DEVELOPMENT OF INFORMATION SYSTEM WITH SUPPLY CHAIN MANAGEMENT APPROACH IN PT. MITRA EKASARI JAYA

Wildan Muhammad Hafizh[1], Sufa'atin[2]

[1,2] Teknik Informatika – Universitas Komputer Indonesia
Jl. Dipatiukur 112-116, Bandung 40132, Indonesia
E-mail : wmh2206@gmail.com[1], sufaatin@email.unikom.ac.id[2]

ABSTRACT

PT. Mitra Ekasari Jaya is an industrial company that produces iodized consumption salt. The resulting salt products include large gandu salt, gandu responsibility, small gandu, YHW gandu, plain responsibility gandu, and fine salt. Problems that occur at this time in PT. Mitra Ekasari Jaya, which is difficult to determine the amount of raw material procurement, so that often there is a shortage of raw materials which impact on product marketing to be late and vice versa if excess stock will make a buildup in the warehouse which causes the raw materials to shrink. Another problem that arises is the difficulty in determining the number and type of products that will be taken when marketing. Based on the problems that occur, information system development with a supply chain management approach is needed. The purpose of this system development is to help determine the amount of raw material procurement and the quantity and type of products that will be taken when marketing. The supply chain strategy used is the push supply chain, because it is adjusted to the activities that occur in the company today using the make-to-stock strategy. Forecasting methods for procurement of raw materials used are Weight Moving Average and the calculation of the safety of raw material inventories using the Safety stock method. Based on the test results it can be concluded that this system has helped in determining the amount of raw material procurement and the number of products that will be brought at the time of marketing.

Keywords : Supply Chain Management, Make-to-stock, Push Supply Chain, Weight Moving Average, Safety Stock.

1. INTRODUCTION

PT. Mitra Ekasari Jaya is an industrial company that produces iodized consumption salt, having its address at Parumasan Hamlet, Paseh Kidul Village RT 03 / RW 01, Paseh District - Sumedang. The resulting salt product reaches at this time including large gandu salt, gandu b responsibility, small gandu salt, gandu salt hubul waton or YHW foundation, plain gandu salt salt, and fine salt with various types that are distinguished from the color of the packaging. In its production, PT. Mitra Ekasari Jaya uses a make-to-stock strategy that is the production process before ordering [1]. Current supply chain management activities start from the upstream to the downstream parts, namely the upstream which is carried out by PT. Mitra Ekasari Jaya is supplying raw materials to suppliers, receiving raw materials from suppliers, and processing raw materials into iodized salt products. PT. Mitra Ekasari Jaya has three categories. Raw material suppliers including, salt raw material suppliers, iodine suppliers, and plastic packaging suppliers. While the activities carried out by PT. Mitra Ekasari Jaya in the downstream part is conducting the product marketing process to customers.

Based on the results of interviews with Mr. Unang as the head of the general department stated that there were problems when procuring raw materials to the supplier, the head of the general section had difficulty in determining the amount of raw materials that must be ordered to suppliers, because the current process was carried out to determine the amount of raw materials which will be ordered only based on estimates. The reason is that there is often a shortage of raw material stock which is caused by the raw material which has a temperature, water content, and humidity that changes during storage which can experience shrinkage. As a result there is a problem when demand for products is high, there is a lack of raw materials in the warehouse which results in delays in marketing products to customers because the production process can only be done after the raw materials are available. Based on data in September 2016 sales of salt products reached 50.185 pcs with the use of raw materials amounting to 75.729 kg, and the amount of raw material procurement was 108.184 kg which experienced a 20% depreciation during the drying process and 10% during the production process. So in September 2016 raw materials in the warehouse experienced a shortage. Vice versa if the demand decreases, there will be a buildup of raw materials in the warehouse, which will cause the amount of depreciation of these raw

materials to increase and will have an impact on the company's profits to decrease, because the resulting products will be reduced due to the depreciation.

Based on the results of an interview with Ms. Nina as sales stated that the product marketing process to customers is carried out every working day with different marketing areas. The company has 2 units of box cars and 1 unit of truck cars to market products to customers. Products ordered by customers in pcs, order products from customers are accepted by sales, customers can only order products when sales come to their store or market. Process payments from customers to PT. Mitra Ekasari Jaya is conducted in cash. Sales several times experience obstacles in scheduling product marketing to customers due to product demand from customers is uncertain, so that when customers ask for additional products often can not be fulfilled because the products brought at the time of marketing are not in accordance with customer needs. As a result, product marketing is late and the product requirements requested by customers do not correspond to the predetermined time schedule. Sales also often have difficulty when determining the type of vehicle to be used.

