DEVELOPMENT OF INFORMATION SYSTEM USING SUPPLY CHAIN MANAGEMENT AT PT. SANDY GLOBALINDO

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ABSTRACT

PT. Sandy Globalindo is a company located in Gunung Batu, Cimahi. This Company is engaged in the production of various motor spare parts with the brand SND. The problems that often occur at PT. Sandy Globalindo is the difficulty in determining the amount of raw material requirement due to the uncertainty of the buyer's demand, because if the shortage of raw materials will cause the stock void which resulted in the late distribution of the product to the distributor and vice versa if the excess stock will make the buildup in the warehouse which will incur additional expenses for its maintenance. Based on the problems that exist in PT. Sandy Globalindo, then the need for an information system development using supply chain management approach. The purpose of this system is to facilitate the planning of raw material needs to avoid stock void or stockpiling.

Supply chain strategy used is push supply chain, because it is based on suitability of supply chain that happened in company at this time that is using make-to-stock strategy. This supply chain system is built from the upstream to the downstream. Forecasting method of raw material requirement used is single moving average. Calculation of the prediction of availability of raw materials in the warehouse using the method of securing the inventory (Safety stock).

Based on the test results can be concluded that this system has helped in planning the raw material needs and avoid stock void.

Keywords : supply chain management, push supply chain, make-to-stock, single moving average, safety stock.

1. INTRODUCTIOIN

PT. Sandy Globalindo is a company located in Gunung Batu area, Cimahi City. This company is engaged in the production of various motor spare parts with the brand SND. SND products come from various raw materials, namely Ring guide manifold, ring manifold, pipe of various sizes, glasswooll, cover dock sylencer, spring guide dock sylencer, sylencer, metal ore etc. In the company of PT. Sandy Globalindo has 2 storage warehouses. The first warehouse is used to store raw materials and the second warehouse is used to store the production of SND products. Activities in the upstream section conducted by the company PT. Sandy Globalindo with suppliers is to procure raw materials to suppliers, accept raw materials from suppliers, processing raw materials into products. While the activities contained downstream section conducted by the company PT. Sandy Globalindo is accepting product order and distributing process to customer.

Based on the interview with Mr. Rizza M. Syahid as production manager 1, stated that the current activities contained in the upstream part of the company is to procure raw materials to suppliers to meet the needs of products ordered customers. The procurement of raw materials is done periodically by PT. Sandy Globalindo for using the make-to-stock strategy to produce sufficient stock to anticipate the purchase order of SND products. There was a problem when the ordering request was high which resulted in the shortage of raw material in the warehouse causing the delay of distribution of the product to the customer due to the production part of the production process first after the raw material is available. Vice versa when demand drops excess raw materials often occur and resulted in the accumulation of the amount of raw materials in the warehouse that will incur additional costs for the maintenance of raw materials and resulted in losses. Uncertainty of ordering request causes Purchasing part difficulty in determining the amount of raw material requirement for procurement process to supplier.

While the activities are downstream at PT. Sandy Globalindo is accepting product order from buyer. Receipt ordering products from customers received by the marketing department. Then the distribution section distributes the product to the customer who has ordered the product. Company PT. Sandy Globalindo distributes the product by using two ways, ie shipping by using freight forwarder and freight forwarding services available at the company. Distribution scheduling to customers is often a delay due to shortage of finished product stock in the warehouse.

Based on the problems that have been described above, then the company PT. Sandy Globalindo needs something to connect the supply chain. Therefore Supply Chain Management (SCM) becomes the right

advice because the function of Supply Chain Management (SCM) itself is to connect business processes ranging from raw material suppliers to distributors.

While the objectives to be achieved in this research are:

a. Facilitate Purchasing in determining amount of raw material ordered to supplier.
b. Avoiding the occurrence of product inventory void to avoid delay of distribution.

2. RESEARCH CONTENTS

2.1 Theoritical Basis

Theoretical basis on the writing of this thesis will explain the theories associated with the application of Information Systems Using Supply Chain Management Approach at PT. Sandy Globalindo.

2.1.1 System

According Jogiyanto "System is a collection of elements that interact to achieve a certain goal." (Jogiyanto, 2005)

Meanwhile, according to Jacob "System is a network of related procedures, collected together to perform a certain activity or purpose." (Yakub, 2012)

Based on the two opinions above the authors conclude that the system is a system is a collection of elements or networks of procedures that interact and relate to achieve a certain activity or purpose.

