THE CONSTRUCTION OF INFORMATION SYSTEMS USING COTTON CANDY PRODUCTS SUPPLY CHAIN MANAGEMENT APPROACH IN THE CV. PUSAKA

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ABSTRACT

CV. Pusaka is a food company that produces candy cotton candy. Great production (Mass product) is done by the CV Pusaka. Brown sugar, chocolate, margarine, flour, Milk, Aroma is the main raw material in the production process. Problems that often occur in the CV. Pusaka is the difficulty in determining the amount of raw materials that are to be held, and in the distribution process by having shipment scheduling, distribution of the amount of the right product. Based on the existing problems in current CV. Pusaka, then it needs a system development supply chain using Supply Chain Management approach. The purpose of the construction of this system makes it easy to determine the amount of materials you will be booked to the supplier, to meet the needs of production and ease in distribution process by having shipment scheduling, the exact number of products distribution and the process of determining the closest distance. Supply Chain strategies used are Push Supply Chain, because it is based on the appropriateness of the supply chain that occurs in the current company that is using the strategy of make-to-stock. Supply chain system was built from the upper part (upstream) to downstream (downstream). The method of forecasting the needs of raw materials used is a Single Exponential Smoothing. Calculation of the predicted availability of raw materials in the warehouse using the method of safeguarding inventory (Safety stock.) Based on the results of the test can be concluded that the system is already helping production planning and controlling part in determining production raw material needs planning and coordinating the production of each sector in the use of raw materials as well as to avoid a vacuum products.

Keywords *: Supply Chain Management, Single Exponential Smoothing, Safety Stock, Push Supply Chain, Make-To-Stock*

1. Introduction

CV. Pusaka is one of the companies engaged in the field of food that produces cotton candy chocolate candy and cotton candy nuts located in Garut in West Java province. CV. Pusaka stands on 10 March 1965. A series of work system in the upper part made by CV. Pusaka against the supplier, namely procurement of raw materials to the supplier, do the reception of raw materials from suppliers, conduct the processing of raw materials into a finished product. There is the downstream activities conducted by CV Pusaka with consumers that is receiving sales and distribution process to the consumers who have purchased the product.

The company has a product that most reservations in Brown cotton candy is the product message. Based on the fact that bookings every month is known, resulting in erratic production manager have difficulty in determining the amount of raw materials that must be reserved to the supplier, to meet the production process during the period of the next month, so the production process can not run smoothly, this led to a shortage of stock the products that will be sold to the consumer cannot be fulfilled.

The process of inventory stock products warehouse supplies, lack or run out of supplies can lead to less sigapnya company in the face of consumers, because if the inventory stock reaches the limit is exhausted (stockouts), the consumers may be looking for more to other places that are ready for sale, and if it continues to happen then the company will lose a lot of consumers. CV. Pusaka do finished product inventory based on the suitability of that happening in the company that is currently using. make-to-stock. The company. which produces continuously and is expected to supply the finished product already available in the warehouse, prior to ordering from consumers.

Distribution is done by the head of the warehouse is experiencing problems, due to the number and the time the finished product to be sent to consumers are often not appropriate, occurs because the amount of stock of existing products in the warehouse is not appropriate, so that it can not meet sales bookings of consumers, this results in a required distribution time taking quite a long time. The management of the complete cycle of chains ranging from the supplier, are concerned with

operational activities, the distribution to the consumer, so the above problem can be overcome by using Supply Chain Management System [3].

The flow of information in the company's goal, starting from the receipt of the booking of the consumer, the procurement of raw materials, the reception of raw materials to distribution, or delivery of finished products to consumers will create synchronization and consistency. Based on the description of the matter contained in the CV. Pusaka, then it needs a system of development of information system in CV. Pusaka using supply chain management approach.Sedangkan tujuan yang ingin dicapai dari penelitian ini adalah :

1. *Facilitate the head of production in determining the amount of raw material that will be ordered against the supplier to meet the requirements of product sales.*
2. *Facilitate the head of warehouse distribution process in determining the existence of a time scheduling the delivery and distribution of the product the right amount.*

THE CONTENT OF RESEARCH

2.1 The Cornerstone Of The Theory

The cornerstone of the theory on writing this thesis will explain about the theories related to the application of the system of product information in CV. Pusaka.

