DEVELOPMENT OF INFORMATION SYSTEM WITH APPROACH SUPPLY CHAIN MANAGEMENT (SCM) IN CV. SAP

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ABSTRACT

CV SAP is a trading company which distribute car paint established in 2009. The problem is in the estimation to finish the product because it can't be sure when the ready mix product that ordered will be finished and delivered to the buyer since it must wait for the arrival of materials from supplier and wait for production too. The large amount of ready mix paint make the company can't stock the material overload, yet the sales of the products are increase. A problem during the large distribution product is to choose what kind of vehicle that able to do it. A pull Push Supply Chain is a strategy of supply chain that use in this case because A pull Supply Chain is used in order the materials and the production of ready mix product is done after an order from customer, while Push Strategy Chain is used because the order is made once in a month. JIT methods is used as a plan to buy the materials and single exponential smoothing methods is used as the planning of the product. From black box testing and beta testing it can be concluded that this system has been able to help manage customer ordering product list, forecasting product order for one month, helping to determine raw material order quantity to supplier and assist in determining product distribution.

Keywords: supply chain management, push-push supply chain, make-to-order, make-to-stock, just in time, single exponential smoothing.

1. INTRODUCTION

CV. SAP is a trading company that distributes car paints under the brand of sikkens and huber established since 2009. The company has a target of independent repair shop customers, body repair, commercial vehicle manufacturers (caroseries) and retail paint stores. This company has 2 types of products that are products that can be distributed directly and products that must go through the production process first. Products that can be distributed directly such as epoxy, putty, filler, thinner, varnish and hardener products, but also paint with a base color called as raw materials that can be mixed into ready mix paint products to meet customer needs. The company has a supply chain activity that is upstream on CV. SAP makes the process of procurement and acceptance of finished products using the make-stock strategy is the procurement of finished products done by way of first stitching, whereas in the downstream process is the acceptance of product ordering from customers, procurement and acceptance of raw materials as well as processing raw materials into a ready mix paint product according to customer request by using make to order strategy [1].

Based on interviews with Ibu Ayu as Sales Admin section, he explained that the ordering of ready mix products must go through the production process first. Problems that occur in the estimation is complete production Sales admin can not know when ready mix ready made product will be finished and delivered to the customer because it must be through waiting for the arrival of raw materials from the supplier and wait for the production process.

Based on the interview with Ibu Sabila as part of Admin warehouse, current condition for product procurement is done once in one month for finished paint product and raw material is done after ordering from customer with payment done with 30 day tempo. Based on product sales data from October to March 2017, the number of ready mix mixed paint products causes the company can not excessively overpock the raw material because it can cause the buildup if long sold so vulnerable raw material is damaged, while the sale of finished products often increase demand if the procurement of finished products done the same way companies often lack of stock so that it can not anticipate customer demand. With the procurement pattern is still experiencing some constraints. ie the warehouse Admin is difficult to determine the number of products that will be available for the next month and raw materials to be in the message when there is order from the customer, so the Admin warehouse still estimates the number of products and raw materials to be on the message to the supplier.

Based on interviews with Ibu Ayu as Sales Admin, he explained the distribution was done for Customer Repair, Commercial Vehicle Manufacturer (Karoseri) and retail Paint Shop that made large quantity purchases. Constraints are

also often experienced in the distribution of orders in large quantities because the Sales department difficulties in determining what type of vehicle that can be used based on the amount of capacity of the vehicle. If there is an order of 80 kg while the capacity of the motor vehicle can only contain 40 kg, then the order can not be contained in one vehicle and 40 kg of order must wait to load in other vehicle. This also causes the order not to arrive on time as it has to wait for other vehicles that are in operation, resulting in less trust and customer satisfaction with the company.

Seeing the conditions that occur, then in support of existing activities within the company good information system running required a management concept that can manage inventory, regulate the flow of products and information accurate and accurate from the supply chain SCM concept [2]. Based on the consideration of some problems that have been presented then will be built Information Systems With Supply Chain Management Approach on the CV. SAP.

