DEVELOPMENT OF INFORMATION SYSTEMS *SUPPLY CHAIN MANAGEMENT* (SCM) IN CV ALMAGADA

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ABSTRACT

CV.Almagada is an industrial company engaged in the manufacture of meatballs and noodles owned by Emma Amalia. Meatball packed into plastic packaging. CV.Almagada's flagship product is meatballs, meatballs are also the most ordered products by customers. CV.Almagada has a series of work systems from upstream to downstream, from the upstream CV.Almagada undertake the process of ordering raw materials to *suppliers* , acceptance of raw materials that have been ordered from *suppliers* , processing raw materials into products. CV.Almagada implements a *make to stock* system , where production is made prior to ordering from customers. While from the downstream CV.Almagada make the process of receiving product orders from customers and the process of distributing products from CV.Almagada to customers. Procurement is done every 1 month with the same quantity, it raises the problem that is often the occurrence of deficiency or excess of raw materials. the problem that occurs on the downstream is the absence of shipping scheduling. The method of procurement of raw materials used to determine the date and amount of raw materials to be ordered to *suppliers* using the method *Economic Order Quantity* (EOQ). Delivery schedule of products using TSP (*Traveling Salesman Problem*) method to determine which customers will be sent first viewed from the nearest distance from the company. Based on the results using *blackbox* testing , and interviewing each section of the Company, it can be concluded that this system has assisted the Company in determining the date and amount of raw materials to be purchased to the *supplier* and assisting the company in determining the delivery schedule to each customer.

Keywords : *supply chain management , economic order quantity, Traveling salesman problem, push supply chain management* .

1. PRELIMINARY

CV.Almagada is an industrial company engaged in the manufacture of meatballs and noodles owned by the mother of Emma Amalia. Types of products produced by CV.Almagada are Meatballs and Noodles, Meatballs packed into Plastic packaging. CV.Almagada's flagship product is meatballs, meatballs are also the most ordered products by customers.

CV.Almagada has a series of work systems from upstream to downstream, from the upstream CV.Almagada undertake the process of ordering raw materials to *suppliers* , acceptance of raw materials that have been ordered from *suppliers* , processing raw materials into products. CV.Almagada implements a *make to stock* system , where production is made prior to ordering from customers. While from the downstream CV.Almagada make the process of receiving product orders from customers and the process of distributing products from CV.Almagada to customers.

Based on direct interview with Mr. Deden as the head of procurement department, he explained that the process of ordering raw materials made by the head of procurement to the *supplier is* done by phone, for the payment process from CV.Almagada to the *supplier is* done when the goods have been received and done by cash or transfer in accordance with the policies of each *supplier* . At this time the procurement of raw materials is done every 1 month with the same quantity, it causes a problem that is often its lack of raw materials resulting in the production process is inhibited so that ordering a product from a customer can not t erpenuhi. Likewise, when reservations decrease, then resulted in the buildup of the amount of raw materials in the warehouse is too much so that raw materials can experience damage . When the raw materials come from *suppliers* directly checked first before entering the warehouse, if there are raw materials that are not feasible then made returns to *suppliers* and *suppliers* usually determine the time to replace it with new raw materials.

Based on the interview with Erni Sumarni's mother as head of marketing department, she explained that product ordered by customer in amount of packaged into plastic, ordering product from customer accepted by marketing department, customer can make order by phone or come directly to office, all process bookings will be recorded in the memorandum and order book. The payment process from customers is made in cash and through bank account. The return process from CV.Almagada to the customer is done when the goods is damaged on the plastic packaging so it is not feasible for sale, the return is done within 1-2 days after the customer reported that there is a product that is not worth selling. The process of distributing products to customers is done every business day in accordance with the number of requests from customers. The company has 2 units of truck- *box* cars to distribute products to customers. Several times the marketing department experienced constraints in the process of distributing products to customers, it happens because there is no scheduling to determine which customers will deliver the order first.

Based on current problems, CV.Almagada needs a system to manage information from upstream to downstream, therefore the development of information system using *Supply Chain Management* (SCM) approach becomes the right solution because the function of *Supply Chain Management* (SCM) itself is to integrate business processes from raw material suppliers to customers.

1.1 Purpose and objectives

Based on the problems that have been described in the background, the purpose of this research is to build a *Supply Chain Management* Information System (SCM) in CV. Almagada.

The objectives of the development of *Supply Chain Management* in CV.Almagada are as follows:

1. Assist the head of the procurement department in the process of determining the amount and date of purchase of raw materials to the *supplier* for the purchase of raw materials in the coming period .
2. Assist the head of the marketing department in the process of distributing products to customers who have made the order by scheduling the shipment.

1.2 *Supply Chain Management*

Supply Chain Management is an integrative method or approach for managing an integrated flow of products, information, and money involving parties from upstream to downstream. An important principle in SCM is the transparency of information and collaboration between the internal functions of the company and with the parties in the company along the *supply chain* . *Supply Chain* is the physical network, ie companies involved in supplying raw materials, producing goods, or sending it to end users. These companies usually include suppliers, manufacturers, distributors, agents and support companies such as logistics services.

