SUPPLY CHAIN MANAGEMENT SYSTEM DEVELOPMENT AT CV. DIMSUM INDONESIA

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ABSTRACT

CV. DIMSUM INDONESIA is one of the fast food producing factories which consist of 4 categories of food such as dimsum steamed taro bakpao, sweet mantao mayoumas dimsum, dimsum fried cuttlefish, hakau, siomay and grilled wotie roasted dimsum. Production results are distributed to the internal restaurant group incorporated in Eastern Group.
The problem faced by the company today is the excess stock of raw materials wet goods that cause raw materials accumulate in the warehouse too long then the possibility of damage to raw materials in terms of shape and taste. As well as often run out of raw materials dry goods it was caused by the lack of proper planning of raw material procurement and the absence of monitoring system raw material inventory that hampers the production process, which causes the distribution of products to consumers is not timely. Supply Chain strategy used by pull supply chain and push supply chain because the ordering of raw material wet goods and new product production is done after ordering from consumer or called make to order, while push supply chain strategy is used because the ordering of raw material of dry goods is done every one month once. Planning of purchasing raw materials wet goods using JIT method and dry goods raw material forecasting using single exponential smoothing method.
The test results using black box and UAT can be concluded that this system has helped manage the ordering list of products from consumers, forecasting the ordering of dry goods raw material for one month, helping to determine the amount of raw material ordering to the supplier and assist in determining the date of distribution of the product along with the vehicle Used.

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

1. INTRODUCTION

CV. DIMSUM INDONESIA is one of the fast food producing factories which consist of 4 categories of food such as dimsum steamed taro bakpao, sweet mantao mayoumas dimsum, dimsum fried cuttlefish, hakau, siomay and grilled wotie roasted dimsum. Production results are distributed to the internal restaurant group incorporated in Eastern Group consisting of 20 branches in the city of Bandung and 2 outside the city of Bandung. CV.DIMSUM INDONESIA has supply chain activities from downstream to upstream that is downstream done CV. DIMSUM INDONESIA with consumers in acceptance of product order using make to order strategy and distributing to consumer. While the upstream in CV.DIMSUM INDONESIA is to process the ordering of raw materials to suppliers by using the strategy of make to stock for raw material category of dry goods, raw material acceptance, and processing raw materials into a product.
Based on interviews conducted with Ms. Rolla as Head of Department of Warehouse and Mother Listia as part of Procurement, stated that the current activities contained in the company is to procure raw materials to suppliers to meet the needs of products in the message by consumers. The process of procurement of raw materials to determine the amount of raw materials to be ordered to suppliers still use intuition so that companies sometimes provide more raw material stock to overcome the uncertainty of orders from consumers, but store the raw materials in large quantities resulted in raw materials pile up in the warehouse for too long then the possibility occurred Damage to raw materials in terms of shape or taste, and raw materials damaged by expiration date expired. The procurement of raw materials is done with two events, namely raw material purchasing done once a month for raw material and dry goods raw materials and raw material purchasing made after the ordering of products from consumers for the category of raw materials wet goods. The waiting time required in the procurement of raw materials about one to five days for raw materials received by the Department of Warehouse so the warehouse is often a vacuum of raw materials that affect the delay in the production process and can not meet customer orders. Of course it will lead to losses and waste of time, labor and increased production costs due to the production schedule.
Based on the interview with Mr. Dicki as part of Marketing at CV. DIMSUM INDONESIA, he

explained that the product ordered in units of pcs with minimum order per product 50-100 pieces that have been set company. Receipt ordering products from consumers received by the marketing department for five days in one week ie Monday-Friday. Distribution of products is done every working day ie Monday-Sunday before 16.00. In this case, the marketing department experienced constraints in determining the delivery date of the distribution of products to consumers when the raw material is empty and delayed delivery. The marketing department should also confirm to the procurement department for the duration of the ordering of raw materials and communicate them to the production department to know the duration of production. Lack of information management leads to marketing difficulties in determining when distribution of products can be done and also difficulty in determining the date of distribution of products to consumers who have made the order. This can make the level of trust and customer satisfaction to be reduced, which of course can harm the company.