2.1.1 System Information

According to Jogiyanto "system is a collection of System is a network of procedures which are interconnected, gathered together to perform the activity or to do target a specific goal. [1]

Generally the information is data that is processed into a form that is more useful and more meaningful to the recipient that later will be used to decide the present nor the future. The function of information is to reduce uncertainty in the decision making process of a State.

2.1.2 Supply Chain Management (SCM)

Supply Chain (chain of procurement) is a system of funneling goods organization places of production and services to its customers. The chain is also a network or networks of interconnected organisations which have the same purpose, namely as best we can organise the procurement or distribution of the goods. [3]

The concept of the supply Chain is a new concept in looking at the question of logistics. In this new concept, the problem of logistics is seen as a broader issue which is very long, starting from raw materials to finished goods used the end consumer, which is the chain of procurement. Therefore it can be said that the supply Chain is the logistics Networks.

In this connection, there are a few companies that have the same interests, i.e. [3]:

1. ***Suppliers***

The network originated from the supplier, which is the source that provided the first ingredient, where the chain of distribution of goods will be started. This first material can be in the form of raw materials, raw materials, materials, auxiliary materials, spare parts, merchandise and so on.

2. ***Manufacturer***

The first chain linked to the second, namely chain Manufacturer or plants or assembler or fabricator or any other forms that do the work of making, mengfabrikasi, mengasembling, assemble, convert, or completed goods (finishing).

3. ***Distribution***

Stuff already so generated by the Manufacturer already had to start distributed to customers. Although there are many ways for channelling merchandise to customers, the public is through a distributor and is usually reached by most of the supply chain. The goods from the factory via Keflavík transmitted to warehouse distributors or wholesalers to small traders.

4. ***Retail Outlets***

Wholesalers usually has its own warehouse facilities or can be also rented from other parties. The warehouse was used to store goods before being channeled to the party retailer, to obtain the savings in the form of the amount of inventories and the cost of the warehouse, with the way the design back shipping patterns, either from the Manufacturer or to the warehouse store retailers (retail outlets). Although there are some factories that directly sell its results to the customer, but the relative amount not much and most use this pattern.

5. **Customers**

The retailers or retailers offers the goods directly to the customer or buyer or user of the item. That includes outlets are shops, stalls, Department stores, supermarkets, cooperative store, Mall, Club store, and so on, anyway the end where buyers make a purchase. New supply chain completely stopped after the goods concerned arrive at the user end of the goods or services.

2.1.3 Proses Supply Chain Management (SCM)

Supply chain management process is a process of processing of products from raw material still start, semi-finished products to finished product is obtained and then sold through a wide range of facilities which are connected by chains along the flow of products and materials. When depicted in the form of a chart will appear as follows:

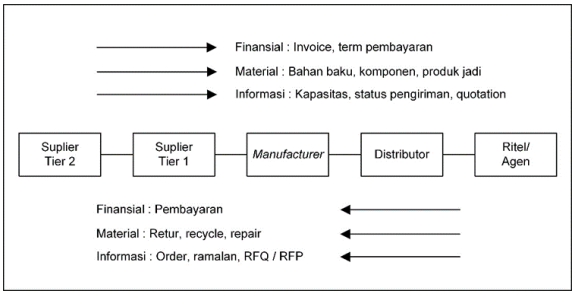


Figure 1. Supply chain model simplification and 3 kinds of flow

Figure 1 shows that the supply chain management is the coordination of material, financial and information among the participating companies.