Based on the existing problems at PT. Mitra Ekasari Jaya, then we need an Information System Development with Supply Chain Management approach at PT. Mitra Ekasari Jaya who can help solve problems and be a solution for the company.

Based on the problem examined, the purpose of writing this final project is to build an Information System with a Supply Chain Management approach at PT. Mitra Ekasari Jaya.

Whereas the objectives to be achieved in this study are:

1. Assist the head of the general department in determining the amount of raw materials that must be ordered to the supplier.
2. Help sales in the process of marketing products to customers by scheduling and determining the number and types of products that must be brought at the time of marketing.

2. RESEARCH CONTENTS

2.1 Research Methodology

The research methodology used in this study is to use a descriptive analysis method.

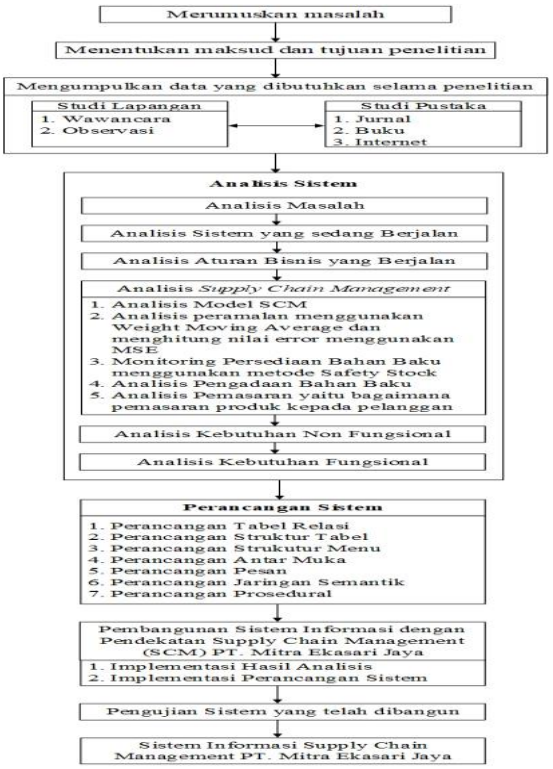

Figure 1. Stages of Research Methodology

2.2 Theoretical Basis

The theoretical foundation is used as a reference to support the implementation of research that contains theory in the development of information systems with supply chain management approaches at PT. Mitra Ekasai Jaya.

2.2.1 Information Systems

Information systems are collections of each component that are interconnected and work together to collect, process, store and distribute information related to use to support decision making, coordination and control processes contained therein [2].

2.2.2 Supply Chain Management (SCM)

Supply Chain is an organizational system for the delivery of products and services to customers. In this chain, networks originating from different organizations are connected to each other and have the same goal, namely to make good product acquisitions, and the process of exchanging goods is also part of the supply chain [3].

In a supply chain, there are usually 3 types of flow that must be managed. The three types of flow are as follows [4]:

1. The flow of goods that flows from upstream to downstream.
2. The flow of money and the like that flows from downstream upstream.
3. Information flow that flows from upstream to downstream and vice versa.

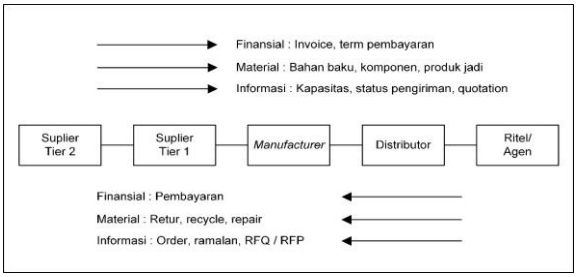

Figure 2. Conceptual Illustration of the Supply Chain

2.2.3 Push and Pull Supply Chain

In the Pull process seen based on customer orders, while to anticipate customer orders can be preceded by the Push process [5].

Pull supply chain is a strategy in the "make-to-order" production process where production will be carried out when there is market demand and will be done based on customer demand. While Push Supply Chain is a "make-to-stock" production strategy. This production system has a forecasting-based strategy to produce a large amount of production, which will then be included in the inventory that will be distributed to customers. In a push system there may be losses due to products that are in a changing market situation, such as:

1 Inability to meet changing market demands.
2 Inventory accumulation that will produce a lot of waste and will require a lot of storage space.
3 Large batch production.
4 Large obsolete product risk.