2. RESEARCH CONTENTS

2.1 Problem Analysis

The problems that exist in CV.Almagada include:

1. Head of procurement difficulties in determining the date of purchase of raw materials and the amount of raw materials to be in the message to the *supplier* because the process of purchasing raw materials done once a month.
2. Head of the marketing department difficulties in conducting the product distribution process to customers who have made the order.

2.2 Analisis pengadaan bahan baku

To determine the optimal amount of raw material required a method of calculating EOQ (*Economic Order Quantity).* There are 7 models of EOQ calculations that can be used include the following:

1. EOQ model with the existence of fixed needs.
2. EOQ model with the existence of *Stock Out*
3. EOQ model with more capacity
4. EOQ model with the grace period
5. EOQ model with the existence of the need is not fixed
6. EOQ model with discounts
7. EOQ model assuming continuous product flow

Based on EOQ calculation models, the most suitable model is used EOQ model with the existence of fixed requirement. The model was chosen because it has fulfilled the following criteria:

1. The demand or the standard requirement for that period of time is known to be constant or relatively small fluctuations of change.
2. The grace period or *lead time* for each raw material is known to be constant for 3 days.
3. No *stock out* .
4. There is no discount when making a purchase with a certain quantity.

The inventory pattern on the model generally is as follows:

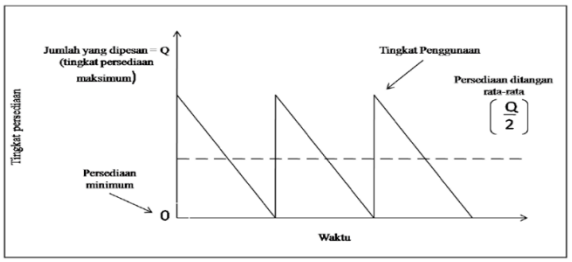


Figure 1 General graph of inventories with fixed needs

With the EOQ model, then proceed with determining the optimal amount of raw material through a series of EOQ calculations. The sample of raw material to be used in the calculation analysis is beef. The following is a table of costs and beef requirements for the period:

a. Booking fee

The booking fee *(Ordering Cost)* is the cost required when obtaining raw materials from *Supplier.*

Table 2. 1 booking fee

No	Cost type	Amount
1	Phone fee	Rp. 50.000

Booking Cost in 1 month Rp. 50,000. so assuming ordering of raw material to supplier could happen every day, so that in one period of April could be 30 times order, seen in formula

S = Total Booking Cost / Order Frequency
= Rp.50.000 / 30 = 1.666
= Rp.1.667
Ket: S = Booking fee every time a message

b. Storage Fee

The cost of storage *(Carrying Cost* or *Holding Cost)* is the cost that arises because the company keeps inventory.

Tabel 2. 2 storage cost

No	Cost type	Amount
1	Electricity cost in warehouse	Rp. 100.000

$$Cc = \frac{\text{Total biaya Penyimpanan}}{\text{Total Kebutuhan bahan baku daging sapi}}$$

$$Cc = \frac{100.000}{1500} = \text{Rp. } 66{,}66 = \text{ Rp } 67/\text{Kg}$$

c. EOQ

EOQ model calculation formula in the presence of fixed needs is:

$$Q = \sqrt{\frac{2\ x\ D\ x\ Cs}{Cc}} \qquad (1)$$

Wich one :
Q is Optimum order size. (To be searched)
Cs is the *ordering cost* (*ordering cost*)
Cc is the cost of storage (*carrying Cost*)
D is the number of requests or monthly needs

$$Q = \sqrt{\frac{2\ x\ 1500\ x\ 1667}{67}} = 273{,}21 \approx \text{ 273 kg.}$$

After obtaining the value of Q or the optimal amount for raw materials Meat, then calculations continued to know how many times the procurement stage should be done if the number of Meat for each time procurement of 273 kg. Here is the calculation:

$$\text{Procurement amount} = \frac{1500\ kg}{273\ kg} = 5{,}49 \approx 6$$

So the number of procurement Meat that must be done is 6 times or 6 times the procurement stage. And to know the procurement cycle for each stage is as follows:

$$\text{Procurement cycle} = \frac{30\ day}{6\ procurement\ stage} = 5$$

So the procurement of meat to be done is for 5 days. Based on these results, the pattern of meat procurement that was originally done simultaneously, will be changed to be done gradually ie procurement will be done 6 times with the procurement cycle every 5 days and with the amount of meat as much as 273 kg for each stage of procurement done.