The purpose of this research are:

1. Helps to determine the estimated ready mix ready paint order
2. Assist in determining the estimated number of orders to the supplier as a consideration for the supply of products and raw materials that will be available in the warehouse
3. Helps to manage the amount of charge on order distribution

2. RESEARCH CONTENTS

2.2.1 Problem Analysis

Problem Analysis is an assumption of the problem that will be described in data processing procedures in the Information Systems program with supply chain management approach on CV. SAP. Problem analysis obtained is as follows:

1. Constraints are often experienced when the sales admin does not know the estimated production of ready mix finished paint products because they have to wait for the arrival of raw materials from the supplier and wait for the production process so that the need for information production estimation of finished mix paint products finished
2. Procurement of product is done once a month for finished paint product and raw material is done after ordering from customer. the number of ready mix mixed paint products causes the company to not be able to overcharge the raw materials because it can cause buildup if long sold so vulnerable raw materials are damaged, while sales of finished products often experience an increase in demand if the procurement of finished products is done in the same way companies often lack so the stock can not anticipate customer demand. With the procurement pattern is still experiencing some constraints. ie Admin warehouse is difficult to determine the number of products that will be available for the next month and raw materials that must be in the message when there is order from customers, so it is necessary forecasting to estimate the number of product demand and calculation of the amount of raw material needs as a reference to procure raw materials and products to suppliers.
3. Section Sales Admin often experience constraints on the distribution of orders due to the large number of products in the message of the customer while the limited vehicle capacity that causes difficult in determining what type of vehicle that can be used so that the need for a scheduling that can determine the vehicle used.

2.2.1 Supply Chain Management Analysis At CV. SAP

Based on the analysis of the running system then proposed supply chain management method on the system to be built in CV. SAP.

2.2.2.1 Supply Chain Model in CV. SAP

This mapping includes the components involved with CV. SAP can be seen in Figure 2

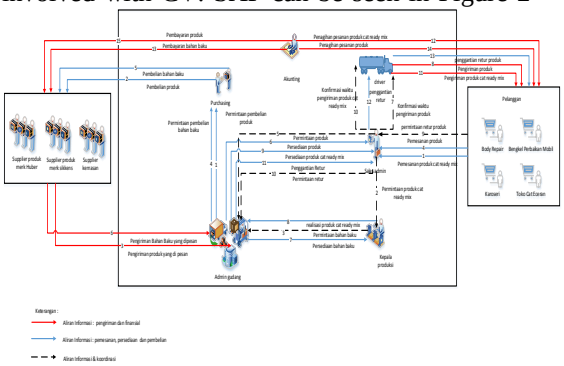


Figure 1 Supply Chain Management Model At CV. SAP

In the implementation, peru made supply chain stages on the CV. SAP. These stages include:

2.2.2.2 *Analisis Supply Chain* in *CV. SAP*

Supply chain analysis is done to describe supply chain management process to be built in CV. SAP based on supply chain model in Figure 3.adapun supply chain analysis in CV. SAP can be seen in Figure 3:

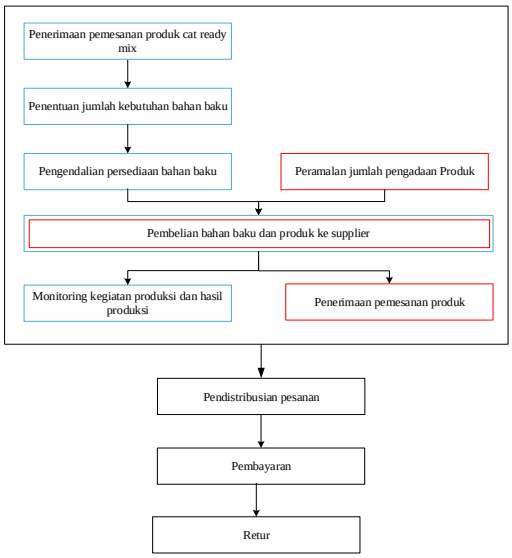


Figure 2 Stages of Supply Chain At CV. SAP

Description of supply chain analysis contained in 2 Stages of Supply Chain At CV. SAP is as follows:

1. Customer Order Acceptance Analysis

Here is an example of ordering paint products from 2 customers namely PT. Aero Citra Mandiri order ready mix paint ABP Silver Met 30 pcs, ACP Red 55 pcs, ACP Yellow 17 pcs. The paint must go through the production process in advance while ordering other products can be directly distributed. Order details can be viewed on

Table 1 Presentation Ordering details of ready mix paint products PT. Aero Citra Mandiri

No Order	Order date	Customer Name	Product name	Qty (Pcs)	Unit price	Total
SO_17030001	May 08, 2017	PT. Aero Citra Mandiri	ABP Silver Met	30	Rp. 430.000	Rp. 12.900.000
			ACP Red	55	Rp. 820.000	Rp. 45.100.000
			ACP Yellow	17	Rp. 730.000	Rp. 12.410.000
Total Bayar						Rp. 70.410.000
Shipping address	JL Raya Gunung Batu / Ruko 1 Sukaraja Cicendo Bandung					
Estimasi pengiriman	May 10, 2017					
Estimated delivery	Waiting for production					
Payment status	The bill is due in full					

PT. Aero Citra Mandiri also orders products that can be distributed directly. But because the order is also a product that must go through the production process then the distribution of waiting products ready mix paint in production first.

Here is the data of product ordering that can be distributed directly can be seen in Table 2

Table 2 Product Order Data

No Order	Order date	Customer Name	Product name	Qty (Pcs)	Unit price	Total
SO_17030003	08 Mei 2017	PT. Aero Citra Mandiri	Autoclear Plus HS / 1 Liter	30	273,000	8,190,000
			Hardener Plus P35 /1 Liter	15	253,000	3,795,000
			Plus Reducer Medium / 1 Liter	30	98,000	2,940,000
Total Bayar						14,925,000
Shipping address	JL Raya Gunung Batu / Ruko 1 Sukaraja Cicendo Bandung					
Estimasi pengiriman	May 10, 2017					
Estimated delivery	being processed					
Payment status	The bill is due in full					

2. Determination Analysis of Total Raw Material Requirement

In determining the amount of raw materials needed for each order ready mix product Here is an example of the calculation process of raw materials based on the composition of the color Autobase Plus Silver Met example requirement of raw material to be calculated is Q811M Met Med Coarse, Sparkling with the following calculation:

$$quantity\ of\ raw\ material = X_{product\ ordering \times composition}$$

$$= 30 \times 565$$

$$= 16950\ \text{Gram}$$

To calculate the amount of other raw material needs is done in the same way. the same one.

3. Control of Raw Material Inventory

Company policy in ordering of raw material adds to minimum rounding for purchasing to supplier that is 1 pcs from each packing of raw material. It can be used as a minimum inventory for raw material inventory.

Table 3 Recommendation Number of Raw Material Needs

Material Name	Product composition per liter (grams)	Total requirements (grams)	≈ Total requirements (pcs)
Q811M Met Med Coarse, Sparkling	565	16950	5
Q455 Bright Yellow	1	30	1
Q195 White Tranparent	4	120	1
Q140 Deep Black	4	120	1
Q110 White	12	360	1
Q190 White Grey Trans	156	4680	5
Q065 Connector	222	6660	7

To be made a reservation to the supplier minimum purchase of 1 pcs so for the difference in raw material needs less should be used as pcs calculation with examples for calculation Q11M is as follows:

$$\text{Total requirements (pcs)} = \frac{-(Number\ of\ excess\ (grams))}{number\ of\ packs\ per\ pcs\ (grams)}$$

$$= \frac{-(-13770)\ grams}{3750\ grams}$$

$$= 3{,}672\ \text{pcs}$$

rounded to 4 pcs

4. Analysis of Forecasting Number of Product Demands Using single exponential smoothing

Sales data of Autoclear Plus HS laminated litter vans from October 2016 to March 2017. It will be explained on the steps of calculation of forecasting to know the sale of Autoclear Plus HS varnish packaging in April 2017 with a forecasting period of 6 months.