2.1.2 Supply Chain

According to I Nyoman Pujawan "Supply Chain is a network of companies that work together to create and deliver a product into the hands of the end user." (Pujawan & ER, 2010)

While according to According to Simchi-Levi et. Al "Supply Chain (SC) is a network of independent and interconnected organizations working together cooperatively and mutually beneficial in controlling, managing and improving the flow of materials and information from suppliers to users." (Simchi-levi, Kaminsky, Simchi-levi, & Bishop, 2003)

From the two opinions cited above can be concluded the supply chain is a network that can be a network of companies and networks of independent organizations working together to create mutually beneficial cooperation in controlling, regulating and improving the flow of materials and information of a product From supplier to end user.

2.1.3 Supply Chain System

Based on experts' opinions on supply chain systems and supply chains the authors conclude the supply chain system is a system in the supply chain that aims to create mutually beneficial cooperation in controlling, managing and improving the flow of material and information of a product from supplier to end user. Development of Information System Using Supply Chain Management Approach at PT. Sandy Globalindo.

2.1.4 Supply Chain Management (SCM)

According to James A. and Mona J. Fitzsimmons "Supply Chain Management is a total approach system to deliver products to end consumers using information technology to coordinate all supply chain elements from supplier start to retailer, then reach the next level which is a competitive advantage that is not Available in traditional logistics systems." (Fitzsimmons & Fitzsimmons, 2004)

Meanwhile, according to Jacobs and Chase "Supply Chain Management is a system to apply a total approach to managing the entire flow of information, materials, and services from raw materials through factories and warehouses to end consumers." (Jacobs & Chase, 2008)

Meanwhile, according to Simchi-Levi et. Al "Supply chain Management is defined as a set of approaches used to effectively integrate suppliers, manufacturers, warehouses and stores to make the inventory available and distributed at the right amount, to the right location, and at the right time so that the overall cost of the system can Minimized while trying to satisfy needs and services." (Simchi-levi, Kaminsky, Simchi-levi, & Bishop, 2003)

Meanwhile, according to I Nyoman Pujawan and Mahendrawati "Supply Chain Management (SCM) is an integrative method or approach to manage the flow of integrated products, information and money involving parties from upstream to downstream consisting of suppliers, factories, distribution networks and services - logistics services." (Pujawan & ER, 2010)

According to I Nyoman and Mahendrawati on supply chain there are usually 3 kinds of flow that must be managed. Three kinds of flow that must be managed in the supply chain is as follows (Pujawan & ER, 2010):

1. First is the flow of goods flowing from upstream to downstream.
2. The second is the flow of money and the like that flows from downstream to upstream.
3. Third is the flow of information that can occur from upstream to downstream or vice versa.

The following is a simplification of supply chain model and 3 kinds of managed flow can be seen in Figure 1.

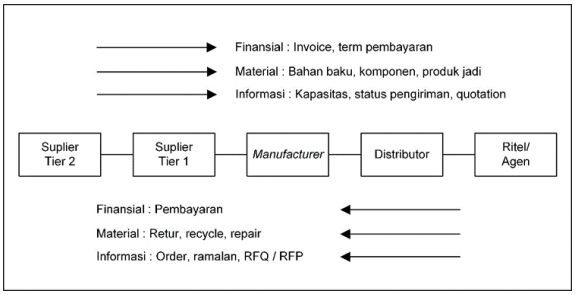


Figure 1. Simplification supply chain model and 3 kinds of stream

2.1.5 *Push* dan *Pull Supply Chain*

According to Chopra and Meindel "pull process based on the customer orders, while the push process initiated and conducted in a way to anticipate the customer's order." (Chopra & Meindel, 2007)

Pull supply chain is the production strategy of "make-to-order" the main benefit is to avoid waste inventory or a corporate strategy mainly manufacturing companies where new production is done always after the market demand and actually performed at the request of customers.

Push Supply Chain is a production strategy Make-to-Stock. This strategy is the opposite of Pull strategy where in the appeal pull, push the strategy is more popular due to its production system based forecasting and produce output in a large number of which will go into inventory prior to distribution to the customer.

