SYSTEM DEVELOPMENT FOR SUPPLY CHAIN MANAGEMENT IN OLIVE BAKERY

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ABSTRACT

Olive Bakery is a company engaged in the field of food producing various types of food between bread, brownies and bagelan. Olive Bakery uses the make to stock strategy, namely the production process prior to ordering, the current procurement activity planning is carried out periodically, the procurement department has difficulty determining the amount of raw material stock requirements. This causes uncertainty in the supply of raw materials. The distribution section has difficulty in estimating the time needed for the product distribution process because when there is a high order and all vehicles are used so that the distribution process to other consumers must wait for the vehicle being used. The method used for forecasting raw materials is a single exponential smoothing and using predictions of raw material availability in the warehouse using a calculation of safety stock. Based on the results of research in the company requires SCM (Supply Chain Management) system. Based on the results of the study it can be concluded that the system that has been built can facilitate the procurement section in determining the estimated number of purchases of raw materials and raw material supplies, meet production needs in the production section and facilitate the distribution section in arranging the delivery of products to consumers.

Keywords : *Supply Chain Management, Single Exponential Smoothing, Safety Stock, Make to stok*

1. PRELIMINARY

Olive Bakery is a company located on Jl Phh mustofa Ruko Surapati Core Complex, J3-J5 Floor 1 Block. Olive Bakery produces a variety of foods and centers by typical regions including bread, brownies and bagelan. At present the marketing process of products in olive bakery is done in 2 ways, namely distributing their products to stores spread across Bandung, Jakarta and Cirebon. Besides that, Olive bakery also sells products directly at olive bakery outlets. Olive Bakery uses the make to stock strategy, namely the production process before ordering.

In the process of procuring raw materials, the procurement department often needs fluctuating raw materials. Every stock procurement often has difficulty in determining the amount of stock needs to be used. This causes uncertainty in the supply of raw materials that have an impact on production supplies at the Olive bakery shop. Where there is accumulation of raw materials at the stage of raw material supply or lack of raw materials at other stages of raw material supply. Olive Bakery Shop has data on raw material procurement and product production starting from January to June 2016.

In the distribution process, delivery is carried out using 3 box cars owned by Olive Bakery which has a capacity to accommodate 300 products (note 1 product = 50 pcs). The three-week distribution process usually distributes one to three stores in 3 cities. The distribution department claimed that the difficulties related to estimating the time needed for the product distribution process were due to high order and the entire vehicle was used so that the distribution process to other consumers had to wait for the vehicle being used

Based on the problems described in the background, the purpose of this study is to build Supply Chain Management (SCM) Information Systems in the Olive Bakery Store. The objectives of supply chain management development in the Olive Bakery Store are as follows:

1. Facilitate the procurement part in determining the estimated amount of raw material purchases and raw material inventories to meet production needs in the production section

2. Facilitate the distribution section in arranging the scheduling of product delivery to consumers

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2. RESEARCH CONTENT

2.1 *information system*

Information systems do not have to involve computers. Information systems that use computers can be called computer-based information systems (Cumputer-Based Information System or CBIS). In practice, the term information system is more often used without a computer-based frills even though in reality the computer is an important part.

There are various definitions of information systems, as listed in Table 2.1. From these various definitions, it can be concluded that the information system includes a number of components (human, computer, information technology, and work procedures), something is processed (data becomes information), and is intended to achieve a goal or goal [1].

Source	Definition
Alter (1992)	The information system is a combination of work procedures, information, people, and information technology that is organized to achieve goals in an organization.
Bodnar dan Hopwood (1993)	An information system is a collection of hardware and hardware designed to transform data into useful information
Gelinas, Oram, dan Wiggins (1990)	An information system is a man-made system which generally consists of a collection of computer-based and manual components that are created to collect, store, and manage data and provide information to users
Hall (2001)	An information system is a series of formal procedures in which data is grouped, processed into information, and distributed to users
Wilkinson (1992)	Information systems are frameworks that coordinate resources (human, computer) to convert inputs into outputs, in order to achieve company goals

2.2.1 *Supply Chain Management*

Supply Chain Management has 3 main components that support the running of a business process as follows [2]:

1. *Upstream Supply Chain*

The supply chain upstream includes the activities of a company with its suppliers (which can be manufactures, assemblers, or both) and their connections to their suppliers (second-tier suppliers). The relationship between suppliers can be extended to several strata, all roads from material origin (for example ore, plant growth, in the upstream supply chain, the main activity is procurement)

2. *Internal Supply Chain*

Part of the internal supply chain includes all inhouse processes used in transforming input from suppliers into the organization's output. This extends from the time of input into the organization. In the internal supply chain, the main concerns are production management, manufacturing and inventory control

3. *Downstream Supply Chain*

Downstream (downstream) supply chain includes all activities that involve sending products to end customers. In the downstream supply chain, attention is directed to distribution, transportation warehousing and after sale service

2.2.2 TYPES OF FORECASTING

Forecasts forecasts are usually classified for the duration or current horizon in the future. Generally the front horizon is divided into three categories, namely:

a.Short-term forecast forecast

Includes a time interval from three to not one year. These short-term forecast forecasts are used in the preparation of purchase plans, task scheduling, work or scheduling, setting the level of the workforce or workforce levels, assigning tasks (job assigments). And the level of production (production levels)

b. Mid-term forecast forecast

Generally this forecast covers a period of time from one year to three years. This medium-term forecast is used in the preparation of sales plans, production planning, and budgeting or budgeting which

includes the cash budget, and analysis of various production plans.

c, Long-term forecast forecast

Generally this forecast forecast covers a period of three years or more. This long-term forecast forecast is used for new product planning, capital expenditure budget or capital expenditure, expansion facility location planning, and research & development (Research & Development

a. Single Exponenthial Smoothing

Forecasting based on exponential smoothing is generally used to estimate product sales, individually. This method is often considered better than the two previous methods, namely single moving average and simple average because of its ability to use past data by assigning weights based on current data. More data is now given greater weight than previous data. The assumption is that more data now always has a stronger influence on the results of forecasting than

with more obsolete data. The formula for single exponential smoothing can

seen in the following equation

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

Where :

Fn + 1 = forecasting results in period n + 1

Fn = the result of forecasting for the previous period

α *= smoothing constant where* $0 \leq \alpha \leq 1$

Yes = true value for the previous period

b. MSE

After all calculations from alpha 0.1 to 0.9, the next step can determine which forecasting results can be used is to calculate the smallest error value of the

2.5 Problem analysis

Problem analysis is an assumption of the problem that will be described in the data processing procedures in the distribution system with the Supply Chain Management approach at Olive Bakery. Analysis of problems from the current system is:

1. Facilitate the procurement part in determining the estimated amount of raw material purchases and raw material inventories to meet production needs in the production section

2. Facilitate the distribution section in arranging the scheduling of product delivery to consumers

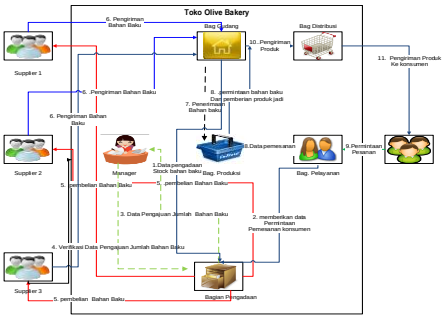


Figure 2.1 Supply Chain Management Model at Olive Bakery Shop

2.3 Forecasting Techniques

Forecasting data with horizontal data patterns can be done using simple average, moving average and single exponential smoothing methods. The following are forecasting techniques that will be used in this study [2]

forecast because the smaller the error value, the forecasting calculation will not miss

2.4 Safety Stock

Ordering an item until the item arrives takes a period that varies from a few hours to months. The time difference between when ordering until the item comes is known as the Lead Time. The grace time is affected by the availability of the goods ordered and the distance of the location between the buyer and the goods provider. An uncertain grace period results in a shortage of goods for example due to the use of goods that are larger than previously estimated, therefore a safety stock is needed. If the Safety Stock is set too low, the inventory will run out before replacement supplies are received so that production can be disrupted or customer requests cannot be met. Planning for raw material inventory that has been calculated, but often the supply of raw materials is insufficient because of frequent jumps in the inventory of the company's products or inventory is damaged and does not meet the standards to meet consumer demand. [5]