Examples of forecasting calculations for procurement of products based on sales data using the constant (α) alpha (α = 0.1) are as follows:

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

$F_{t+1} = 0{,}1\ x\ 171 + (1 - 0{,}1)\ x\ \ 128{,}4$

$F_{t+1} = 132{,}7\ (133\ Pcs)$

Forecasting calculations for other periods are conducted in the same manner as in October forecasting calculations. Then the result for the calculation with α = 0.1 can be seen in table 4

Table 4 Example of product forecasting of Autoclear Plus HS Packaging Liter

Period	Data Actual	Forecasting results
		α = 0.1
October	121	-
November	91	121
December	99	118
January	133	116,1
February	224	117,8
March	171	128,4
April 2017 forecasting results		132,7

Forecasting for α = 0.2 to 0.9 is the same as the calculation of α = 0.1 only its alpha value is replaced.

5. Error Calculation Using Mean Square Error (MSE)

After forecasting is known, then the forecasting results will be calculated error value using MSE. Calculating the value of MSE is done to find out which forecasting technique is the most accurate to use as a sales forecasting tool in the next period. The results of forecasting that are known will be entered into equation 6 so that will be obtained the results of MSE calculation of forecasting results with the method of single exponential smoothing

Here is an example of MSE calculation process based on forecasting results of autoclear veneer type plus 1 liter pack HS with single exponential smoothing method in Table 4

The calculation of MSE based on alpha calculation is 0.1

$MSE = (\sum|F_t - Y|^2) / n$

$= (839 - 733{,}971^2) / 13$

$= 1838{,}5$

Table 5 Results of MSE calculation of product Autoclear Plus HS packaging liter

MSE calculation results								
α : 0,1	α : 0,2	α : 0,3	α : 0,4	α : 0,5	α : 0,6	α : 0,7	α : 0,8	α : 0,9
1838,5	1448,4	1047,1	693,1	415,6	220,6	98,8	33,5	6,1

6. Analysis of product ordering to suppliers

Based on the results of the forecasting then the company will order the product with the minimum quantity of ordered products that is calculated as follows:

Products ordered = forecasting results - stock leftovers

The number of products ordered at PT. Akzonobel Car Refinishes can be seen in Table 6

Table 6 Number of Products Must Be Ordered At PT. Akzonobel Car Refinishes

Product name	Forecasting Results (pcs)	Stock (pcs)	Number of ordered products (pcs)
PSEP / 1 Liter	74	20	54
Polykit Pro / 2 kg	214	45	169
Priming Filler / 1 Liter	125	3	122
Autoclear Plus HS/ 1 Liter	176	68	108
Hardener Plus P35 / 0.5 Liter	125	84	41
Plus Reducer Medium / 1 Liter	252	142	110

7. Monitoring analysis of production and production

Monitoring process of production and production activities aims to monitor whether the production activities at CV. SAP is running or not and monitor how many products have been produced and when each order will be completed. The part involved in this process is the Head of production and tinter. For the duration of production can be calculated as follows:

Production amount / day = Production amount / hour × many × t machines

= (1 hour / (1 liter × 5 minutes / 60 minutes)) × 1 machine × 8 Hours

= 12 liters per hour × 1 machine × 8 hours

= 96 liters / day

Here's the old calculation of production for ready mix paint ABP Silver Met as much as 30 liters:

$$long\ production = \frac{number\ of\ product\ order}{production\ amount\ /\ day}$$

$$= \frac{30\ Liter}{96\ Liter/\ day}$$

= 0,3125 day

Company's production time per day is 8 hours, then 0.3125 days equals 0.3125 × 8 hours = 2.5 hours (2 hours 30 minutes). If production starts at 09.00, then order from PT. Aero Citra Mandiri will be more or less completed on 08 May 2017 at 09.00 + 2 hours 30 minutes = 11.30.