This strategy has a focus on efficiency and standardization activities. Push strategy can be connoted with lean supply. Increasingly, companies have little variation, the products that fit this strategy. However, for products with market conditions change, the use of the push system will bring some disadvantages, as:

1. Inability to meet the demands of a changing market.
2. Inventory buildup that will bring a lot of waste and need a lot of storage space.
3. Large production batches.
4. The risk of major product obsolete.

2.1.6 Inventory

Inventory throughout the supply chain has major implications for the financial performance of a company.

According Riyanto "inventory or inventories as the main elements of working capital is an asset that is always in a state of rotating and constantly changing." (Riyanto, 2001)

Meanwhile, according to Zaki Baridwan "Definition of inventory is generally the term used to indicate the inventory of goods held for resale or used to produce goods for sale." (Baridwan, 2000)

2.1.7 Safety Stock Tecnique

Safety stock inventory or security functions to protect the error in predicting demand during Lead Time. Lead time is the time it takes between the raw materials ordered to arrive at the company. The amount of safety stock depends on the uncertainty of supply and demand. Here is the formula in determining Safety stock is shown in Equation 1

$$SS = average\ usage\ previous\ period \times LT \quad (1)$$

Where:

SS = *Safety Stock*

LT = *Lead Time*

Reorder point or reorder point is when the inventory reaches a point where the necessary reordering. Here is the formula to determine reoder point can be seen in Equation 2.

$$Reorder\ Point = (LD \times AU) + SS \quad (2)$$

Where:

LD = *Lead Time*

AU = Average usage

SS = *Safety Stock*

2.1.8 Single Moving Average Forecasting Method

Method of moving average single-use amount of actual data to generate new demand forecast values for future demand. This method will be effectively implemented if we can assume that the market demand for the product will remain stable over time. This method has two special properties, namely to make a forecast requires data.

Historically within a certain period, the longer the moving averages will produce a moving average that is more subtle, systematically moving average can be calculated by equation 3.

$$S_{t+1} = \frac{x_t + x_t - 1 + \cdots + x_t - n + 1}{n} \quad (3)$$

Keterangan:

S_{t+1} = Forecast for *t+1*.

Xt = Data in period t.

n = Time period Moving Averages

2.1.9 Mean Absolute Error (MAE)

Mean Absolute Error (MAE) is the average absolute error of error foresee (positive and negative values are not seen) is shown in Equation 4.

$$MAE = \frac{\sum |x_t - F_t|}{n} \quad (4)$$

2.1.10 Mean Absolute Deviatioan (MAD)

Mean Absolute Deviation (MAD) to measure forecast accuracy by averaging the alleged error (absolute value of each error). MAD useful when measuring forecast error in the same units as the original series. MAD value can be seen in Equation 5.

$$MAD = \frac{\sum (Absolut\ dari\ Forecast\ Error)}{n} \quad (5)$$

2.1.11 Mean Squares Error (MSE)

Mean Squared Error (MSE) is the average of the squared forecasting error and can be seen in Equation 6.

$$MSE = \frac{\sum(X_t - F_t)}{n} \quad (6)$$

2.1.12 Mean Absolute Percentage Error

MAPE is a measure of the relative error. MAPE is usually more significant than MAD as stated percentage error MAPE forecasting results against the actual demand for a certain period that will provide information on the percentage of errors is too high or too low. Mathematically, MAPE can be seen in Equation 7

$$MAPE = \frac{100}{n} \sum |A_t \frac{F_t}{A}| \quad (7)$$

2.2. Analysis of the problem

Problem Analysis is an assumption of the problem that will be described in the data processing procedures in the Information System development program using the Supply Chain Management approach in PT. Sandy Globalindo. Problem analysis of the current system is:

1. Purchasing Section difficulties in determining the amount of raw materials for procurement to suppliers due to fluctuations in the number of orders that change change. If the determination of the quantity of raw materials is not suitable will result in a void of raw material stock if the ordering of the product is high and also causes stockpiling in the warehouse if the ordering of the product is low which has a loss for stock maintenance.
2. Distribution Section difficulties in scheduling the distribution due to delays in delivery and late production process caused by the empty supply of raw materials in the warehouse (out of stock). Delivery delays should be minimized as it will result in the distributor's trust to purchase the product.

2.3 Supply Chain Management (SCM) Analysis

Supply chain management analysis is used to apply supply chain management approach to the system to be built. Supply chain management has a framework that is a development component for the system.