Tabel 2. 3 procurement beef

Raw Material Name	**Number of purchases**	**Purchase date**
beef	273	6 April 2017
	273	11 April 2017
	273	16 April 2017
	273	21 April 2017
	273	26 April 2017
	273	1 Mei 2017

Calculation of starch

$$Cc = \frac{\text{Total biaya Penyimpanan}}{\text{Total Kebutuhan bahan baku Tepung Kanji}}$$

$$Cc = \frac{100.000}{250} = \text{Rp. } 400 = \text{ Rp } 400/\text{Kg}$$

EOQ model calculation formula in the presence of fixed needs is:

$$Q = \sqrt{\frac{2\ x\ D\ x\ Cs}{Cc}}$$

Wich one :
Q is Optimum order size. (To be searched)
Cs is the *ordering cost* (*ordering cost*)
Cc is the cost of storage (*carrying Cost*)
D is the number of requests or monthly needs

$$Q = \sqrt{\frac{2\ x\ 250\ x\ 1667}{400}} = 45{,}6 \approx \text{ 46 kg}$$

After obtaining the value of Q or the optimal amount for the raw material Flour, then the calculation is

continued to find out how many times the procurement stage should be done if the amount of flour for each procurement of 46 kg. Here is the calculation:

Procurement amount = $\frac{250\ kg}{46\ kg}$ = 5,43 ≈ 6

Then the amount of procurement of flour that must be done is 6 times or 6 times the procurement stage. And to know the procurement cycle for each stage is as follows:

Procurement cycle = $\frac{30\ days}{6\ procurement\ stage}$ = 5

So Procurement of starch to do is for 5 days. Based on these results, the pattern of procurement of kanji starch which was originally done simultaneously, will be changed to be done gradually ie procurement will be done 6 times with 5 days procurement cycle once and with the amount of starch as much as 46 kg for each stage of procurement done.

Tabel 2. 4 pengadaan tepung kanji

Raw material name	Number of purchases	Purchase date
Starch	46	6 April 2017
	46	11 April 2017
	46	16 April 2017
	46	21 April 2017
	46	26 April 2017
	46	1 Mei 2017

Egg calculations

Cc = $\frac{\text{Total biaya Penyimpanan}}{\text{Total Kebutuhan bahan baku Telur}}$

Cc = $\frac{100.000}{50}$ = Rp. 2000/Kg

Q = $\sqrt{\frac{2\ x\ D\ x\ Cs}{Cc}}$

Wich one :
Q is Optimum order size. (To be searched)
Cs is the *ordering cost* (*ordering cost*)
Cc is the cost of storage (*carrying Cost*)
D is the number of requests or monthly needs

Q = $\sqrt{\frac{2\ x\ 50\ x\ 1667}{2000}}$ = 9,1 ≈ 9 kg.

After obtaining the value of Q or the optimal amount for egg raw material, then the calculation is continued to know how many times the procurement stage should be done if the number of eggs for each procurement of 9 kg. Here is the calculation:

Procurement Amount = $\frac{50\ kg}{9\ kg}$ = 5

Then the number of procurement Eggs that must be done is 5 times or 5 times the procurement stage. And to know the procurement cycle for each stage is as follows:

Procurement cycle = $\frac{30\ days}{5\ procurement\ stage}$ = 6

So Procurement of eggs to be done is for 6 days. Based on these results, the pattern of egg procurement that was originally done simultaneously, will be changed to be done gradually ie procurement will be done 5 times with procurement cycle 6 days and with the number of eggs as much as 9 kg for each stage of procurement done.

Tabel 2. 5 egg procurement

Nama Bahan Baku	Jumlah Pembelian	Tanggal Pembelian
Telur	9	6 April 2017
	9	12 April 2017
	9	18 April 2017
	9	24 April 2017
	9	30 April 2017

Calculations of fried onions and fried garlic

Cc = $\frac{\text{Total biaya Penyimpanan}}{\text{Total Kebutuhan bahan baku bawang}}$

Cc = $\frac{100.000}{50}$ = Rp. 2000/Kg

Q = $\sqrt{\frac{2\ x\ D\ x\ Cs}{Cc}}$

Wich one :
Q is Optimum order size. (To be searched)
Cs is the *ordering cost* (*ordering cost*)
Cc is the cost of storage (*carrying Cost*)
D is the number of requests or monthly needs

Q = $\sqrt{\frac{2\ x\ 50\ x\ 1667}{2000}}$ = 9,1 ≈ 9 kg

.
After obtaining the Q value or the optimal amount for the onion raw material, then the calculation is continued to find out how many times the procurement stage should be done if the number of onions for every time the procurement of 9 kg. Here is the calculation:

Procurement amount = $\frac{50\ kg}{9\ kg}$ = 5

Then the number of onion procurement that must be done is 5 times or 5 times the procurement stage. And

to know the procurement cycle for each stage is as follows:

$$\text{Procurement cycle} = \frac{30\ days}{5\ procurement\ stage} = 6 \text{ days}$$

So the procurement of onions to be done is for 6 days. Based on these results, the pattern of onion procurement that was originally done simultaneously, will be changed to be done gradually ie procurement will be done 5 times with procurement cycle every 6 days and with the number of onions as much as 9 kg for each stage of procurement done.