The objectives of this system are:

1. Assist the Head of Department of Warehouse in determining the amount of raw material purchases required in the next month for the category of supporting raw materials and dry goods and determine the amount of raw material wet goods category that must be ordered by the Procurement to suppliers after the ordering of products from consumers.
2. Assist the Marketing department in determining the date of distribution of the product to the customer who has made the order, thereby reducing errors in the provision of information.

1. RESEARCH CONTENTS

2.1 Theoretical Basis

Theoretical basis aims to provide an overview of the sources and studies of the theories related to system development. Theoretical basis to be discussed is the theory of information systems, Supply Chain Management, control (monitoring), inventory, inventory cost, just in time (JIT) method, JIT role, raw material requirement calculation, forecasting, And safe stock of raw materials on management of transportation and distribution of analytical modeling, supporting software and black box testing.

2.1.1 Information System

The information system can be defined as a set of interrelated components of components and work together to collect, process, store and distribute related information in support of the decision-making, coordination and control processes contained therein. The purpose of the information system is to provide and systematize information from all events or activities necessary to control the operation of an organization. Activities referred to in this information system include taking, processing, storing, and convey the necessary information in operating all the activities of the organization concerned. [1]

1.1.2 Supply Chain Management

Supply Chain Management is the integration of competent business sources in the distribution of goods, including the planning and management of procurement and logistical activities as well as related information from raw materials to consumptions, including coordination and collaboration with a network of business partners (suppliers, manufacturers, warehousing, transportation, Distribution, retail and consumer) to meet customer needs. [2]

SCM Link (Network SCM) consists of 7 chains of supplier, Manufactur, Warehouse, Transportation, Distributor, Retailer and Customer. [2]

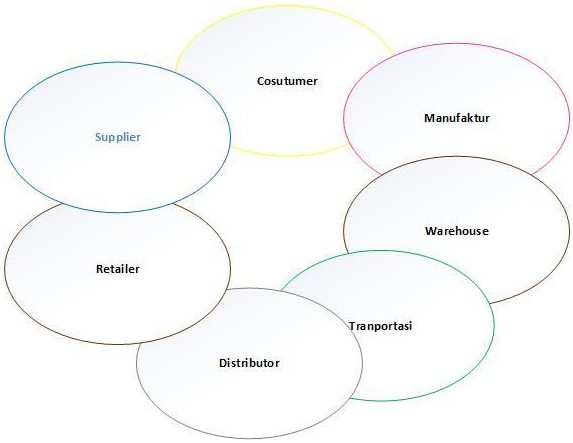


Figure 2 Managemnet SCM Supply Chain Link

1.1.2 Monitoring

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

Monitoring aims to remind the effectiveness and efficiency of a project or organization and is based on predetermined goals and activity plans. Monitoring allows us to determine whether our resources have been covered and well used.

1.1.3 Just In Time (JIT)

Just In Time (JIT) is a philosophy of solving problems strictly and continuously to eliminate unexpected wastes and deviations. JIT itself is a production philosophy developed by Toyota Motor, which succeeded in making the automotive industry and electronics japan into an industry that is able to work efficiently with good output quality. Japan's industry is able to shift by taking the market share of automotive and electronics that has been dominated by European countries and the United States.

According to Yamit, "Just In Time" is an attempt to eliminate waste in all areas of production, so as to

produce and deliver the final product on time for sale [3].

Determination of Raw Materials Needs

Determination of raw material need to determine the amount of raw materials that will be used for production process in accordance with the number of product orders from customers. Determination of the need of each raw material for all products CV. DIMSUM INDONESIA can be calculated by the formula in equation (1).

Amount of raw material = Xpemesanproduct X composition (1)

Information :

Xproductproducts = The number of product orders from customers.

The company policy in ordering raw materials to suppliers in determining the needs of raw materials, which can be calculated by the formula equation (2).

Order amount = amount of raw material x 5% (2)

2.1.5.2 Determination of Product Delivery Date

Determination of product delivery date is used to calculate when the product can be sent by the company to the customer. The formula calculation can be seen in equation (3) to equation (5).