1. *The first is the flow of goods that flow from upstream (upstream) to downstream (downstream).*
2. *The second is the flow of money and the like which flows from downstream to upstream.*
3. *Third is the flow of information that may occur from the upper to the lower or vice versa.*

2.1.4 Push and Pull Supply Chain

Pull supply chain is a strategy of production make-to-order "that the main benefit is avoiding waste or inventory is a strategy the company mainly manufacturing companies where new production done always after the sales market and actually done on orders from consumers.

Push the Supply Chain is a strategy of production Make-to-Stock. The push system is essentially a system of planning and controlling production [7]. The push strategy is more popular than with pull system because the system of production-based forecasting and forecasting or to produce output in large quantities that would later go into inventory before it is transmitted to the customer.

2.1.5 Metode Single Exponential Smoothing

Forecasting based on exponential smoothing method (exponential smoothing) is generally used to estimate sales of products individually. This method is often considered better than the previous two methods, namely simple average and a single moving average because of its ability to use past data by administering the weighting based on the data. [5].

The formula for the single exponential smoothing can be seen in the equation 2.3.

$$F_{t+1} = \alpha X_t + (1-\alpha)F_t \quad (2.3)$$

where :

F_{t+1} = *Yield forecasting for the period t-1*
α = *konstanta* $(0 \leq \alpha \leq 1)$
X_t = *Actual sales data for the period t*
F_t = *Forecasting in the period t*

2.1.6 Mean Squares Error (MSE)

The mean Squared Error (MSE), namely the average of the squared forecasting errors and can be seen in the equation 2.5.

$$MSE = \frac{\sum(|X_t - F_t|)^2}{n} \quad (2.4)$$

Description:
MSE = the value of the mean squeres error
X_t = *The actual data in the period t*
F_t = *Forecast data from the model used in the period t*
n = *A lot of data results forecast*

Counting errors of forecasting used to know the accuracy of forecasting results that have been made against actual data. There are many models for forecasting errors doing the calculations. The method used to calculate the fault forecasting (forecast error) is a method of MSE (Mean Squared Error). MSE is the average of the difference in the squares of the values predicted with observed [5]. MSE is used by generating an existing error indicates how large the difference results estimation with the destinations. This makes it different due to the randomness in the data or because it does not contain a more accurate estimation. The formula for the MSE can be seen in the equation 2.6. Counting errors of forecasting used to know the accuracy of forecasting results that have been made against actual data. There are many models for forecasting errors doing the calculations. The method used to calculate the fault forecasting (forecast error) is a method of MSE (Mean Squared Error). MSE is the average of the difference in the squares of the values predicted with observed [5]. MSE is used by generating an existing error indicates how large the difference results estimation with the destinations. This makes it different due to the randomness in the data or because it does not contain a more accurate estimation. The formula for the MSE can be seen in the equation of 2.6.

$$MSE = (A_{t-1} - F_{t-1})^2$$

where,
F_{t-1} = *Forecasting of previous period*
A_{t-1} = *Actual sales of the previous period*

2.1.7 Inventory

A method of inventory control is done based on mathematics, statistics and optimization as the main tool to answer quantitative issues that occur on a system of inventory (inventory). This method is in fact trying to find the optimal answer in determining inventory policy, i.e. a policy relating to the determination of economical order lot size (Economic Order Quantity), while order (Reoder Point), as well as on backup safety supplies (minimum Stock) is required. The approach used mathematical modeling is doing against the alternative answer to the problem so that the optimal answer can be determined analytically. [1]

2.1.8 Technical Safety Stock

Based on the classification of the preparation which is already explained earlier the author uses techniques of Safety stock to mngakomodasi requests that the uncertainty effect on supplies [2].

Safety inventory (Safety stock) is useful to avoid shortages of raw materials at a particular moment or moment of lag time (lead time) in the process of booking the next security, inventory (safety stock) is useful for protecting companies from the risk of running out of [2].

Formula safety stock (SS) to find the value of safety stock can be seen in the equation 2.5.