Tabel 2. 6 onion procurement

Raw material name	Number of purchases	Purchase date
Fried onion Fried garlic	9	6 April 2017
	9	12 April 2017
	9	18 April 2017
	9	24 April 2017
	9	30 April 2017

2.3 Analisis Pemilihan Supplier

After making the process of procurement of raw materials, the next step is the process of purchasing raw materials to *suppliers* . At this stage the actors involved in the stage of purchasing raw materials, namely Head of Procurement at CV.Almagada, head of procurement department will make procurement in accordance with the production needs of the monitoring results of raw materials that have been done previously. Then determine which *supplier* will be selected for the purchase of raw materials based on the stock of raw materials if the stock needs of raw materials in the first *supplier* deficient then the procurement department will order or buy raw materials to the second *supplier* based on raw material needs for production. The *supplier* selection table and the table of raw material quantities to be purchased can be seen as follows:

Tabel 2. 7 supplier selection based on stock

Nama Bahan Baku	Nama Supplier	Jumlah Stok Di Supplier	Jumlah bahan baku yang dipesan
Daging Sapi	FINA SUPPLIER	500kg	276 kg
	H. Kosasih	3000kg	
Tepung Kanji	CV.JAYA ABADI	500kg	46 kg
	PT.GITA SURYA	200kg	
	PT.MAKMUR JAYA	20kg	
Gula Merah	CV.JAYA ABADI	50kg	5 kg
	PT.GITA SURYA	50kg	
Telur	CV.SINAR LESTARI	80kg	9 kg
	H.YUSUF SANUSI	80kg	
GARAM	PT.GITA SURYA	25kg	1 kg
	PT.MAKMUR JAYA	30kg	
Bawang Merah Goreng	PD. SINAR JAYA	50kg	9 kg
	H. UDAY	70kg	
	PD.MUCHTAR	80kg	
Bawang Putih Goreng	H. UDAY	50kg	9 kg
	PD.MUCHTAR	80kg	
Penyedap rasa	PD.MUCHTAR	50kg	6 kg
	PD. SINAR JAYA	50kg	
Lada	H.YUSUF SANUSI	75kg	5 kg
	CV. SINAR LESTARI	25kg	

After choosing *suppier* there are some *suppliers* selected to procure raw materials to the company, here are the suppliers that have been selected:

Tabel 2. 8 amount of raw materials to be purchased

Bahan Baku	Jumlah bahan baku yang harus dipesan	Supplier
Daging Sapi	276 kg	FINA SUPPLIER
Tepung Kanji	46 kg	PT. GITA SURYA
Gula Merah	5 kg	PT. GITA SURYA
Telur	9 kg	H.YUSUF SANUSI
Garam	1 kg	PT. GITA SURYA
Bawang Merah Goreng	9 kg	PD. MUCHTAR
Bawang Putih Goreng	9 kg	PD. MUCHTAR
Penyedap rasa	6 kg	PD. MUCHTAR
Lada	5 kg	CV. Sinar Lestari

2.4 Analysis of product distribution

In the supply chain there are distribution / delivery activities . Coverage of activities include monitoring the status of delivery, delivery scheduling with the determination of the nearest distance and capacity of vehicles to be used in the distribution. Distribution monitoring is done so that the product gets to the customer at the right time and place and knows the delivery status. Vehicles used to distribute products are 2 truck cars box. distribution process also requires analysis of the ordering process from customers to know the customer data so that it can form a distribution schedule. Packing used to package the product to be delivered to customers is a large plastic. 1 large plastic containing 25 large meatballs, 25 small meatballs, 50 small meatballs, can be seen in the following table

Tabel 2. 9 orders of meatballs products

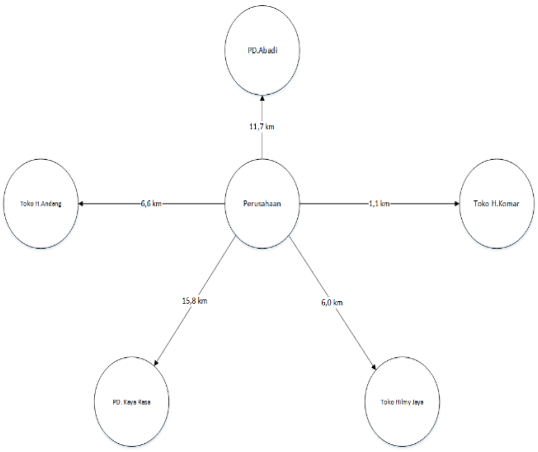
Customer name	Number of product	Packing
PD. Abadi	225	6 Plastik
Toko H. Komar	150	6 Plastik
PD. Kaya Rasa	250	6 Plastik
Toko H. Andang	350	8 Plastik
Toko Hilmy Jaya	250	5 Plastik