Tp = Order + (long ordering of raw materials + old production) (3)

Length of production = number of product order (4)

Amount of production / day

Production amount = number of production per hour x lot

day

Machine x t (5)

Information :

Submit = product delivery date

Tp.product = product order date

T = duration of production in a day (8 hours)

Single Exponential Smoothing Method

Forecasting based on exponential smoothing method is generally used to estimate sales of individual products. This method is often considered better than the previous two methods of simple average and single moving average because of its ability to use past data with weighting based on the current data. More data is now given greater weight than previous data. The assumption is that more current data always has a stronger effect on forecasting results than with more outdated data [4]. The formula for single exponential smoothing can be seen in equation 6.

$Fn + 1 = \alpha Yn + (1 - \alpha) Fn$ (6)

Where :

Fn + 1 = forecast result in n + 1 period

Fn = forecasting result for previous period

A = refinement constant where $0 \leq \alpha \leq 1$

Yn = actual value for previous period

Mean Squared Error (MSE)

MSE is the average of the difference of the square of the forecasted value to that observed [5]. MSE is used by generating an existing error showing how much difference the estimation results with that destination. This makes it different due to randomness to the data or because it does not contain a more accurate estimate. The formula for MSE can be seen in equation 7.

MSE = 〖(Σ▒ 〖(At- Ft)〗) / n〗 ^ 2 (7)

Where,

At = Actual Request in period t

Ft = Forecasting Demand in period t

N = number of forecasting periods involved

1.1.2 Security Supplies (Safety Stock)

Security inventory or safety stock serves to protect errors in predicting demand during lead time. The security supply will work if the actual demand is greater than the average value [6]. 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 equation 8.

Safety Stock = Z x Sdl (8)

1.2 Problem Analysis

Problem analysis done in CV. DIMSUM INDONESIA of the current system is:

A. Head of Department of Warehouse does not keep the stock of excess raw materials in the warehouse, because the capital for the purchase of raw materials is considered large and inadequate storage. The amount of ordering of raw materials is done once a month for supporting raw materials and dry goods, and for raw materials wet goods order amount is usually ordered in accordance with the amount of product ordering. This sometimes complicates the Head of Department of Warehouse because it has to determine the amount of raw material of support and dry goods purchased for the next one month as well as calculate the amount of raw material wet goods that must be ordered to the Procurement department whenever there is product order from the consumer. Delivery of raw materials from suppliers keperusahaan also have a time lag waiting 1-5 days for raw materials wet good and lag time of 1-2 days for raw materials support and materials buku dry goods. Therefore, if this continues to happen there will be a void of raw materials in the warehouse that causes the production process too late If the production process is hampered then the process of shipping products to consumers will be too late.

B. Lack of management of information, especially about the availability of raw materials, causing the Marketing department difficulty in determining or reset the delivery date of the product to the consumer that is when the delivery of raw materials experiencing delays so that the Marketing sometimes make mistakes in providing information distribution to consumers. If this

continues to happen it will certainly impact on customer satisfaction to be reduced and will ultimately harm the company.

2.3 Single Exponential Smoothing Analysis

The forecasting value can be searched by using the formula in Eq. 7. As for the alpha (α) to be used is the range value between zero to one ie alpha = 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 and 0.9 for comparison. Here is a sample calculation for October 2016 forecasting using α = 0.1 as follows:

The actual data available starts from October 2016 in the sense that forecasting can only be done in the following month period in November 2016. That way, the forecasting value in October is ignored or marked (-). Looking for prediction value for April is done by entering actual data and forecasting data in the previous month period ie March to equation 7 so obtained the following calculation:

FApril = (0,1 * 2250) + ((1 - 0,1) * 1923,525)

FApril = 1956,1725

Forecasting calculations for other periods are conducted in the same way as in September forecasting calculations. Then the results for calculations with α = 0.1 can be seen in Table 1.