2.6 ***SUPPLY CHAIN MANAGEMENT ANALYSIS IN OLIVE BAKERY STORES***

2.6.1 Analysis of Supply Chain Management in the Olive Bakery Shop

Based on the description of the flows and production systems owned in the olive bakery shop, it can be proposed the use of supply chain management methods on the system to be made. On supply chain management methods have framework that is a component of development in the system to be created. There are a total of 7 suppliers owned by the Olive Bakery Shop to meet the needs of raw materials, while distributors who work together to order

2.6.2 SCM stages in the Olive Bakery Shop

The information system strategy SCM approach that will be built in Olives Bakery Shop consists of several stages that can be seen in Figure 2.2

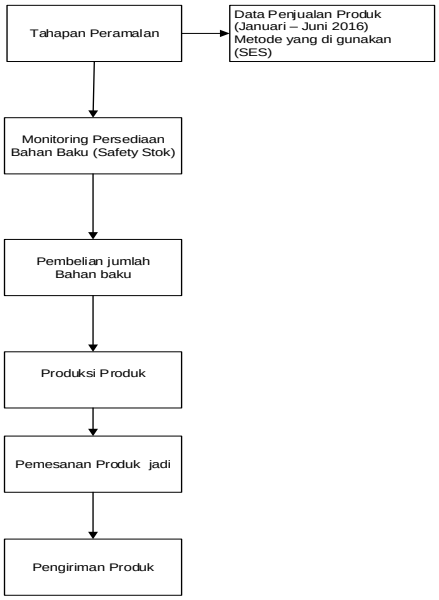


Figure 2. 2 SCM stages in the Olive Bakery Shop

1. Forecasts of Finished Products

The Olive Bakery Shop manages product ordering data ordered by the shop Consumer and the Olive Bkery Shop predicts the procurement of finished products in the following month from the product ordering data 6 months earlier. The data taken is data on bagelan cheese cheese from some shop customers because the data is 6 months from January to June 2016 which previously experienced the highest number of orders.

2.2 Cheesecake Sales Data Table

bulan	Data Penjualan Bagelan Keju
Januari	155 dus
Februari	140 dus
Maret	168 dus
April	169 dus
Mei	171 dus
Juni	160 dus

a. SES (Singel Expontial Smoothing)

Taken a first sample value in the table for July with a minimum of 0.1 with the initial data taken from the sales data. January is the sale of cheese bagelan products in January (Fn) = 155 boxes and January forecasting results (Yr) = 155 boxes, because January cannot be calculated so the calculation results can be from January product sales. So that get a calculation example α = 0.1 as below: [3]

*FFebuari = (0.1 * 155) + (1 - 0.1) * 155*

= (155) + (- 1395)

= 155 boxes

b.MSE

After all calculations from alpha 0.1 to 0.9, the next step can determine which forecasting results can be used is to calculate the smallest error value of the forecast because the smaller the error value, the forecasting calculation will not miss. Calculation of error values using MSE (Mean Squared Error) with formula :

MSE = (XFebuari - FFeburari) ²

= (140-3155) ²

= 225

MSE results for February are 225.

2. Monitoring the Supply of Raw Materials (Safety Stock)

Safety supplies or often called Safety Stock are very necessary in a company because it serves to avoid the occurrence of shortages of raw materials so as to facilitate the production process.