After looking at the ordering data and determining the type of packing, it is necessary to analyze the customer data so that it can determine the closest distance for delivery of the product to the customer. Customer data that has made the order can be seen in the following table

Table 2. 10 Route shipping product

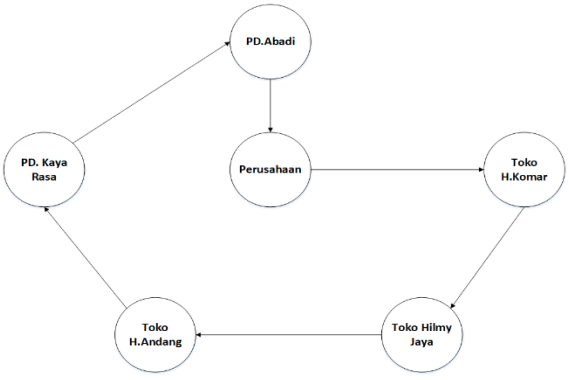
Order date	Customer name	Address	mileage
08-Jan-17	PD ABADI	Pasar Caringin no 13 bandung	11,7 km
08-Jan-17	Toko H. Komar	Jalan Raya Ciwastra, Bandung	1,1 km
08-Jan-17	PD. Kaya Rasa	Pasar Sederhana	15,8 km
08-Jan-17	Toko H.Andang	Pasar Kordon	6,6 km
08-Jan-17	Toko Hilmy Jaya	jl. Binong	6,0 km

From the above order table will be determined delivery route by using TSP method (*Traveling Salesman Problem*) , here is the determination of the delivery route:



Gambar 2. 1 initial rute

Company distance to PD.Abadi = 11,7 km
Company distance to Toko H.Komar = 1,1 km
Company distance to Toko Hilmy Jaya = 6,0 km
Company distance to PD.Kaya Rasa = 15,8 km
Company distance to Toko H.Andang = 6,6 km
The distance minimum generated from company to customer is 1.1 km then the first visited is Toko H.Komar, then next we look for stores that will be visited after the store H.Komar determination is as follows:
Distance Toko H. Komar – Toko Hilmy jaya = 5 km
Distance Toko H. Komar – Toko H. Andang = 5,6 km
Distance Toko H. Komar – PD kaya Rasa = 14,8 km
Distance Toko H. Komar – PD abadi = 10,6 km
Got a minimum distance of 5 km, then the delivery route is the company - Toko H.Komar - Toko Hilmy Jaya - Toko H.Andang - PD. ABADI - PD Kaya Rasa..



Gambar 2. 2 delivery routes to customers

Once known distance of the closest customers to be sent, then made the scheduling delivery of products to customers and in the order in accordance with the closest distance sequence.

2.5 Functional Analysis

2.5.1 Database Analysis

Database analysis on the information system will be built using *Entity Relationship Diagram* (ERD) . ERD is a data model that uses several notations to describe data in the entity context and the relationships described in the data. Modeling the data in Figure 2.3

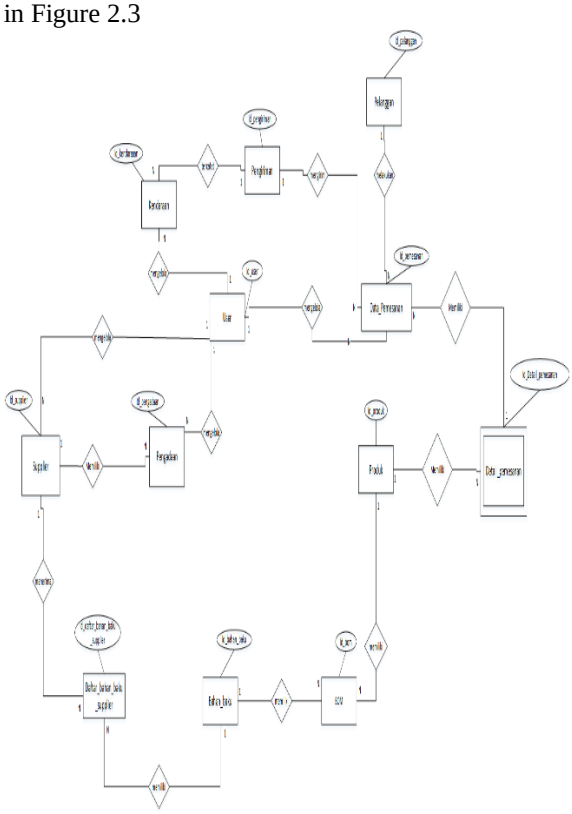


figure 2. 3 Entity Relationship Diagram

2.5.2 Context Diagram

Context diagram is a model to explain globally how data is used and transformed to process or describe the flow of data into and out of the system. The context diagram built in Figure 2.4