Safety Stock = Z x Sdl

where,

Z = Service Level (the ability of the company to serve the request or translated from decision management)

SDL = determined from the request with conditions of uncertainty can be seen in Figure 2.4.

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

Lead Time

Figure 2 interaction between demand and lead time on penetuan safety stock

2. 1 The Determination Of The Route

One of the very important decisions in the management of the distribution is the determination of the route schedule and delivery from a single location to multiple destination location. This decision is extremely important for the delivery of products from one location to the shops in a city. For minimising the distance delivery delivery destination sorting done by the nearest distance. There are several methods in the sorts of distance nearest [2]:

Method nearest insert

The method uses the principle of choosing the insert nearest store when inserted into the existing route generates additional minimum distance. The initial distance is from warehouse to warehouse with distance zero. next will see the distance that occurs when adding the distance each store. The result is as follows:

a. *Warehouse – Cimahi – Gudang = 6,2+6,3 = 12,5 km*

b. *Warehouse – Rancaekek – Gudang = 4 + 4,1= 8,1 km*

Because of the resulting minimum distance 8.1 then visited first was the rancaekek that Shed routes diproleh – rancaekek – Canberra – warehouse.

Method nearest neighbor

Nearest neighbor method is also quite simple, in principle we always add stores which are closest to the store that we visit. The following is an example of the case:

Tgl Pemesananan	Nama Agen	Alamat	Total jarak tempuh
04–01–2016	H.Slamet	JL. Pekiringan. Cirebon	158 km
05–01–2016	Ibu Mia	/Kelapa Gading, Kota Jakarta Utara	213 km
06-01-2016	Asep B	Jalan Raya Ciwidey Bandung	107 km

a. *Warehouse-H.Slamet = 164 km*

b. *Warehouse-Ibu Mia = 166 km*

c. *Warehouse-Asep B = 107 km*

Because the closest distance that is generated is 107km then the first visit is Asep b. So retrieved route Warehouse – Asep B, the same way can evaluate a store where further on the visit. Of the two alternatives is obtained as follows:

a. *Warehouse-AsepB-H.Slamet = 107 + 164 = 271 km*

b. *Warehouse-AsepB-Ibu Mia = 107 + 166 = 273 km*

Because the resulting distance nearest 271 km of the second alternative, then visited first was the Asep B so that the Warehouse-Asep route acquired B-h. Slamet-Mother Mia-Warehouse.

2.2 Analysis Of The Problem

Analysis of the problem is an assumption of the problem which will be outlined in the procedures of data processing in information systems development program Supply Chaim Management CV. heirlooms. Analysis of the problems of the system that is running at the moment these are:

1. *Head of Production have difficulty in determining the amount of raw material that will be booked to the supplier to meet the requirements of product sales, because of the difficulty of estimating the number of sales that would occur during the next months, which will impact the advantages of a raw material or a shortage of raw materials, and would suffer losses.*
2. *Head of warehouse experience difficulties in making the right product distribution schedule because of the time and the number of products that will be sent to the agent often have inconsistent rendering, so that delivery be long against the consumer, and the consumer can switch to the other company, and consumers would lose and would suffer losses.*

2.3 Analysis Of Supply Chain Management (SCM)

Analysis of supply chain management is used to work on components of the information system will be built. Supply chain management has a framework that is a component of the development for the system.

2.3.1 The model of Supply Chain Management (SCM) in CV. PUSAKA

Based on the analysis of SCM which have been described in the previous section, the following models of supply chain in CV. Inheritance can be seen in Figure 3.

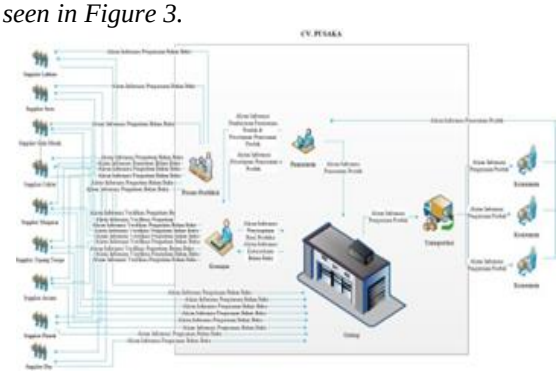


Figure 3 Model Supply Chain Managemnt CV. Pusaka.