Table 1 Example of Calculation Results Forecasting of Chicken Dumpling products for α = 0.1

Periode	Data Aktual	Hasil Ramalan
		α = 0.1
Oktober	1800	-
November	2050	1800,0
Desember	2100	1825,0
Januari	2200	1852,5
Februari	2300	1887,3
Maret	2250	1928,5
Hasil Peramalan April 2017		1960,7

Forecasting for α = 0.2 to 0.9 is the same as the calculation of α = 0.1 only that the alpha value is replaced. After done all the calculation of product sales from October 2016 until March 2017 with α = 0,1 up to α = 0,9.

2.4 Mean Squared Error Analysis (MSE)

After the forecasting results are known, then the forecasting result will be calculated error value using MSE. Calculating the value of MSE is done to find out which forecasting techniques are the most accurate to use as a sales forecasting tool in the next period. The results of forecasting that are known in Table 1 will be inputted to equation 8 so that the MSE calculation results from the forecast results will be obtained using the single exponential smoothing method. The calculation results can be seen in Table 2.

Table 2 Results of MSE calculation of Chicken Dumpling Product with Single Exponential Smoothing method

2.5 Safety Stock Analysis

After performing the forecasting stage, the next step is to monitor raw material inventory and determine the safe limit of raw materials that must exist in the raw material warehouse so that there will be no shortage or void of raw materials using Safety stock method. Calculating the safety stock using equation 9 with the formula Sdl is determined from the demand uncertainty. In the calculation using the method of safety stock, there are variables that affect the value of the safety stock value of z and Sdl. The value of z is taken from the management policy while to find the value of Sdl which will be used in the research that is using the value of Sdl which has the value of changing the raw material demand (variable) while the lead time value has constant value (constant). Here is an example of raw material inventory calculation using safety stock method:

Calculation of chicken dumpling product inventory:

The number of April 2017 forecasting (d) = 2254/30 days = 75,133 or rounded to 76 pcs.

Standard deviation of April 2017 forecasting amount (sd) = 252 pcs

Lead time procurement to supplier (l) = 30 days

Standard deviation from lead time (sl) = 30/10 = 3

Service level (z) = 95% in normal inverse = 1.645

Resolution:

Sdl = Sd x √ (l)

= 252 √3

= 145,492268 ≈ 146

Safety Stock = Z x Sdl

Safety Stock = 1.645 x 146

Safety Stock = 240.17 or rounded to 240 pcs.

Based on the above safety stock calculation results, the CV. DIMSUM INDONESIA must provide 240 pcs chicken dumpling safety stock for every raw material. Safety stock for each raw material can be seen in Table 3.

Table 3 Safety Stock Raw Material Chicken Dumpling

Nama Bahan Baku	Unit	Jumlah
Bawang bombay	Kg	0,24
Bawang putih	Kg	0,024
Daging ayam	Kg	0,3
Daging sapi	Kg	0,35
Daun kucai	Kg	0,001
Garam	Kg	0,045
Jamur shitake	Kg	0,1
Kulit pangsit	Lembar	50
Lada Putih	Kg	0,025
Mayu lokal	Liter	0,03
Tahu putih	Kg	0,1

The calculation of safety stock for other products is done in the same way

2.4 Calculation of Raw Material Requirements

Based on order data on there are three different consumers who order dimsum products and based on order data, the three consumers order some of the same products. Therefore calculation of raw material requirement can be calculated at once using equation formula (1).

Calculation of raw material requirement to produce chicken dumpling.

Needs of raw materials of onions.

Amount of raw material = Xpem product order χ composition

= 50 χ 0.001 kg

= 0.05 kg

Calculation of raw material requirement for other chicken dumpling products is done in the same way.

2.5 Determination Analysis of Delivery Date

Calculation for determining delivery date can be directly used equation formula (2.3). Here is an example of calculating delivery date based on product order from Po Ka Tiam, Asia Bagus and Coffee Shop which finished its production on the same day.

Tp = Order + (long ordering of materials Raw + old production)

= 26 April 2017 + (2 days + 1 day)

= 26 April 2017 + 3 days

= April 29, 2017

Based on these calculations, product orders for Po Ka Tiam, Good Asia and Coffee Shop will be delivered on April 29, 2017.