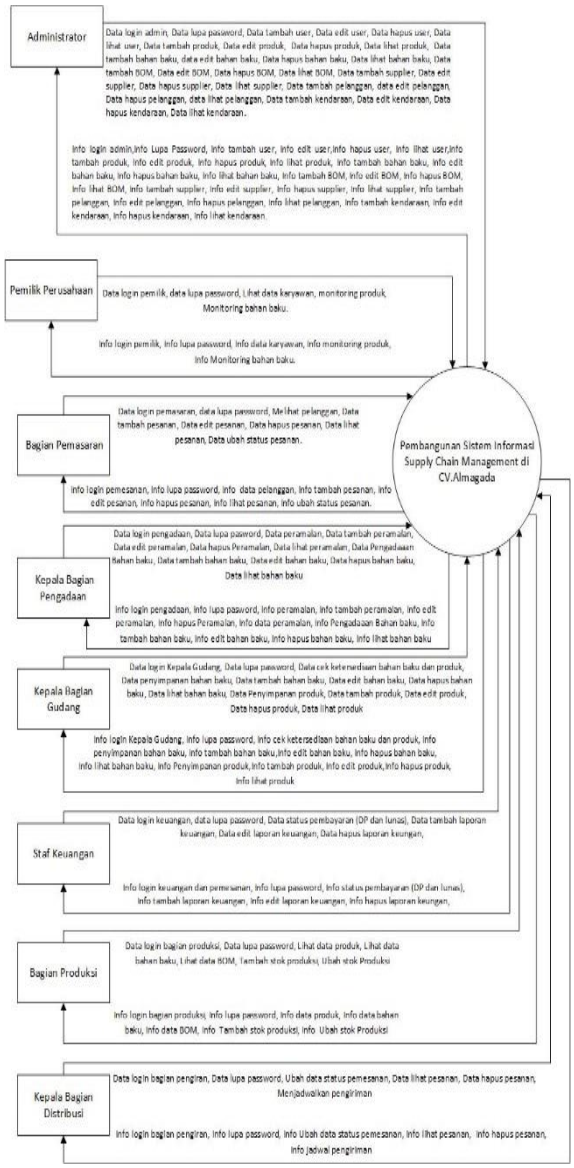


Figure 2. 4 Context diagram

2.5.3 *Data Flow Diagram* (DFD)

Data Flow Diagram (DFD) or data flow diagram is a medium used to describe the flow of data flowing p there an information system. Processes that occur in the system until the process is more detailed. In the context diagram information systems such as Figure 2.4 can be broken down into multiple DFDs. DFD will explained starting from Level 1 DFD .