2.2.4 Procurement

The acquisition of goods and services is the process of obtaining products and services by companies that depend on what and how much is needed, where they buy and how much money is used to make the acquisition. The acquisition method used by the company is different [6].

2.2.5 Inventory

Inventory has a very vital role in commercial activities because in it is the core of the company's wealth. In every company, of course, always rely on inventory.

In manufacturing we have supplies such as raw material deposits and finished products which will be processed into finished products. The finished product will have economic added value and then be sold to consumers as third parties. Deposits of goods that are ready and ready to be sold to consumers will be used as inventory for commercial companies [7].

2.2.6 Safety Stock Technique

To ensure inventory security in this study, the authors use the Safety stock technique, this is done by the author because the demand for products in the company is uncertain, which can affect inventory.

The function of the Safety Stock is to protect and avoid mistakes when estimating requests during delivery time. The security inventory will function if the actual demand is greater than the average value [8].

The safety stock formula can be calculated with equation 1.

Safety Stock = Z x Sdl (1)

Where :

Z = *Service Level (Company ability to service requests or translate from management decisions)*

S_{dl} = determined by the uncertainty of the request

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

Figure 3. Interaction Between Requests

2.2.7 Forecasting Methods Weight Moving Average

In this method they have similarities in moving averages, which distinguish values that have a greater burden will be given a new value in the periodic series to calculate estimates [9].

In the weight moving average method of each historical data value in the past, different weights will be given, assuming that the latest or most recent historical data has a weight value that is greater than the value of the previous historical data, because the relevant data for making forecast is the latest data or the latest data. Systematically, the weight moving average method can be calculated with equation 2. [10]

$$WMA = \left(\sum(Dt * bobot)\right) / \left(\sum bobot\right) \quad (2)$$

Information :

Dt = Actual data for period t.

Bobot = Weight given for each month.

2.2.8 Calculating Forecasting Errors

To test the performance of the forecast to be used, a forecast error size is required. To calculate errors in predictions, the authors use Mean Square Error (MSE), which is the average quadratic forecast error and can be seen in equation 3.

$$MSE = \frac{\sum(|X_t - F_t|)^2}{n} \quad (3)$$

2.3 Problem Analysis

Problem analysis is the assumption of the problem that will be explained in the Information Systems data processing procedure with the Supply Chain Management Approach at PT. Mitra Ekasari Jaya. Analysis of ongoing system problems is as follows:

1. The head of the general section has difficulty in determining the amount of raw materials that must be ordered to suppliers for the next period.

2. Sales have difficulty in the process of scheduling product marketing and determining the number and type of products that must be brought when marketing products to customers.

2.4 Analysis Supply Chain Management (SCM)

Supply chain management (SCM) analysis is carried out to apply the supply chain management approach to the system to be built at PT. Mitra Ekasari Jaya.

2.4.1 Supply Chain Management Model (SCM) at PT. Mitra Ekasari Jaya

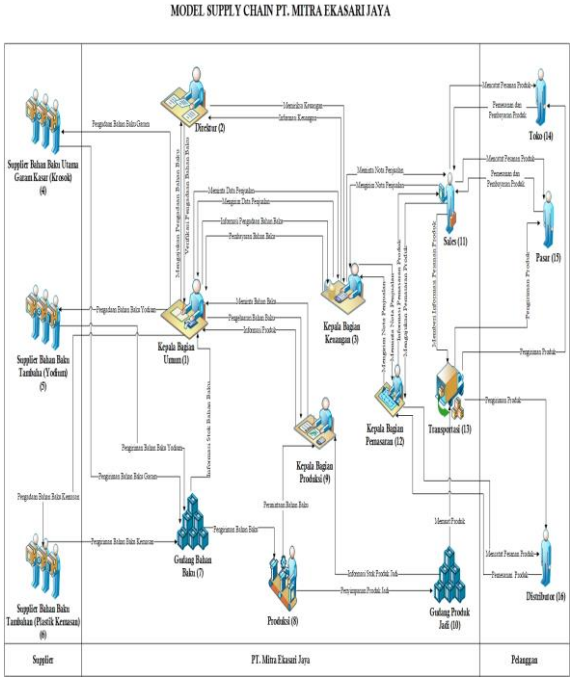

Figure 4. Supply Chain Model at PT. Mitra Ekasari Jaya

2.4.2 Supply Chain Management Analysis at PT. Mitra Ekasari Jaya

Supply chain management analysis is used to describe the supply chain management process that will be built at PT. Mitra Ekasari Jaya. Supply chain management stages at PT. Mitra Ekasari Jaya is as follows:

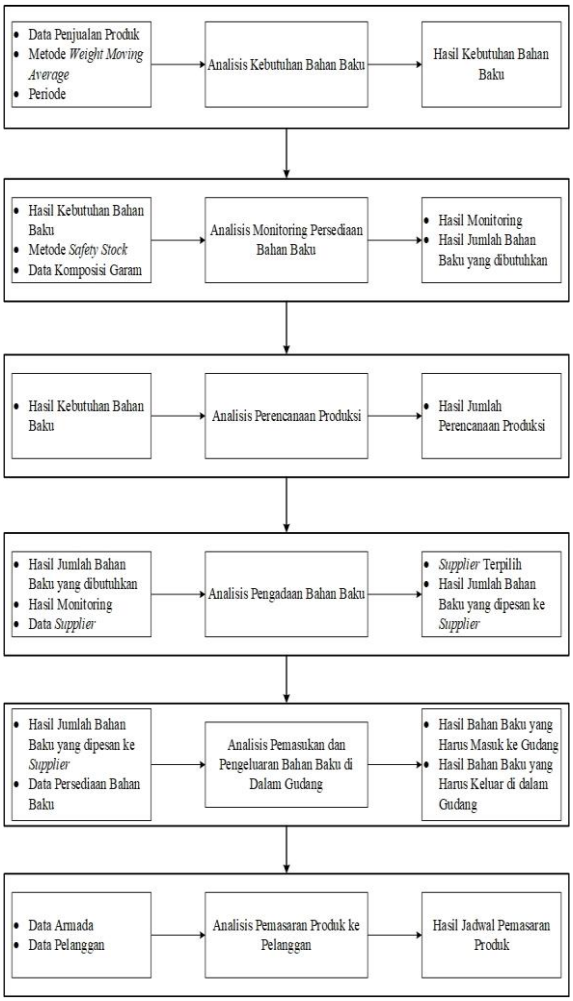

Figure 5. Stages Supply Chain Management at PT. Mitra Ekasari Jaya

1. Analysis of Raw Material Requirements

Analysis of raw material requirements is done by predicting raw material requirements for the production process. The purpose of forecasting the need for raw materials is to meet production needs where when there is a high demand for products, everything can be met. Forecasting techniques used are quantitative forecasting techniques, because the availability of past data is sufficiently met. When determining raw material requirements, the Weight Moving Average forecasting method is obtained, which is obtained from a comparison of the Trend, Single Moving Average and Weight Moving Average methods and based on the data patterns found, namely seasonal data patterns.

2. Analysis of Monitoring Raw Material Inventories

After the product forecasting stage is carried out, the next step is to monitor the supply of raw materials, with the aim to avoid shortages of raw materials in the warehouse. At this stage, the authors determine the safe limit of raw materials using the safety stock method.

3. Production Planning Analysis

In this analysis of production planning, the head of production conducts production planning to fulfill product orders from customers. The amount of production to be done is in accordance with the number of products that have been calculated based on the results of forecasting divided by the number of workdays in a month.

4. Raw Material Procurement Analysis

In this raw material procurement analysis, the Head of General Affairs places an order based on the raw material submission document that has been approved by the Director. Raw materials to be ordered from suppliers include crude salt (krosok), iodine, and plastic packaging. The procurement process is carried out by means of cooperation that has been agreed with the supplier. When raw materials ordered from suppliers have arrived, they will be handled by the head of the general department to check and receive raw materials. If the raw materials that arrive are as ordered, payment will be made and entered into the raw material inventory warehouse.

5. Analysis of Import and Export of Raw Materials in the Warehouse

The analysis of the import and release of raw materials in this warehouse applies to the main raw material, namely krosok. This is done in order to regulate how many raw materials must enter and exit the warehouse, because the company's raw material warehouse only has a capacity of 180 tons, so the storage of raw materials must be regulated properly so that there is no buildup in the warehouse. will cause the raw material to shrink.

6. Analysis of Product Marketing to Customers

This product marketing analysis aims to determine the number and types of products that will be taken at the time of marketing the product to customers, and to determine the vehicles that will be used in conducting the marketing process. The part responsible in this case is the sales person along with the head of marketing. Sales will determine the amount and type of salt product that will be taken, and the type of vehicle used at the time of marketing.