8. Anaisis Determination of product delivery date

At this stage will be determining the date of delivery based on the order first order. calculations for determining delivery dates can be directly used equation formula (2). Here is an example of the calculation of delivery date based on product ordering from PT. Aero Citra Mandiri and PT. Panca Tunggal Bersatu that finished its production on the same day..

$$Tp = Order + (long\ ordering\ of\ raw\ materia + old\ production)$$

= 08 May 2017 + (0 day+ 2 day)

= 08 May 2017 + 2 day

= 10 May 2017

Based on the calculation, product order for PT. Aero Citra Mandiri and PT. Panca Tunggal Bersatu will be sent on May 10, 2017

9. Product distribution analysis

Based on the length of production in the previous stage, all orders are completed on May 09, 2017 at 17.00. so the order can be delivered the next day at 08.00 simultaneously with different vehicles in accordance with the delivery destination.

Based on existing data, total order of product of PT. Aero Citra Mandiri 177 liters, PT. Panca Tunggal Bersatu 60 liters and PT. Bagas Nusantara Putra. For the following case the car vehicle is operating out of town so for delivery within the city is done using motor so for order PT. Aero Citra Mandiri 177 kg needs to be done with motor vehicle as much as 4 motors / 2 times turned when adjusted to existing vehicle at company Then product distribution can be seen in Table 3. 40

Table 7 Presentation of product distribution

No. Surat Jalan	Delivery Date	Customer Name	Vehicle	Load Amount (kg)	Shipping Destination	Delivery status
SO_WH17050001	May 10, 2017	PT. Aero Citra Mandiri	motorcycle	177	Cimahi	Being sent
			motorcycle			
			motorcycle			
			motorcycle			
SO_WH17050002	May 10, 2017	PT. Panca Tunggal Bersatu	car	60	Sukabumi	Being sent
SO_WH17050002	May 10, 2017	PT. Bagas Nusantara Putra	motorcycle	6	Bandung	Waiting to be sent

10. Returns Analysis

At the time the product is distributed it could be the product is in a state of damage or packaging is not worth selling. At CV. SAP products that can be ordered in addition to ready mix products. For the process of returns that can be done is by way of goods are exchanged with reimbursement of goods back and can not be returned in the form of money or the process of return is not related to the financial existing in the company. Here is an example if the product is going through a return process because the product with unfit packaging on the shipment to the customer can be seen in Table 8

Table 8 The presentation of data returns

Customer Name	:	PT. Aero Citra Mandiri			
Date of Return	:	May 09, 2017			
Product Name	**Qty (pcs)**	**Batch**	**Reason Returns**	**Status returns**	**Date of Replacement**
Autoclear Plus HS/ 1 Liter	2	3006232001	Packaging not worth selling	Not yet replaced	May 10, 2017
Hardener Plus P35 / 0.5 Liter	2	3007062001	Packaging not worth selling	Not yet replaced	May 10, 2017

The product will be replaced if the product has been replaced by the supplier, then for the damaged product the Sales admin will make a return application by attaching a verified submission application form to the warehouse admin. The warehouse admin will reimburse returns 1-2 days after the date of return.

2.3.1 Functional Needs Analysis

Functional needs analysis is an analysis of the needs functionally both in the flow of data and information. Functional analysis is described in structured analysis which will be discussed as follows

2.3.1.1 Database analysis

on information systems areniss in CV. SAP will be built using Entity Relationship Diagram (ERD). The diagram is illustrated in Figure 4