2.3.1 Model Supply Chain Management (SCM) at PT. Sandy Globalindo

Based on the SCM analysis described in the previous section, while the supply chain model contained in PT. Sandy Globalindo can be seen in Figure 2.

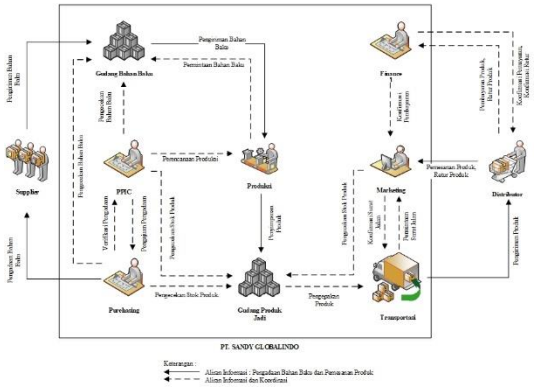


Figure 2. Supply chain model at PT. Sandy Globalindo

2.3.2 Supply Chain Analysis at PT. Sandy Globalindo

Supply chain analysis is done to describe supply chain management process to be built in PT. Sandy Globalindo based on supply chain model in Figure 2. The supply chain analysis can be seen in Figure 3.

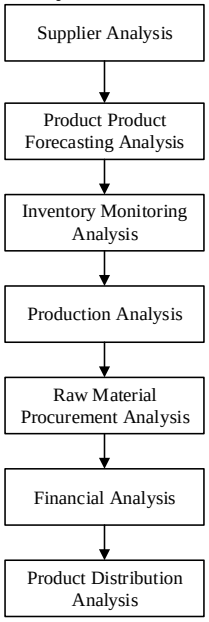


Figure 3. Supply Chain Management at PT. Sandy Globalindo

1. Supplier Selection Analysis

Supplier selection is done by PT. Sandy Globalindo by way of procurement of raw materials to suppliers based on the largest amount of invertation by the company.

2. Product Product Forecasting Analysis

Forecasting demand for raw materials based on actual data of previous ordering request. The results of forecasting obtained is used to determine the amount of procurement to be done and as a basis for

consideration to make purchases of raw materials to suppliers. Analysis of the forecasting stage that will be done is to predict the raw material needs for the procurement process.

3. Analysis of Inventory Monitoring of Products and Raw Materials

After performing the forecasting stage, the next step is to monitor raw material inventory and determine the safe limit of raw materials that must be in the raw material that aims to avoid the occurrence of deficiencies or void raw materials using the method of Safety Stock.

4. Production Analysis

In production analysis, the production department scheduling the production plan to fulfill the order. The number of products produced is calculated based on forecasting results divided by the number of working days in a month.

5. Raw Material Procurement Analysis

In the analysis of procurement of raw materials, the purchasing department makes an order based on the production plan document made by the PPIC section.

6. Financial Analysisi

In this financial analysis is the process of checking the financial coming into the company and the finances that come out for the procurement of raw materials.

7. Product Distribution Analysis

In the analysis of the distribution of this product is the determination of the amount of freight transport product delivery.

2.4 Database Analysis

Database analysis on information systems using supply chain management approach at PT. Sandy Globalindo will be built using Entity Relationship Diagram (ERD). The diagram is illustrated in Figure 4.

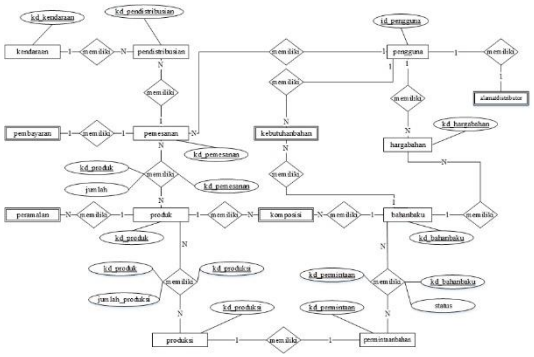


Figure 4. Entity relationship diagram of information systems using supply chain management approach in PT. Sandy Globalindo

2.5 Context Diagram

Context diagram explains how data is used and transformed to process in the form of data flow into and out of information systems using supply chain management approach in PT. Sandy Globalindo globally. Context diagram on the system can be seen in Figure 5.