2.5 Database Analysis

Database analysis is a stage that is used to describe data in the form of relationships between entities involved in the system information to be built. In this research database analysis used is Entity Relationship Diagram (ERD).

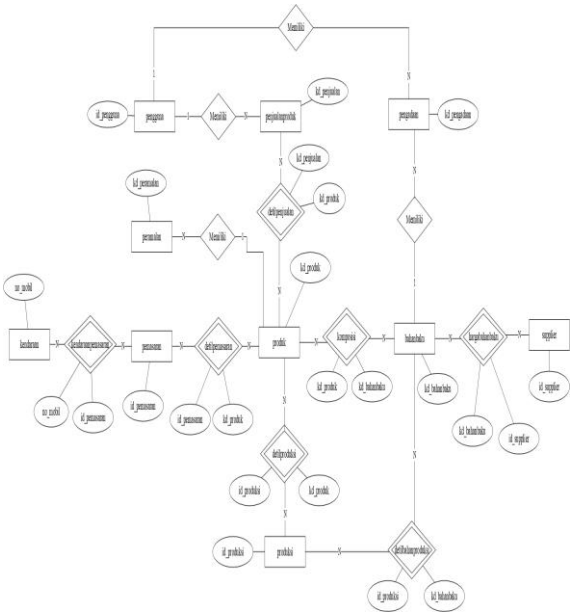

Figure 6. Entity Relationship Diagram (ERD) SCM Information System at PT. Mitra Ekasari Jaya

2.6 Context Diagram

This context diagram is a modeling in describing each function to explain globally how data is used and transformed to process or describe the flow of data into and out of the system.

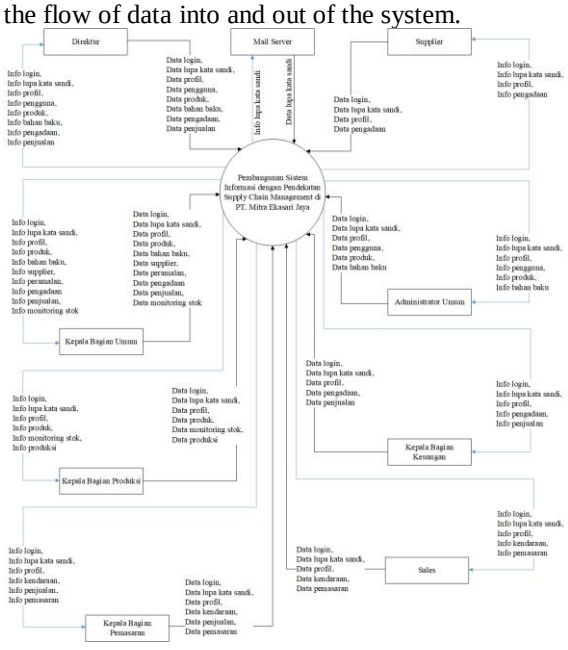

Figure 7. Context Diagram

2.7 Data Flow Diagram (DFD)

Data flow diagrams illustrate the flow of existing data and describe the processes that occur into the system to the more detailed stages of the process. In context diagrams such as Figure 5 can be broken down into several DFD.

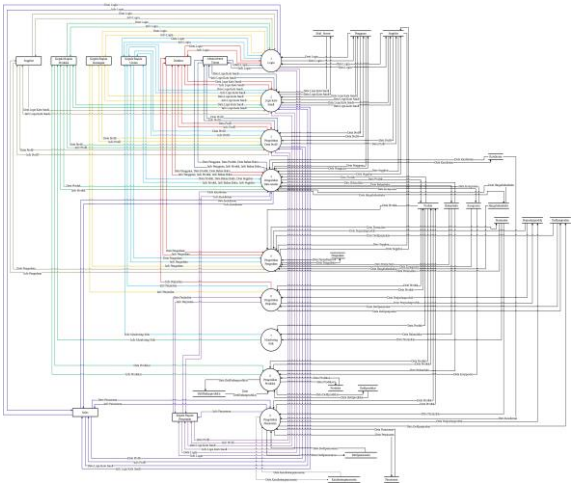

Figure 8. DFD Level 1 Supply Chain Management Information System at PT. Mitra Ekasari Jaya

2.8 Relationship Table

The relation table illustrates the relationship between data, the meaning of data and its limitations. Relations that exist in attributes describe each combination of attributes that have the same primary key, so that these attributes become a single entity that is connected by the key field.