2.6 Distribution Analysis

The company's car capacity can accommodate 7110 chicken dumpling, hakau, chicken feet, shrimp leaf lumpia, goring, dumplings, swikiaw dumplings, dumplings and roasted wotie, company motors can accommodate 900 pcs chicken dumplings, hakau, chicken feet, shrimp spring rolls Leather tofu, goring monitor, dumplings chives, dumplings swikiaw, dumplings and grilled wotie. The products at CV. DIMSUM INDONESIA transported by using plastic box wrapper with two size, big box size 28x20x6.5 contains 90 pcs chicken dumpling product, hakau, chicken feet, lobster shrimp tofu, manta goring, dumplings chives, dumplings swikiaw, siomay and grilled wotie, Small box size 17x17x8 contains 12 pcs chicken dumplings, hakau, chicken feet, lobster shrimp tofu leather, manta goring, dumplings chives, dumplings swikiaw, dumplings and grilled wotie. Delivery of product will be done before 16.00, vehicle capacity for product distribution can be seen in Table 4.

Table 4 Capacity of Company Vehicles

Kategory Kendaraan	Kapasitas Kendaraan	Ukuran Box Produk	Kategori	Kapasitas Box
Mobil	79 Box	28x20x6.5	Box Besar	90 pcs
	593 Box	17x17x8	Box Kecil	12 pcs
Motor	10 Box	28x20x6.5	Box Besar	90 pcs
	75 Box	17x17x8	Box Kecil	12 pcs

Based on the calculation of production duration in the previous stage, all orders are completed on April 29, 2017 at 16:00. So the order can be sent the next day at 08.00 simultaneously with different motor vehicles adapted to the delivery line. Po Ka Tiam 1150 product, Asia Good 1300 products and Coffee Shop 750 products. The total order if it has been wrapped in plastic box is:

Number of plastic boxes for siomay

Po Ka Tiam = 1080 pcs / 90 pcs + 70 pcs / 12 pcs

= 12 Large Boxes + 6 Small Boxes

Number of plastic boxes for siomay

Good Asia = 1260 pcs / 90 pcs + 40 pcs / 12 pcs

= 14 Large Boxes + 4 Small Boxes

The number of plastic boxes hakau to

Coffee Shop = 720 pcs / 90 pcs + 30 pcs / 12 pcs

= 8 Large Boxes + 3 Small Boxes

2.7 Database Analysis

In the construction of supply chain management system required a database design, Modeling to be used in the design of this database using Entity Relational Diagram (ERD). Database modeling can be seen in Figure 2.

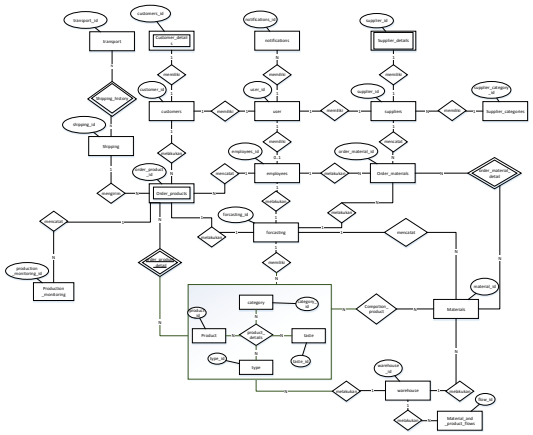


Figure 2 *Entity Relationship Diagram* CV. DIMSUM INDONESIA

2.4 Context Diagram

A context diagram is a simple diagram illustrating the relationships between outside entities, inputs and outputs of the system. There are 7 users who play a role in this system is Kep. Production, Kep. Warehouse, Procurement, Kep. Finance, Marketing, suppliers and consumers where each user has different access rights that can be seen in figure 3.