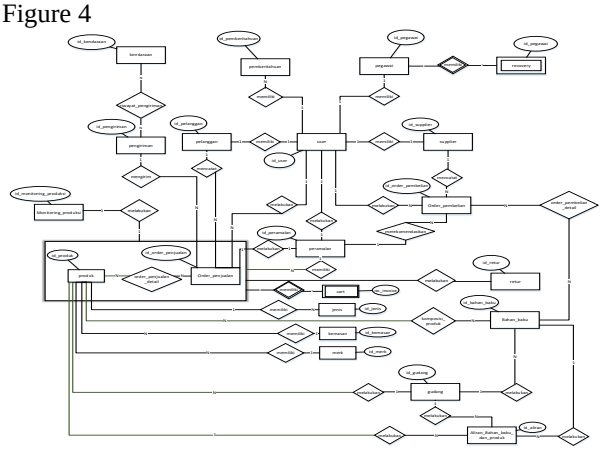


Figure 3 ERD Model

2.3.1.2 Context diagram

Context diagram of the system can be seen in Figure 5

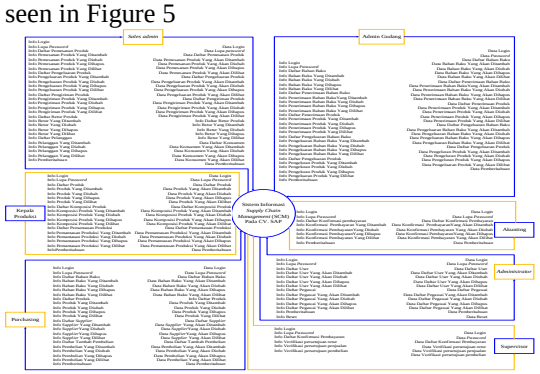


Figure 4 Context diagram

2.3.1.3 Data Flow Diagram (DFD)

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 6 can be decomposed into several DFD.

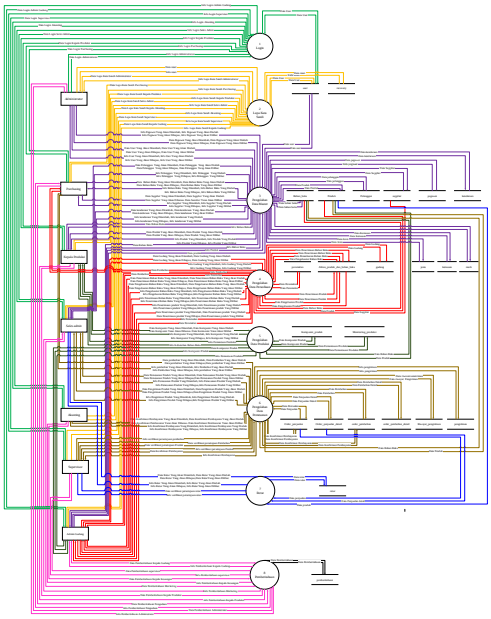


Figure 5 DFD Level 1 Information System with supply chain management approach on CV. SAP

2.3.1.4 Designing Table Relationships

Table relation describes the relationship between data, meaning data and limitations. The process of relations between attributes is a combination of attributes that have the same primary key, so that these attributes into a single unit that is linked by the key field. Table relation will be explained in attached in Figure 7.

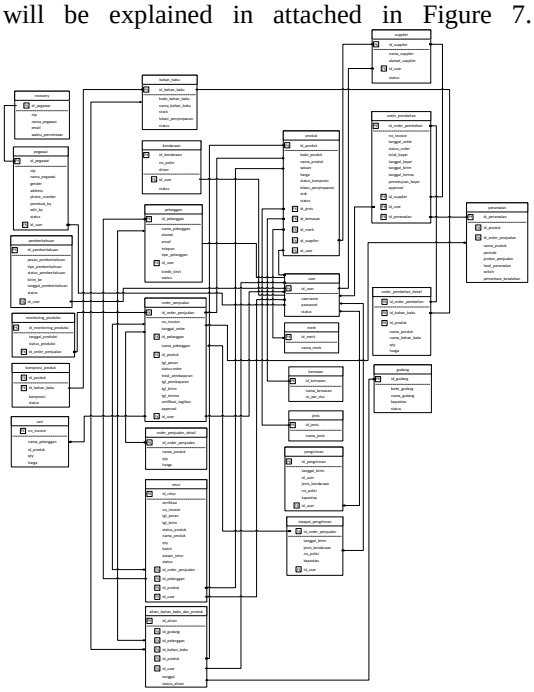


Figure 6 Table relation supply chain management information system on the CV. SAP

2.3.1.5 Menu Structure Design

The design of the menu structure to Admin warehouse is a menu structure designed according to the user level Admin warehouse. The design of Warehouse Admin menu structure can be seen in Figure 7.