Calculation of Standard Deviation as follows:

Number of Forecasting July 2016: 160

Number of working days in 1 month: 30 days

Procurement lead time to supplier (l): 5 days

Procurement averages in one month (d): 5,333

Standard deviation lead time (sl): 0.5

Order standard deviation (sd): 8.71

Standard level of 95% (Z): 1.64

Safety stock = Z x Sdl

Sdl = √ (d2 x sl2 + l x sd2)

Sdl = √5.3332 x 0.52 + 5 x 8.712

Sdl = √2699,719

Sdl = 51,95882

Safety Stock = 85,465

Rounding = 85 (rounding)

Table 2.3 Table of Raw Material Supplies

Nama Bahan	Stok	Safety Stock	Satuan	Status
Telur	1150	1176	Kg	Tidak Aman
Terigu Segitiga	4895	4788	Kg	Aman
Gula Pasir	753	588	Kg	Aman
Gula Tepung	800	588	Kg	Aman

Gula Fondan	783	588	Kg	Aman
Gula Palem	607	588	Kg	Aman
Soft Cream Holman	200	84	Kg	Aman

3. Purchasing Amount of Raw Material

The purchase of raw materials is an activity to calculate the price of ordering raw materials to suppliers. The activities include payment in accordance with the amount of raw material ordered to the specified supplier. Purchase purchase payments are made by the procurement department. After procuring raw materials and ordering the supplier, then the procurement department reports the number of orders approved by the manager, the manager approves and reports to the procurement department to order raw materials.

Table 2.4 Table for Purchasing Amount of Raw Materials

Nama Bahan	Hasil ramalan	Stock Gudang	Jumlah Bahan baku Yang dipesan	Supplier	Status
Telur	2246	1150	2341	Moderasa	Tersedia
Terigu Segitiga	9146	4895	9070	Bravo	Tersedia
Gula Pasir	1123	753	993	Santa Bakery	Tersedia
Gula Tepung	1123	800	1295	Bownies Vaniessa	Tersedia
Gula Fondan	1123	783	963	Saung Kuring	Tersedia
Gula Palem	1123	607	1139	Yasi Mart	Tersedia
Soft Cream Holman	160	200	149	Moderasa	Tersedia

4. Product production

In the production of products, the production department conducts a production plan to schedule production plans to meet orders from consumers. The number of bagelan cheese products produced every day is calculated based on the results of forecasting raw materials divided by the number of working days in a month. [7]

Table 2.6 Product Production Table

Jumlah Peramalan Bulan juli 2016	160	
Jumlah Hari Kerja dalam 1 bulan	30	hari
lead time pengadaan ke supplier (	5	hari
rata2 pengadaan dalam satu bulan	5,3	
Pembulatan	**5**	

Table 2.7 Product Production Table

Nama Bahan	Data Bahan Baku Perhari	Hasil	Satuan	Jumlah Bahan Baku	Status
Telur	14	70	Kg	72	Tersedia
Terigu Segitiga	57	285	Kg	286	Tersedia
Gula Pasir	7	35	Kg	36	Tersedia
Gula Tepung	7	35	Kg	43	Tersedia
Gula Fondan	7	35	Kg	36	Tersedia
Gula Palem	7	35	Kg	36	Tersedia
Soft Cream Holman	1	5	Kg	72	Tersedia

5. Finished Product Ordering

Bookings are made to the shop service department to order products from the Olive Bakery Store to suit the consumer's wishes, then the shop service section submits the product ordered by the consumer and is given to the production department. [4]

Table 2.8 Ordering of Finished Products

Nama Konsumen	Total Bayar	Nama Produk	Jumlah Pemesanan	Tanggal Pesan	Alamat
Rose Bakery	480.000	Bagelan Keju	10 dus	08-Jun-16	Taman Galaxy G 4-5 Jaka Setia Bekasi
	255.000	Brownies Chocochip	10 dus		
	56.000	Roti Keju	7 pcs		
Moderasa	580.000	Bagelan Talas	10 dus	08-Jun-16	Jl. Kebon Kawung No. 7
	1.100.000	Bagelan Stick Coklat	20 dus		
	400.000	Bagelan Stick Susu	10 dus		
Bravo	6.000.000	Bagelan Keju	100 dus	08-Jun-16	Jl. Holis 133
	48.000	Roti Keju	6 pcs		
	30.000	Roti Coklat	5 pcs		
	25.000	Roti Blueberry	5 pcs		
	450.000	Brownies Almond	10 dus		
	30.000	Roti Kacang Ijo	5 pcs		
Santa Bakery	500.000	Brownies Coklat	10 dus	08-Jun-16	Jl. TB. Simatupang No 18 D Cilandak Jaksel
	600.000	Brownies Keju	10 dus		
Brownies Vaniessa	9.000.000	Bagelan Keju	150 dus	08-Jun-16	Buah Batu
	560.000	Brownies Coklat	10 dus		
	600.000	Brownies Keju	10 dus		
	450.000	Brownies Almond	10 dus		
	580.000	Bagelan Talas	10 dus		