2.3.2 Stages of the Supply Chain Management in CV. Pusaka.

Stages of the Supply Chain Management was conducted to describe the supply chain management process that will be built at CV Heirloom based on supply chain model in Figure 3. As for the stages in the supply chain management CV Inheritance can be seen in Figure 4.



Figure 4 Supply Chain Stages Managemt CV. Pusaka.

1. The Analysis Of Forecasting Products

The analysis of stage of forecasting is going to do is predict the need of raw materials for the production process. Forecasting needs raw materials aiming to meet production needs where demand for cotton candy when it becomes available, because the American raw materials appropriate for use in the production process. The technique used is the forecasting techniques forecasting quantitatively, due to availability of data past the quite fulfilled.

For example in the calculation of the actual booking data forecasting candy cotton candy chocolate unit cartons in February 2016 then data used for meramalkannya using data from the previous month IE January 2016 known data previous forecasting or X_t = 9100 Kg and actual sales period before F_t = 9100 Kg with a ratio of alpha (α), then in May the calculations as follows:

$$F_{February} = (0{,}1 * 9100) + ((1 - 0{,}1) * 9100)$$
$$F_{February} = 910 + 8190$$
$$F_{February} = 9100\ Dus$$

Bulan	Penjualan	Nilai Alpha								
		0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9
Januari	9.100									
Februari	8.900	9100	9100	9100	9100	9100	9100	9100	9100	9100
Maret	9.500	9080,00	9060,00	9040,00	9020,00	9000,00	8980,00	8960,00	8940,00	8920,00
April	9.000	9122,00	9148,00	9178,00	9212,00	9250,00	9292,00	9338,00	9388,00	9442,00
Mei	9.600	9109,80	9118,40	9124,60	9127,20	9125,00	9116,80	9101,40	9077,60	9044,20
Juni	9.500	9158,82	9214,72	9267,22	9316,32	9362,50	9406,72	9450,42	9495,52	9544,42
Hasil Peramalan		9192,94	9271,78	9337,05	9389,79	9431,25	9462,69	9485,13	9499,10	9504,44
TS		2,95	2,76	2,56	2,34	2,12	1,90	1,69	1,49	1,23
MAD		314,68	310,98	309,24	309,70	312,50	317,70	325,24	334,98	364,44
MSE		117596,77	113765,45	112695,14	114524,44	119406,25	127569,48	139380,83	155413,17	176530,16
MAPE		0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,04	0,04

2. Analysis of Monitoring Inventories of products and raw materials.

At this stage is to conduct an analysis of monitoring inventories of products and inventory of raw materials as well as determine the limits of safe products and raw materials which must be digudang which aims to prevent the occurrence of deficiencies or vacuum products and materials raw method using a Safety Stock.

Nama Produk	*Hasil Peramalan*	*Sisa Stock Yang Ada*	*Safety Stock*	*Status*
Permen Gulali Coklat satuan dus	*9337,05 Dus*	*100 Dus*	*132 Dus*	*Tidak Aman*

3. The Analysis Of Procurement Of Raw Materials

Procurement process is carried out by the provisions of the kriterian that the supplier has a good quality of goods supply and lower prices, if the Supplier undertakes the company will choose Suppliers. If one Supplier did not meet those criteria then the company will choose suppliers and others who are able to meet the criteria specified as suppliers of raw materials to the company.