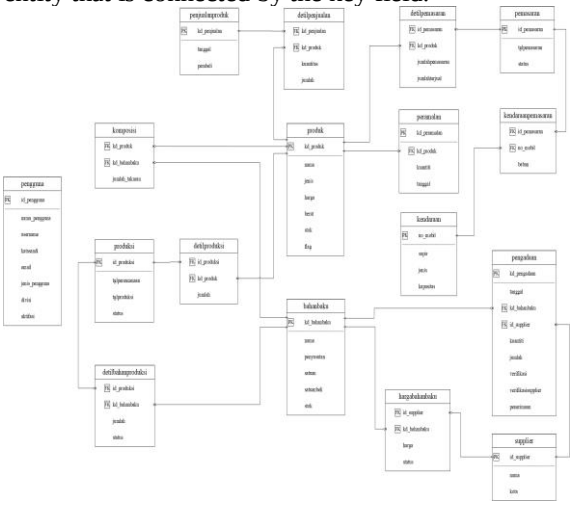

Image 9. Information System Relationship Table with the Supply Chain Management approach at PT. Mitra Ekasari Jaya

2.9 Menu Structure Design

The design of the existing menu structure is used to describe what menus can be accessed on the system. In the system created there are several menu structures that will be built. In this menu structure, it is divided into several functional subdivisions that are tailored to users who have access rights to the system to be built. The design of the general section head menu structure is a menu structure that is designed in accordance with the general section head user level. In the design of the menu structure on the general section head can be seen in Figure 10.

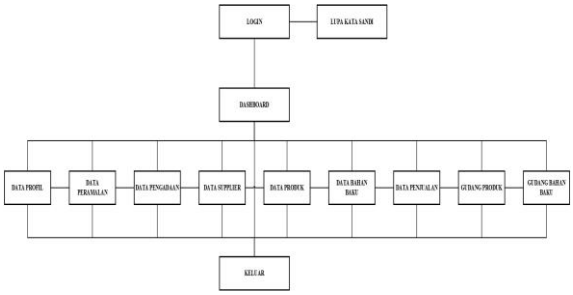

Image 10. General Head Menu Structure

2.10 Interface Design

The design of the existing interface to describe the appearance of the program which will then be implemented into the system for use by users / users, to be able to interact with the system created. The design is made based on the interface display both input and output that will be generated when the application is implemented. As for some examples of interface design in information systems with a supply chain management approach at PT. Mitra Ekasari Jaya.