6. Product Distribution Stage After carrying out the product ordering stage, the company distributes the product to the consumer. The store is in accordance with the amount that has been ordered

Table 2.9 Product Distribution Phase

Jenis Kendaraan	Nama Produk	Jumlah Pemesanan	Nama Konsumen	Alamat Pengiriman	Kapasitas Mobil
Mobil Box 1	Bagelan Keju	10 dus	Rose Bakery	Taman Galaxy G 4- 5 Jaka Setia Bekasi	300 dus
	Brownies Chococ hip	10 dus			
	Roti Keju	7 pcs			
	Bagelan Talas	10 dus	Moderasa	Jl. Kebon Kawung No. 7	
	Bagelan Stick Coklat	20 dus			
	Bagelan Stick Susu	10 dus			
	Bagelan Keju	100 dus	Bravo	Jl. Holis 133	
	Roti Keju	6 pcs			
	Roti Coklat	5 pcs			
	Roti Blueberry	5 pcs			
	Brownies Almond	10 dus			
	Roti Kacang Ijo	5 pcs			
Mobil Box 2	Brownies Coklat	10 dus	Santa Bakery	Jl. TB. Simatupang No 18 D Cilandak Jaksel	300 dus
	Brownies Keju	10 dus			
	Bagelan Keju	150 dus	Brownies Vaniessa	Buah Batu	
	Brownies Coklat	10 dus			
	Brownies Keju	10 dus			
	Brownies Almond	10 dus			
	Brownies Talas	10 dus			
	Brownies Talas	10 dus	Saung Kurinng	Jl. Raya Puncak Km. 75 Cipayung Bogor	
	Roti kismis	20 pcs			
	Roti Susu	20 Pcs			
	Brownies Almond	10 dus	Yasi Mart	Jl. Cipto Mangunkusumo No. 27	
	Bagelan Keju	79 dus			
	Bagelan Garlic	20 dus			
	Bagelan Stik Coklat	14 dus			
	Bagelan Keju	120 dus	Aneka	Jl Ganda Wijaya No 3 Ledeng	
	Bagelan Stik Susu	10 dus			
	Roti Unyil	18 pcs			
	Brownies Almond	10dus			

2.7 Context Diagram This diagram is the

highest level diagram of the DFD that describes the relationship between the system and the external environment. The context diagram of the Olive Bakery Shop information system is as follows:

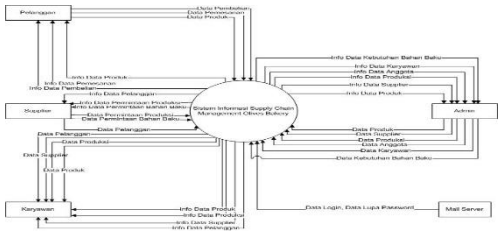


Figure 2.3 Context Diagram

2.8 Data Flow Diagrams (DFD) Level 1 The *following are level 1 data flow diagrams (DFD) processing master document data shown in the*

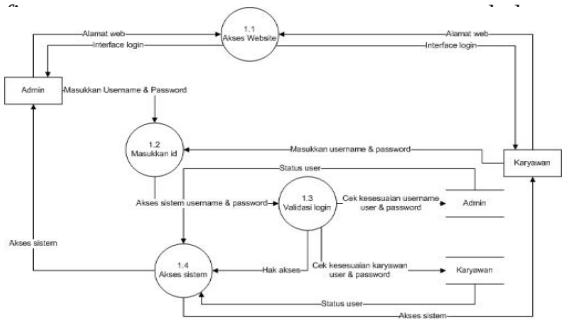


Figure 2.4 Level 1 Data Flow Diagrams (DFD)

2.9 *Entity Relationship Diagram*

In designing the database, the data model that will use is Entity Relationship Diagram (ERD). ERD results of the analysis that have been carried out are as follows:

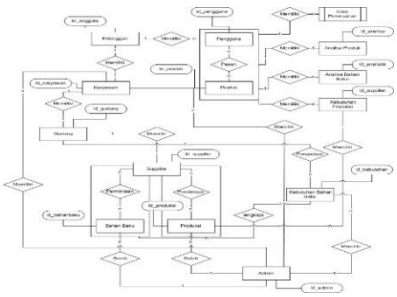


Figure 2.5 Entity Relationship Duagram Olive Bakery

2.10 Relationship Scheme

Describing the connection of tables in the system in detail or clearly, a relation scheme is used. The relation scheme will be explained in Figure 2.6

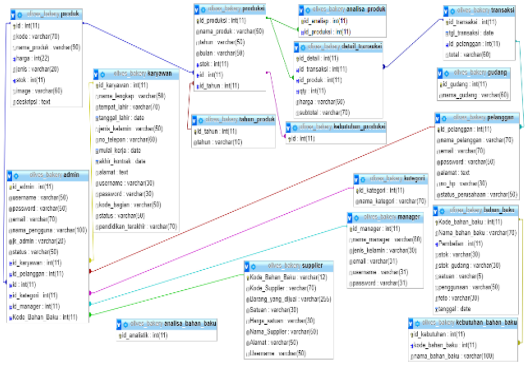


Figure 2.6 Relationship Scheme

2.11 Interface Design

In designing the appearance of the software to be built, the interface design is needed. In designing this interface there are 3 types of users, namely administrators, customers and employees. The following is the initial display of the software to be built:

2.11.1 Interface Design Login page

The design of the production menu structure is a menu structure designed according to the level of the login menu. The design of the master menu structure can be seen in Figure 2.7

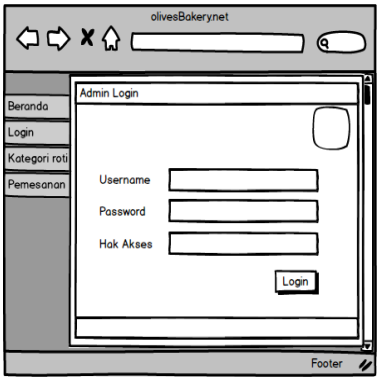


Figure 2.7 Designing an Admin Login Interface

2.12 Conclusion System testing

System testing is the most important thing that aims to find errors or shortcomings in the information system tested. The test intends to find out the information system that is made has fulfilled the performance in accordance with the design goals. The test used to test the new system is the black box testing method. Black box testing focuses on testing the functional requirements of information systems. The test plan that will be carried out is by testing the system built in Black Box and beta. Development testing of Supply Chain Management (SCM) In Olives Bakery Shop uses test data based on the data provided from some data that has been given.

a. Based on the results of the comparison α in the calculation of errors using MSE, it can be concluded that α with a value of 0.2 produces the smallest error. resulting in the smallest error of 11.84

b. System testing uses blackbox and beta methods, both of which are requirements for feasibility in the system and in the process of testing the application crud all pass the test and can be accepted.

2.12.1 Conclusion of Black Box Testing

Based on the results of the system testing that has been carried out in its entirety it can be concluded that the application process of the Supply Chain Management information system is sufficiently maximal and the system functionality can produce the expected output.

2.12.2 Conclusion of Beta Testing

1. This information system can facilitate ordering in processing the product ordering process from consumers.

2. The information system built can facilitate the warehouse in monitoring the supply of raw materials in the warehouse.

3. This information system can facilitate the procurement section in determining the amount of raw material procurement as needed.

4. The information system built makes it easier for the shipping department to determine which ordering products must be sent first.

3. CLOSING

Conclusions and recommendations

Based on the results obtained in this final assignment, the following conclusions can be drawn: The Supply Chain Management system that was built can facilitate the procurement part in determining the amount of raw material that will be submitted to suppliers to meet production needs in the production section. And can facilitate procurement in scheduling product delivery to customers (Stores). Suggestions for system development need better development and maintenance of the system that has been built, so that the system can be used according to the needs in the future

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