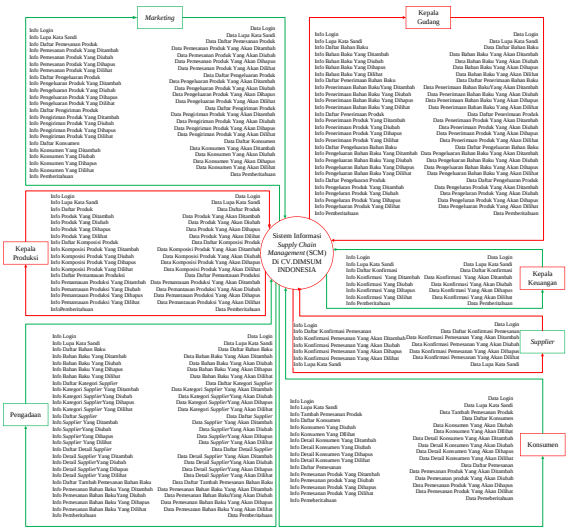


Figure 3 Context Diagram CV. DIMSUM INDONESIA

2.5 DFD Level 1

DFD Level 1 explains in general what process can be done on information systems in CV. DIMSUM INDONESIA. Level 1 DFD can be seen in Figure 4.

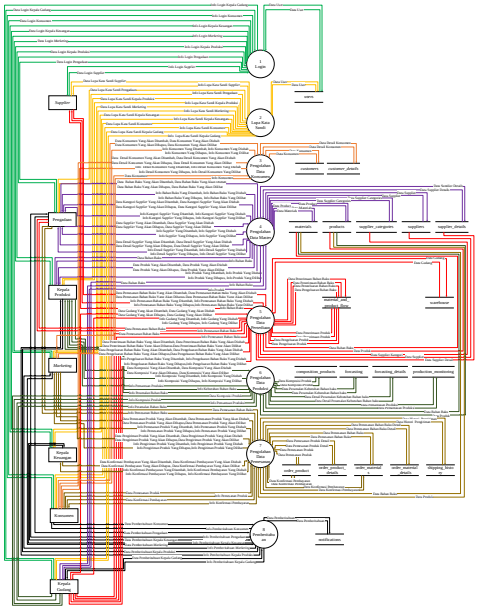


Figure 4 DFD Level 1 Information System CV. DIMSUM INDONESIA

2.6 Tabel Relasi

Table relation describes the relationship between data, meaning 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 can be seen in Figure 5.

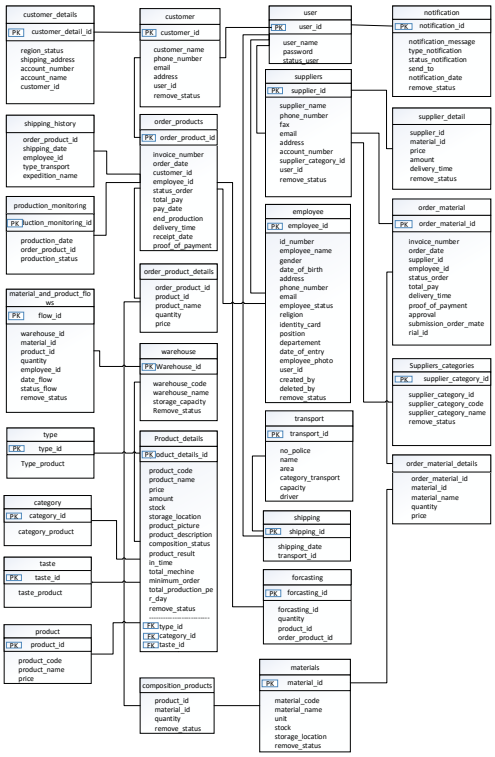
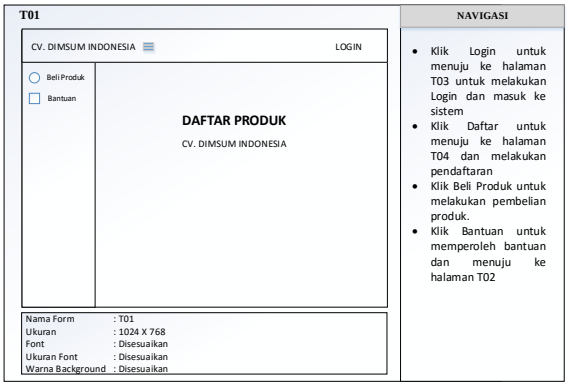


Figure 5 Table Relation Information System CV. DIMSUM INDONESIA

2.7 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 6.