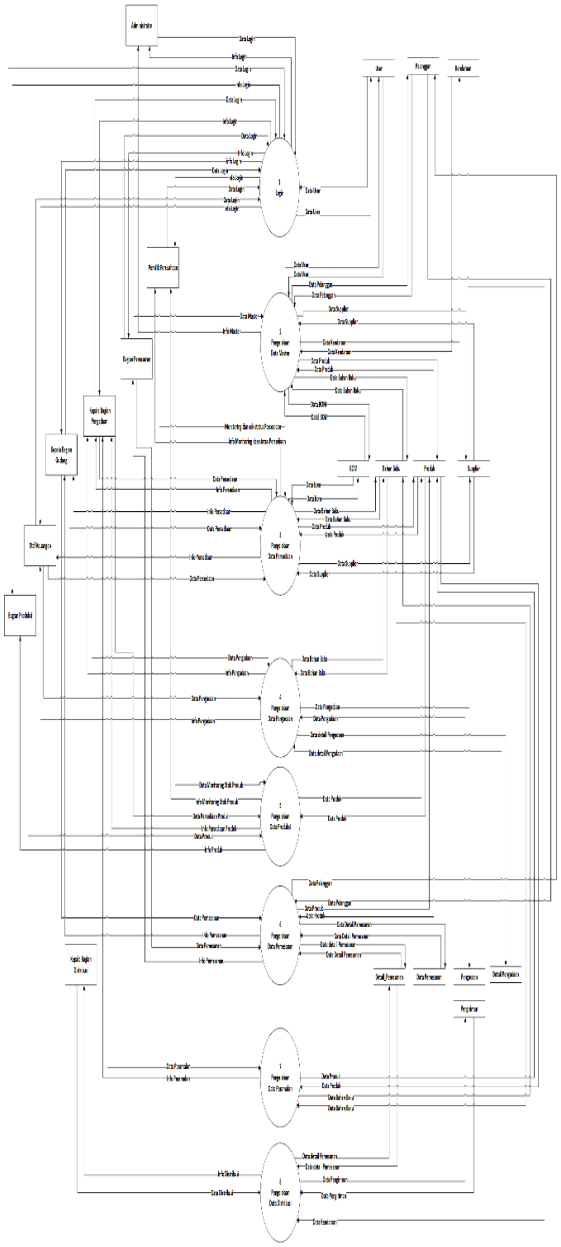


Figure 2. 5 DFD Level 1

2.6 Interface

The design of the login interface can be seen in figure 2.6

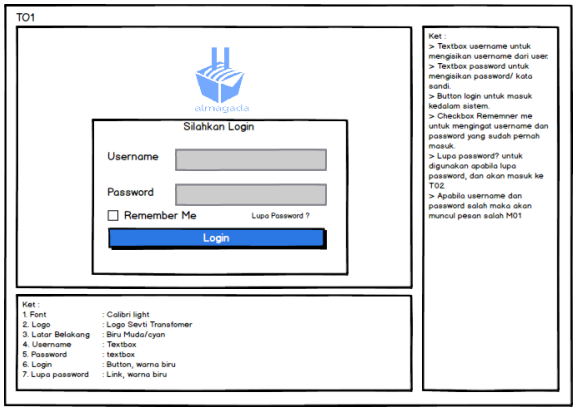


Figure 2. 5 Login infteface

The design of the admin interface can be seen in Figure 2.7

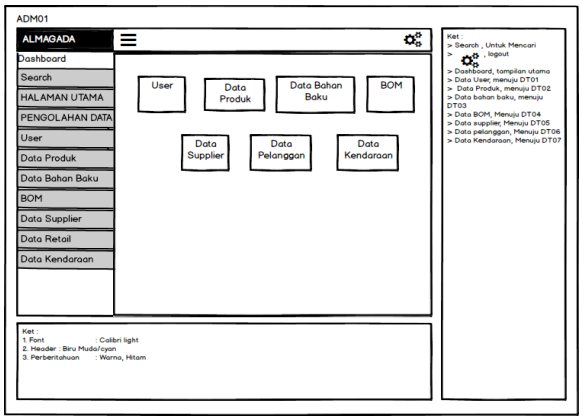


Figure 2. 6 admin interface

The design of the employee interface can be seen in Figure 2.8

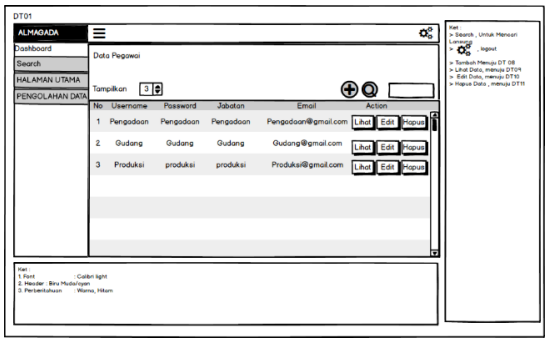


Figure 2. 7 antarmuka pegawai

The design of the product data interface can be seen in Figure 2.8

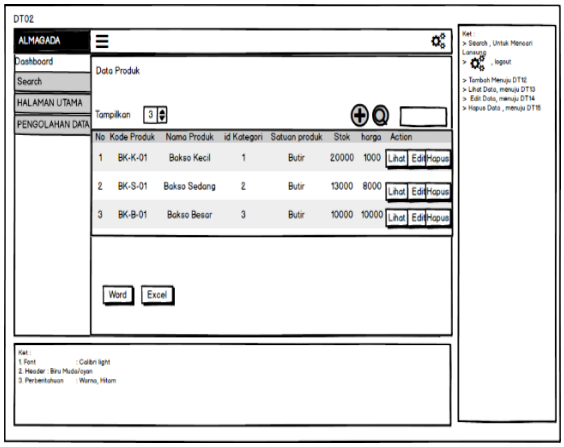


Figure 2. 8 product data interface

The interface-added design of raw materials can be seen in Figure 2.9

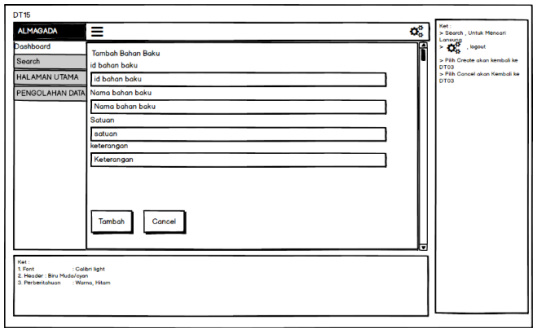


Figure 2. 9 interface added raw materials

The design of the BOM interface can be seen in Figure 2.10

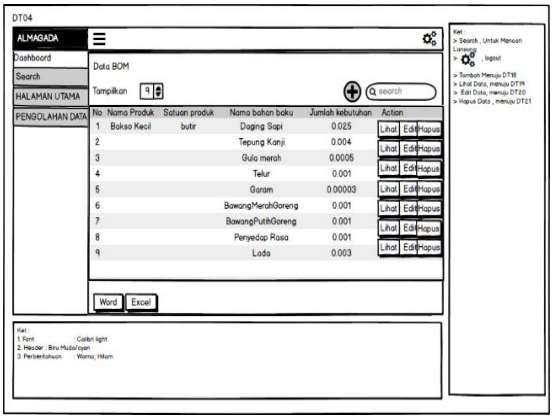


Figure 2. 10 BOM interface

The design of *supplier* interface can be seen in Figure 2.11

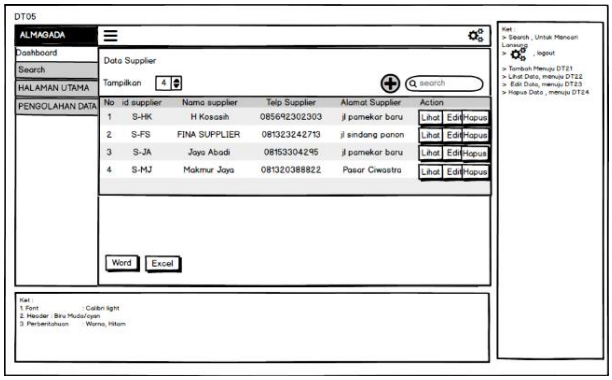


Figure 2. 11 *supplier* interface

The design of the financial interface can be seen in Figure 2.12

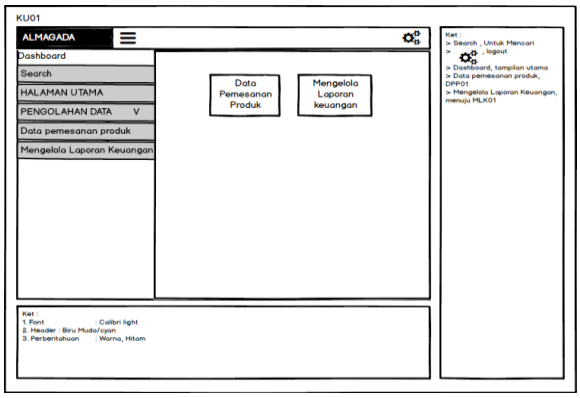


Figure 2. 12 page financial interface

The design of the product order interface can be seen in Figure 2.13

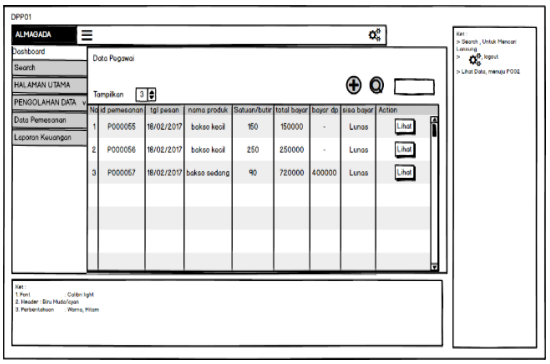


Figure 2. 13 product order interface

The design of the owner interface is shown in Figure 2.14

