship Diagram* (ERD). The ERD itself can be seen in picture 4.



Picture 4. ERD Information system using *Supply Chain Management* approach in SHB Company

2.8 The context diagram

The context diagram explains how the data used and transform to be processed input or output of the data in information system using *Supply Chain Management* approach in SHB Company. The context diagram in the system can be seen in picture 5.

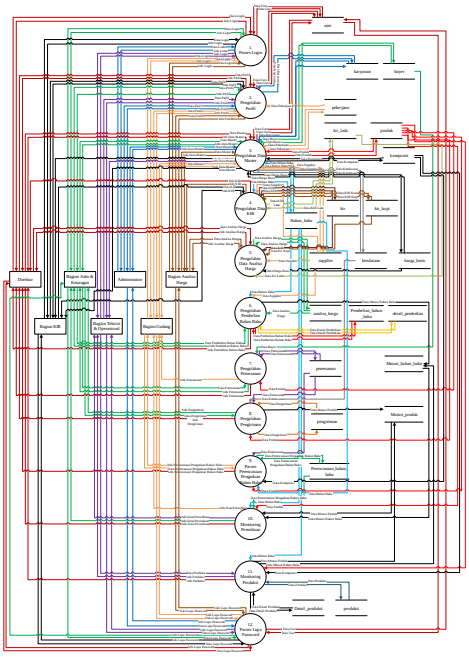


Picture 5. The Context diagram of information system using *Supply Chain Management* approach in SHB Company

2.9 The Data Flow Diagaram (DFD)

The *Data flow diagram* shows how the data processed and analyzed in the system in the more specific way. The context diagram on picture 5 can be explained into some DFD which divided into some levels.

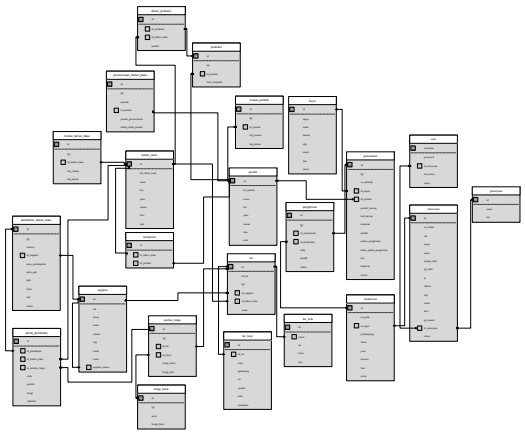
The DFD on Level 1 of information system using *Supply Chain Management* approach in SHB Company can be seen in picture 6, it explains what process that can be done by the system generally.



Picture 6. The DFD on Level 1 of information systek using *Supply Chain Management* approach in SHB Company

2.10 The relation schemes

The relation schemes describe the relationship between the data, the meaning of the data and its limitation. The relation process between the attributes is the combination between the attribute that has the same main key so that the attributes can be united that are connected to the key field. The relation schemes of Information system using *Supply Chain Management* approach in SHB Company can be seen in picture 7.



Picture 7. The relation schemes in Information system using *Supply Chain Management* approach in SHB Company

2.11 The trial of the system

The trial of the system is the most important thing that has aims to find out the mistakes or a shortage of the tested system.

The plan for the test is dobe by testing the system built using *black box, user acceptance test* (UAT) and *beta*.

a. The trial of *Black Box*

The trial of *black box* focused on the functional requirements of the software that has been built.

Based on the results of the trial in the sample case that has been tested, it is proven that the whole process is done and meet the expectation, but there is some error in functionality and does not meet the expectation. The screening process of the mistakes is in the form of display of message page that is done well.

b. The trial of *User Acceptance Test* (UAT)

The purpose of the *User Acceptance Test* (UAT) is to confirm that the system that is still in the process of trial can fulfill the business need to make sure that the system tested is working well and can be used before it is given officially to the users. The trial of the users is done by one ot more representative with the help of the examiner team.

Based on the results of the trial of *User Acceptance Test*, with the sample case tested, it is proven that the average of process can be done so well. The functional system can give the results and meet the expectation functionally.

c. The trial of *Beta*

The trial of *beta* is the test that is done directky in the real environment. The users is done the test towards the software using an interview method. From the interviews, it can be concluded whether the software built is mateched with the purpose or not.

The interviews is done by the users from the system that involve the administrator, The main director, the administration & finance staff, the warehouse staff, the price analyst staff, KIR staff, and techinical & operational staff.

Based on the trial of the *beta* above, it can be concluded that:

1. This system helps the administrator, the main director, the administration & finance staff, the warehouse staff, the price analyst staff, KIR staff, and techinical & operational staff in their job.
2. The system built is easy to use.
3. The system built has the simple display and easy to understand.

4. The use of language in the system is understandable and easy to understand.
5. There are some components that is still need to be develop so that the process can be in the maximum range.

3. CONCLUSION

3.1 Conclusion

The conclusion that can be taken by this research is the process of constructing the information system can be explained as follows:

a. The information system used by *supply chain management* approach can help the head officer of the warehouse in the process of planning for supplying the materials to determine the amount of the materials needed in the certain period.
b. The information system using *supply chain management* approach can help the administration & finance manager in determining the schedule of shipping to the buyer.

3.2 Suggestion

The suggestion for the developer of information system using *supply chain management* approach can be seen as follows:

a. The finishing on the plan of supplying the materials is that the plan of the supplying is not only for monthly, but it can be more than one month or adapting the seasonal materials.
b. The further development in shipping process and the decision on vehicles so that this system can automatically made the shipping schedule and the kind of vehicle used without disturbing other contracts.

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