Gambar 6 T01 Perancangan Antar Muka Login

2.7 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 a network of semantic users of the Department Head Warehouse in the information system at CV. DIMSUM INDONESIA can be seen in Figure 7.

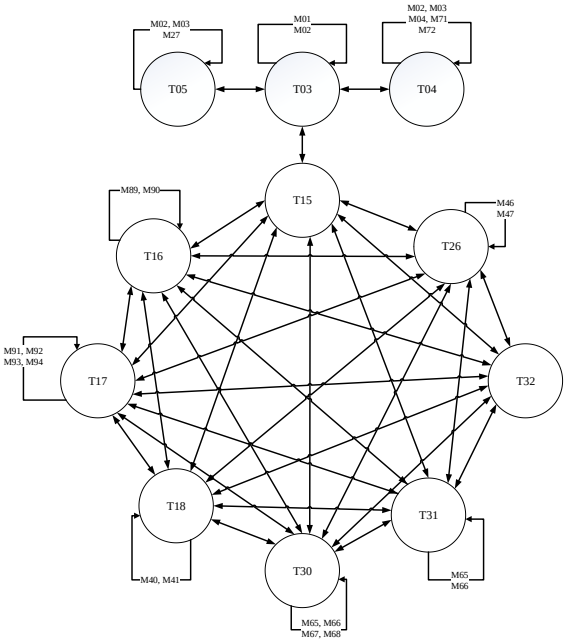


Figure 7 Semantic Network Head of Department of Warehouse

2.7 Menu Structure Design

The design of the menu structure is used to provide an overview of what the menu can be accessed on the system. The menu structure to be constructed consists of several menu structures. The division of menu structure is based on user consisting of head of production, head of warehouse, head of finance, procurement, marketing, supplier and consumer. The following design of the warehouse head menu structure can be seen in Figure 8.

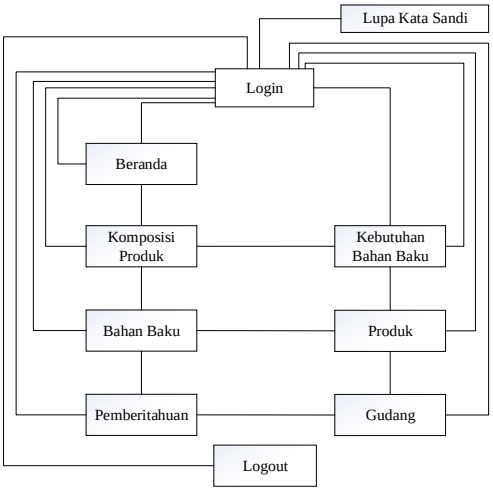


Figure 8 Menu Structure Head of Warehouse Department

2.16 Conclusion Testing Functionality

Based on the test results with the test sample case that has been done and gives 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.

2.17 Conclusion of User Acceptance Testing

Based on the test of user acceptance test that has been done by representative of Head of Warehouse to Supply Chain Management system at CV. DIMSUM INDONESIA, it can be concluded that the system must first be improved on forecasting test, raw material procurement and delivery data in accordance with the record given by the Head of Warehouse Department before entering into the end user stage.

2.18 Conclusion of Interview Results

After doing the interview in CV. DIMSUM INDONESIA with Head of Department of Finance, Head of Production Department, Head of Department of Warehouse, Procurement, Marketing and Supplier can be concluded that this information system has helped the CV. DIMSUM INDONESIA in managing product ordering data, raw material ordering data, forecasting, managing raw material data, monitoring raw material inventory, and managing product delivery well enough, in terms of usage The language used is good, easy to use and display interface is enough good.

3.2 Suggestion

Suggestions that can be taken from all the processes that have been done in building supply chain management information system in CV. DIMSUM INDONESIA namely:

1. In this system is not equipped with detailed financial data processing. For the next research should add financial data processing concerned with CV. DIMSUM INDONESIA.
2. The existence of special training to users of this information system, so that they can get familiar with this information system.

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