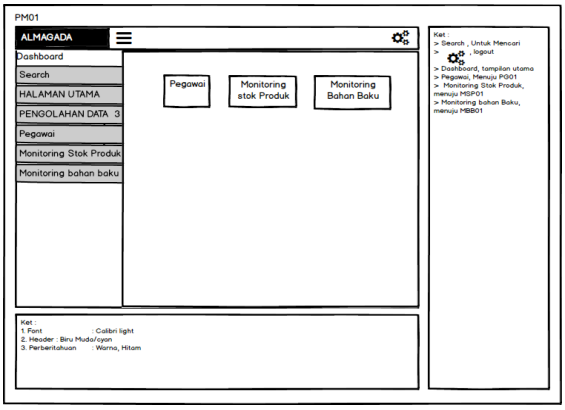


Figure 2. 14 interface of the company owner

The design of the distribution interface can be seen in figure 2.15

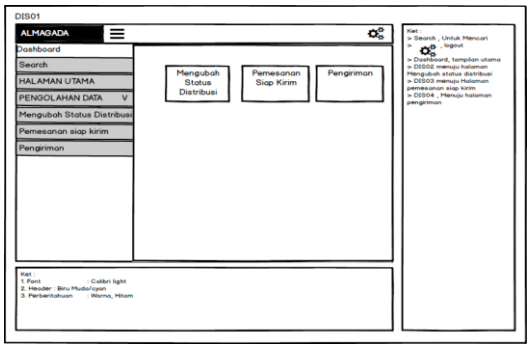


Figure 2. 15 distribution interface

3. CLOSING

3.1 Conclusions

Based on the research that has been done on the analysis, design implementation and testing of *supply chain management* information system in CV Almagada hence can be drawn conclusion as follows

1. The supply chain managemet information system at CV.Almagada can assist the procurement department head in determining the date and amount of raw materials to be purchased for production activities to continue and proceed smoothly.
2. The supply chain managemet information system at CV.Almagada can assist the head of the marketing department in the delivery process by scheduling the delivery of the product to the place of Customer.

3.2 Suggestion

Suggestions for the development of this information system there are several suggestions that can be done, among others:

1. The study is expected to do a combination of supply chain management information system with customer relationship management information system to manage relationships with customer.
2. This information system can be developed with the addition of features of a mobile order process performed by each customer

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