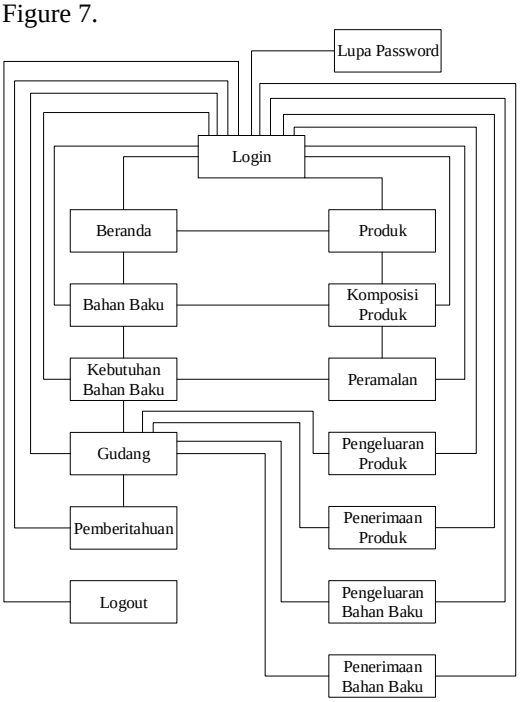


Figure 7 Designing Warehouse Admin Menu Structure

2.3.1.6 Interface Design

Interface design in information systems with supply chain management approach on CV.SAP. Here is the design of the interface in the information system on the CV. SAP.

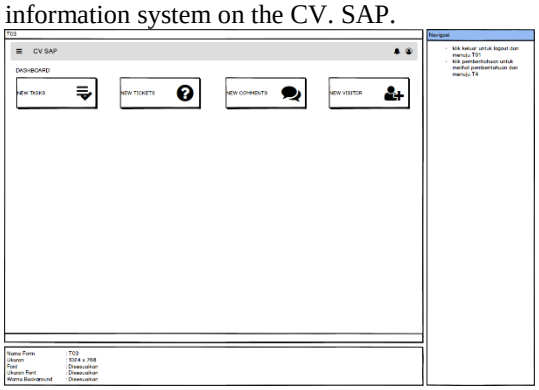


Figure 8 Interface Page

2.3.1.7 The design of semantic network

The design of semantic network Admin Warehouse is a network design that connects the menus that can be accessed by Admin Warehouse with error messages that occur in each process as shown in Figure 9

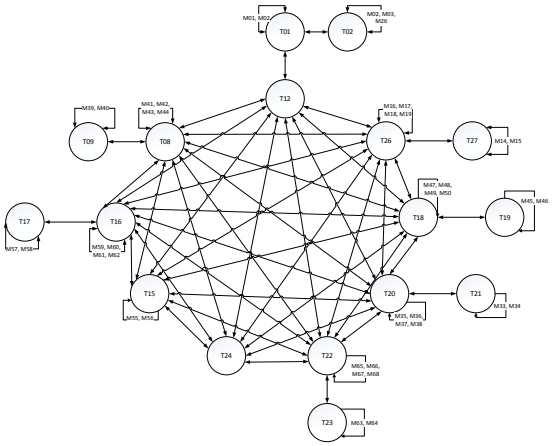


Figure 9 Perancangan Jaringan Semantik Admin Gudang

3. CLOSING

In this section, the closing chapter number will adjust the number of chapters in the content section of the study. Concluding remarks contained research conclusions, as well as development suggestions for subsequent research.

3.1 Conclusions

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

1. This information system can make it easy to determine the estimated ready mix ready paint order
2. This information system can facilitate in determining the estimated number of reservations to the supplier as a consideration for the supply of products and raw materials that will be available in the warehouse
3. This information system can make it easier to adjust the amount of charge on order distribution

3.2 Suggestions

Development of Information Systems With Supply Chain Management Approach (SCM) on CV. SAP can be further developed with higher specifications and better performance.

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

1. Information system built on subsequent research is expected to the development of financial and personnel processing, because the existing finances in the system built not complete and the absence of personnel system built disistem
2. Information system built on the next research is expected to the development of E-commerce to facilitate the conduct of booking transactions.

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