Supplier	Nama Bahan Baku	Quantity	Harga	Total
PD. Gula Sinar Jaya	Gula Merah	4436525g	Rp. 10.000	Rp. 44.365.250.000
PT. Tama Cokelat Indonesia	Coklat	13653995g	Rp. 21.000	Rp. 286.733.895.000
PT. Citra Nata Pramana	Margarin	176461g	Rp. 11.000	Rp. 1.941.071.000
PD. Bumi Mandiri Sejahtera	Terigu	883305g	Rp. 95.00	Rp. 3.496.416
PT. Lucky Rejeki	Aroma	13653495g	Rp. 25.000	Rp. 341.337.375.000
PT. Primadian Kencana	Susu	708844g	Rp. 78.000	Rp. 55.289.832.000
Toko Ewok Jaya	Plastik Kecil	909173pcs	Rp. 24.000	Rp. 21.820.152.000
CV. MSP	Plastik Besar	909373pcs	Rp. 30.000	Rp. 27.281.190.000
PT. Kimu Enam	Dus	910073pcs	Rp. 2.800	Rp. 2.548.204.400
PT. Hasindo Utama	Lakban	68.287 roll	Rp. 11.000	Rp. 751.157.000

4. Analysis of the distribution of the product to the Customer

Analysis of the distribution is made based on the presence of the delivery process or distribution process in the supply chain. Distribution is happening in lingkupan this form of supply chain products to customer. Distribution is done by taking into account the distance to the closest, nearest distance determination will use the nearest neighbour method. Scheduling and monitoring of shipping activities conducted to consumers with the timetable agreed upon one another.

2.4 Analysis Database

Data base analysis on information system in supply chain management CV heirloom will be constructed using Entity Relationship Diagram (ERD). ERD is a data model that is built using some notation to describe the data in the context of the entities and relationships described by the data. Us for the chart depicted in Figure 5.

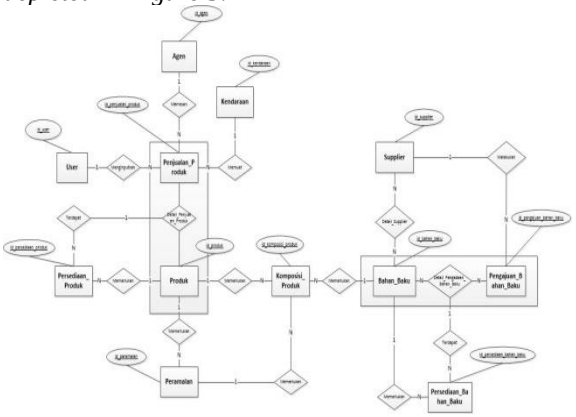


Figure 5 ERD information system of raw materials in the CV. Pusaka

2.5 A Context Diagram

Context diagram is a model to explain how data is used globally and is transformed to the process or describe the flow of data into and out of the system. Context diagram on the system can be seen in Figure 6.

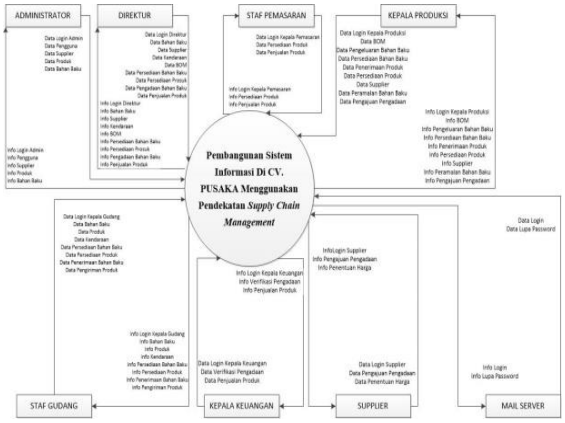
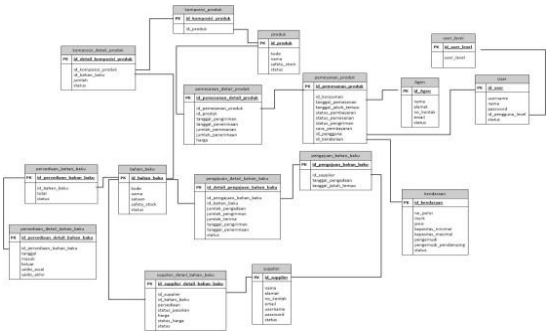


Figure 6 a product information system Context Diagram in CV. Pusaka

2.6 Table Relation

Table relation describing relationships between data, meaning data and their boundaries. The process of relationship between attributes is a combination between an attribute that has the same primary key, so that these attributes into a single entity linked by the key field.