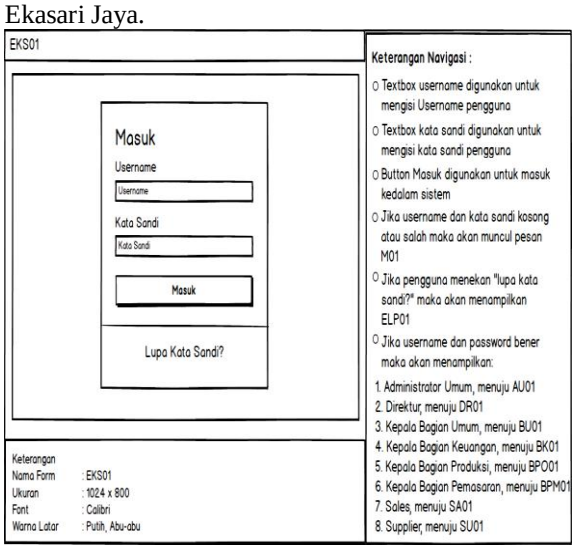

Figure 11. Login Interface Design

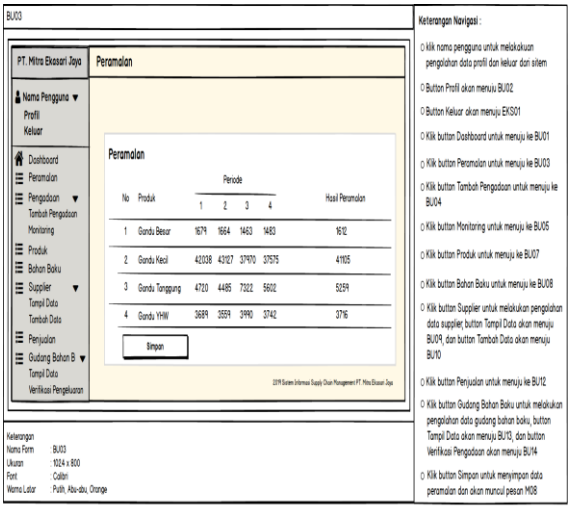

Figure 12. Forecasting Interface Design

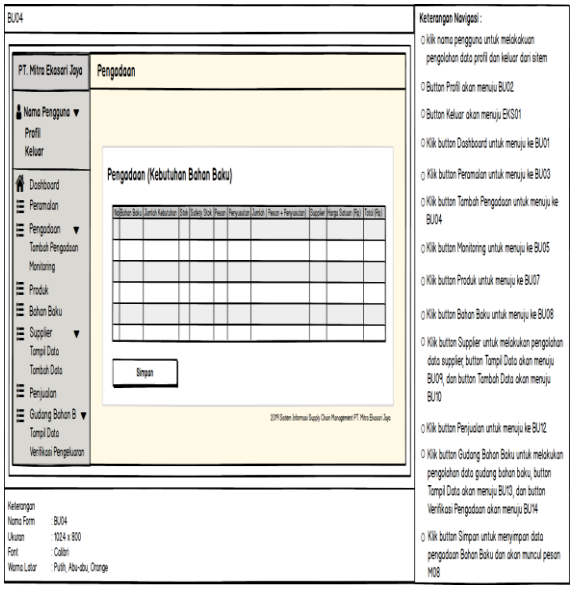

Figure 13. Designing the Interface Add Procurement

2.11 Semantic Network Design

Semantic network design is a connection image from each navigation menu from one form to another. In the semantic network design of this information system, the application of the main page to the supply chain management approach for the general section head can be seen in Figure 14.

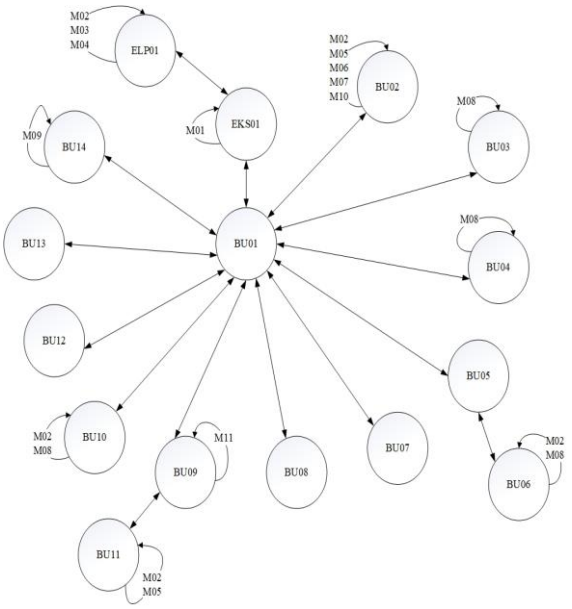

Figure 14. Semantic Network Page Head of General Affairs Section

2.12 Procedural Design

The design procedure aims to describe the structural elements contained in the system architecture that will be implemented in the components of the software procedure. The design of system procedures to be built can be seen in Figure 15.

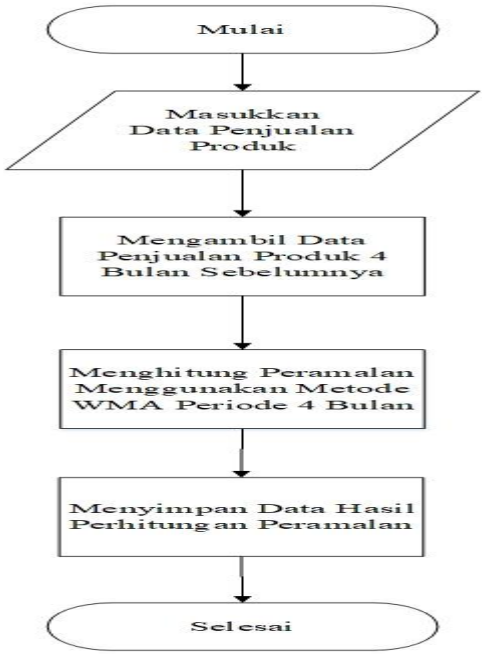

Figure 15. Forecasting Procedure

2.13 System Testing

System testing is done with the aim of finding errors and deficiencies found in the information system being tested [11].