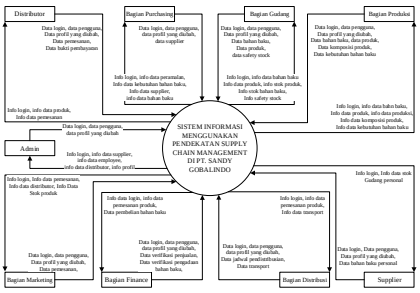


Figure 5. Context diagram of information systems using supply chain management approach in PT. Sandy Globalindo

2.6 Data Flow Diagram

Data flow diagram shows how the data flow describes the processes that occur in the system until the process more detail. In the context diagram like Figure 5. can be decomposed into several DFD.

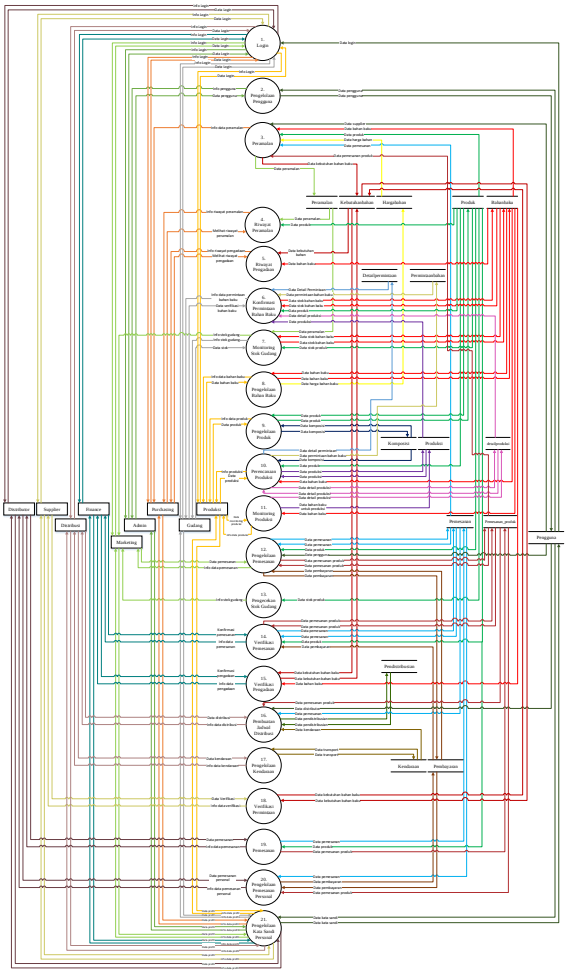


Figure 6. DFD Level 1 information system using supply chain management approach in PT. Sandy Globalindo

2.7 Relation Scheme

The relation scheme describes the relationship between data, the meaning of data and its limits. The process of relation between attributes is a combination of attributes that have the same primary key, so that these attributes become a unity connected by the key field. Table relation is described in Figure 7.

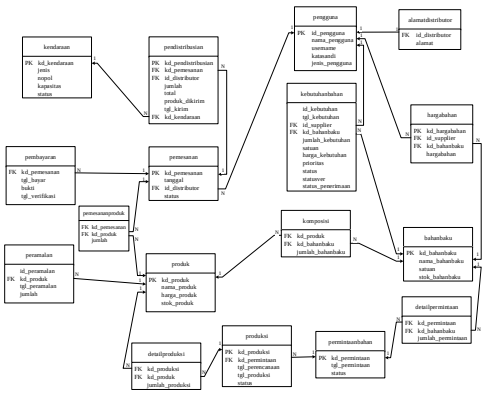


Figure 7. Scheme of information system relation using supply chain management approach at PT. Sandy Globalindo

2.8 Interface Design

Interface design is made to describe the appearance of the program that will be used by the user to interact with the system to be built. The design is made based on the interface of both input and output that will be generated when the application is implemented. Here is an example of designing a login interface that can be seen in Figure 8.