Gambar 8 Table relation

2.8 The Design Of The Interface

The design of the interface was created to illustrate the appearance of the program that will be used by the user to interact with the system are made. The design is based on the input and output to be generated when the application is implemented. Here is a sample login interface design which can be seen in Figure 9.

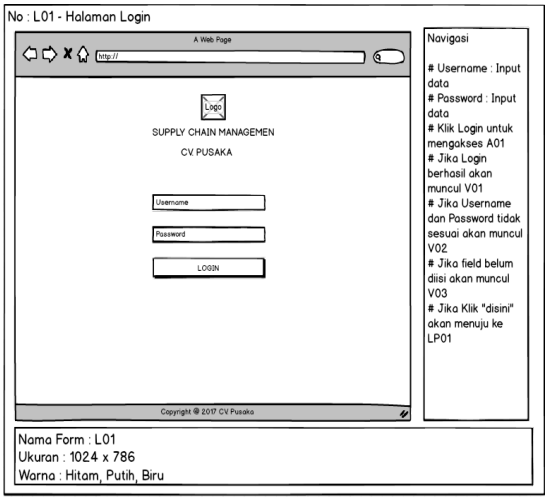


Figure 9 the login interface Design

2.9 The Design Of The Semantic Network

The design of the semantic network is a representation of the design of the interface that indicates where each interface is connected. Semantic network design in supply chain management information system in CV. Pusaka can be seen in Figure 10.

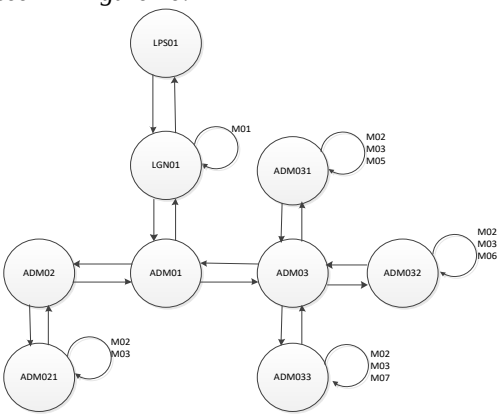


Figure 10 the design of the Semantic Network Administrator

2.9 Testing The System

System testing is the most important thing that aims to find any errors or omissions in the information system tested. Testing the system in question to know the performance of information systems that have been made in accordance with the objectives of the design of information systems. Testing the system using black box testing. Black box testing focuses on the functional requirements of the software and user acceptance testing (end users).

1. Functional Testing

Black box testing is a test used to test the new system. Black box testing is focused on testing the functional requirements for information systems.

3 Concluding

In this section, describes the conclusions contains the results obtained after the analysis, design, and implementation of the design of software built and have been developed as well as suggestions that will provide notes It is important and possible repairs need to be done for the development of the software before.

3.1 Conclusions

Based on the results obtained in the writing of this final task, then a conclusion can be drawn as follows:

1. *Supply chain management information system built this can ease the head of production in determining the amount of raw materials that must be reserved to the supplier to meet the production needs of each month.*
2. *Supply chain management information system can make the head part delivery schedules in regulating the distribution of the product the right suit stock products available and also the distance to the nearest customer*

3.2 Advice

Suggestions for the development of a supply chain management information system there are some suggestions that may be made, inter alia:

1. *Development of the interface more attractive.*
2. *The addition of features to facilitate the checking of delivery.*
3. *The development of information systems for applying consumer relationship management which includes ordering products and handling consumer complaints in order to facilitate consumers in making a booking.*

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