2.13.1 Conclusion of Blackbox Testing

Based on the results of tests on the sample test cases that have been carried out as a whole, it can be concluded that in general the process in the information system with the supply chain management approach at PT. Mitra Ekasari Jaya is going well and correctly. Process error filtering in the form of a user interface is quite optimal and functionally the system can be run in accordance with the expected output.

2.13.2 User Acceptance Testing (UAT)

Based on the results of the end user acceptance test, the user acceptance test is conducted with the head of the general section of the information system with a supply chain management approach at PT. Mitra Ekasari Jaya, it can be concluded that all processes and systems have been received by users at PT. Mitra Ekasari Jaya includes general administrators, directors, heads of general affairs, heads of finance, heads of production, heads of marketing and sales. Then the system can proceed to the next stage.

2.13.3 Beta Testing

Based on the results of interviews conducted at the user level consisting of general administrators, directors, heads of general affairs, heads of finance, heads of production, heads of marketing, sales, and suppliers, stated that the information system with a supply chain management approach made can help in carrying out their respective jobs. The system

built is quite easy to use, has a simple appearance and is quite attractive. While the language used in the system that is built can be understood.

3. CLOSING

This chapter will explain the conclusions that contain the results obtained after the analysis, design, and implementation of software designs that have been built and developed, as well as suggestions that will provide important notes and possible improvements that must be made for software development.

3.1 Conclusions

Based on the results obtained in research conducted in information systems with a supply chain management approach at PT. Mitra Ekasari Jaya, the following conclusions can be drawn:

1. Information system with supply chain management approach at PT. Mitra Ekasari Jaya can assist the head of the general department in determining the amount of raw materials that must be ordered to suppliers for the next period.
2. The information system with a supply chain management approach that is built can assist sales in scheduling marketing by determining the number and type of products that must be brought when marketing.

3.2 Suggestions

Suggestions for the development of information systems with a supply chain management approach, there are several suggestions that can be done, including:

1. User data processing in the built information system will be better if it can process employee data, so that system users can be selected directly from the employee data.
2. There is a need for development in the financial department, because the financial data available on the system being built is still incomplete.
3. The need for additional pages for customers, so customers can order products through the system.

BIBLIOGRAPHY

[1] N. Dzikrillah, et al., "Pengendalian Persediaan Melalui Penentuan Produk Strategi," *SOSIO-E-KONS*, Vol. 8, No. 2, p. 171, 2016.

[2] J. Hutahaean, *Konsep Sistem Informasi*. Yogyakarta : Deepublish, 2014.

[3] E. B. Setiawan and A. Setiyadi, "Implementasi *Supply Chain Management* (SCM) dalam Sistem Informasi Gudang untuk Meningkatkan Efektifitas dan Efisiensi Proses Pergudangan," *in Seminar Nasional Teknologi Informasi dan Multimedia*, STMIK AMIKOM Yogyakarta, 2017, p. 20.

[4] I. N. Pujawan and M. ER, *Supply Chain Management* (Edisi 3). Yogyakarta : Institut Teknologi Sepuluh November (ITS), 2017.

[5] H. Pangestu, "Pentingnya Supply Chain Management dalam Proses Bisnis," Universitas Binus, 2016. [Online]. Available : https://sis.binus.ac.id. [Accessed April 4, 2019].

[6] E. Turban, J. Lee, and D. King, *Electronic Commerce A Managerial Perspective Global* (Edition 6). New Jersey : Pearson, 2010.

[7] I. N. Pujawan and M. ER, *Supply Chain Management* (Edisi Kedua). Surabaya : Guna Widya, 2010.

[8] J. Lee and H. C. Palit, "Perancangan Gudang dan Sistem Manajemen Pergudangan di UD. Wirakarya," *JTI*, Vol. 5, No. 1, p. 63-70, 2017.

[9] S. Alfarisi, "Sistem Prediksi Penjualan Gamis Toko Qitaz Menggunakan Metode Single Exponential Smoothing," *JABE (Journal of Applied Business and Economic)*, Vol. 4, No. 1, p. 80-95. 2017.

[10] A. A. Gofur and U. D. Widianti, "Sistem Peramalan Untuk Pengadaan Material Unit Injection di PT. XYZ," *Komputa*, Vol. 2, No. 2, 2013.

[11] I. Afrianto and A. Setiyadi, "Sistem Informasi Monitoring Perdagangan, Pariwisata dan Investasi Indonesia dengan Negara-Negara di Kawasan Amerika dan Eropa," *Informatics for Educators and Professionals*, Vol. 3, No. 2, p. 182, 2019.