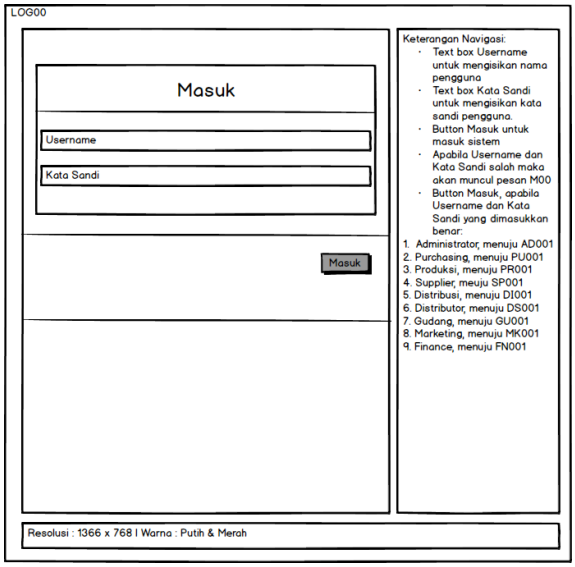


Figure 8. Login Interface Design

2.9 Semantic Network Design

The design of semantic networks is a representation of interface design that shows where each interface is connected. Here is an example of designing semantic network admin users in information systems using supply chain management approach in PT. Sandy Globalindo can be seen in Figure 9.

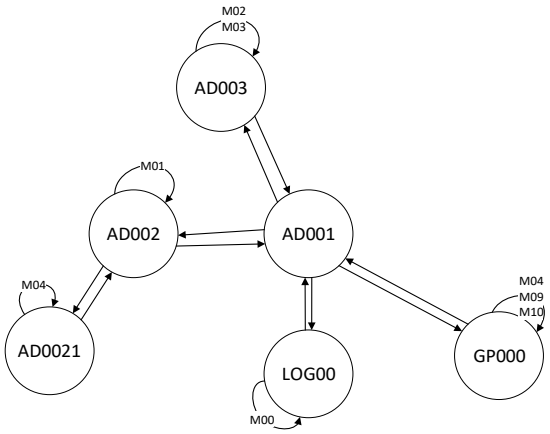


Figure 9. Designing Semantic Network Admin Users

2.10 Procedural Design

Procedural design transforms the structural elements of the program architecture into a procedural description of the software components. Here is an example of procedural login design that can be seen in Figure 10.

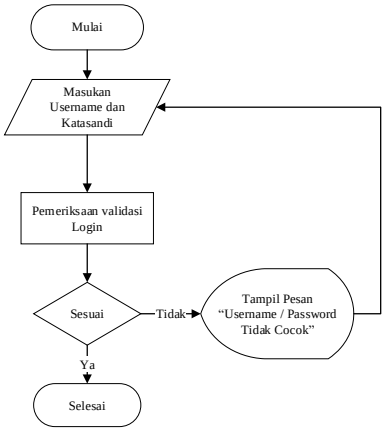


Figure 10. Procedural Logging Design

2.11 System Testing

Testing the system is the most important thing that aims to find errors or deficiencies in the system being tested. Testing intends to know the information system using supply chain management approach that has been made to meet the performance in accordance with the design objectives.

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

The test plan that will be done is to test the system built in Black Box and beta. Testing the development of information systems using supply chain management approach at PT. Sandy Globalindo uses test data based on given data from some data that has been given.

1. Functional Testing

Black box testing is focused on the functional requirements of built software.

Testing is done by testing each process for possible errors that occur.

Based on the test results with the test sample case that has been done to give the conclusion that the process is correct. Filtering process errors in the form of landing page view messages is quite maximal. Functionally the system is able to produce the expected output.

2. Beta Testing

Beta testing is a direct test of the real environment. Users make an assessment of the software using interview methods. From the results of these interviews it can be concluded whether the software built in accordance with the purpose or not.

Interviews are conducted for users of systems consisting of admin, purchasing, distribution, marketing, finance, warehouse and production.

Based on the beta test, it can be concluded that :

1. This system helps admin, purchasing, distribution, marketing, finance, warehouse and part production in running their respective jobs
2. The built system is easy enough to use
3. The built system has a simple and easy to understand interface.
4. The use of language in the system is easy and easy to understand.

3. CLOSING

In this section, explains the conclusions that contain the results obtained after the analysis, design, and implementation of the design of built and developed software and suggestions that will provide important records and possible improvements that need to be made for software development previous.

3.1 Conclusion

Based on the results obtained in the writing of this thesis, it can be concluded as follows:

1. Information systems using supply chain management approaches can facilitate the purchasing department in determining raw material requirements for procurement.
2. This information system using supply chain management approach facilitates the part to conduct stock monitoring in order to avoid out-of-stock vacuum.

3.2 Suggestion

Suggestions for information system developers using this supply chain management approach there are several suggestions that can be done, among others:

1. The addition of user data management will be better if there is a special system that manages employees so that users can be selected directly from the system.

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