PRODUCT WAREHOUSE INFORMATION SYSTEMS AT CV. NJ APROACH SUPPLY CHAIN MANAGEMENT

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ABSTRACT

CV. N.J is a company engaged in the food industry. CV N.J produce the kinds of tofu. There are several kinds of tofu who produced like pukis tofu, sutra tofu, hen tofu, super tofu, and jumbo tofu. The process of selling to customers is having problems related to the availability of products out for sale. These constraints such as customer demand are often not met by CV. NJ because the product out experienced vacancies. These constraints caused by uncertainty about the amount of sales. So that make a Head of Production difficulties to determining the amount of production and determine the amount of raw material needs to be provided.

Based on the existing problems in current CV. NJ, it takes a finished product warehouse information system using the approach of supply chain management. The aim is to simplify the Head of Production to determining the amount of production so as to meet the needs sales to consumers and determine the amount of raw material needs to be provided for the production process not having problems. The method used for forecasting sales in this study is a single exponential smoothing, while the method for determining the amount of inventory is using safety stock method.

Based on the results of research and testing can be concluded that a system built to facilitate head of production in determining the amount of production and the amount of raw material needs to be provided to meet production needs.

Keywords: Supply Chain Management, Single Exponential Smoothing, Safety Stock

1. INTRODUCTION

CV. NJ is a company engaged in the food industry. CV NJ produce the kind of Tofu. There are several kinds of tofu who produced like pukis tofu, sutra tofu, hen tofu, super tofu, and jumbo tofu. Supply Chain Event Management at CV. NJ carried from the upstream to the downstream. The upstream The upstream production planning, procurement of raw materials to suppliers, receiving raw materials, and perform the processing of raw materials into tofu with peanut spend about 5-8 tons of soybeans per day and can produce 150,000 pcs out per day.

The downstream activities of sales and delivery of tofu to customers. Tofu sales made to customers in the area of Bandung or the city of Bandung as Sukabumi, Tangerang, Jakarta Cikampek up. The system of payments to CV. NJ using cash payment system.

CV.NJ has tofu sales data from January through the month of August 2016 amounted to 31 299. with an average selling tofu 3,912,397 pcs per month. the best seller of tofu is small pukis tofu which reached 8,889,994 pcs. Based on these data it is known that the number of selling tofu every month and even every day uncertain.

For example, sales of small pukis tofu in February decreased by 116 477 pcs in comparison with January, in March the sale of tofu pukis small increase reaches 3513 pcs, in April also increased the number of sales reached 13 864 pcs, in June the increase in tofu sales totaled 6324 pcs,

while in July has a significant decline in sales as many as 274 112 Tofu. This situation caused the Eid holidays so that companies do not conduct sales activities for a few days, in August sales of small pukis tofu has increased by 223 476.

Based on an interview with Mr. Hana as Head of Production at CV. NJ stated that uncertainty about the amount of tofu sales led to the Head of Production difficulties in the process of determining the amount of production. As in the case on January 3, 2016 where product sales reached more than 90,000 pcs. So that require CV. NJ to producing small pukis tofu usually exceeds capacity is around 80,000 pcs for their increase in purchases from customers.

As a result, to meet the production needs of the tofu, Head of Production to reduce the production of tofu whose sales slightly and replace it with the production of a small pukis tofu with a risk of loss of potential sales for this type of cake whose sales slightly. Meanwhile on August 21, 2016 Sales of small pukis tofu just reached 23 743 pcs. As a result, there is a buildup of small pukis tofu in the warehouse of finished products. Stacking tofu in the warehouse of finished products will result in a

decrease in the quality of the tofu like texture of the tofu to be damaged or become stale.

Uncertainty about the amount of sales also complicate the Head of Production in the process of determining the amount of raw material procurement. Head of production often provide stocks of raw materials in bulk rather than having shortages of raw materials to maintain continuity of production so that the quantity and quality of production fixed in accordance with the vision and mission of the company. However, in case of such date of August 21, 2016, the production of small cakes will be reduced and will have an impact in unused raw materials in the warehouse of finished products. If raw materials are not used there will be an accumulation of raw materials in the warehouse of raw materials

The problems noted previously can be solved by using Supply Chain Management. Supply Chain Management is a systematic and strategic coordination will traditional business functions within and across companies in a supply chain to develop long-term performance of companies and entire supply chain. [3]

Based on the description of the problems that have been mentioned earlier, it takes a finished product warehouse information system using the approach of Supply Chain Management at CV. NJ with the following objectives:

a. Assisting the Head of Production in determining the amount of raw materials that should be provided to meet production needs.
b. Assisting the Head of Production in determining the amount of production out so that the product provided in accordance with the needs of selling out to the customer.

2. Content Of Research

2.1. Information System

The system is an element that is interconnected and work together to fulfill a process with a specific purpose. The definition of information in general is a collection of data that has been processed into something that can be understood so that the collection of such data could be useful for anyone who needs it. The information system is a set of information components that contain certain data according to user needs the data which are interconnected with each other data to achieve a certain goal.

The information system is a regular combination of people, hardware, software, communications networks, and data resources that collect, transform, and distribute information within an organization. Field of information across a lot of complex technology, the concept of behavioral, and specialized applications in the areas of business and non-business are countless.

Information system framework focuses on five areas of knowledge of information systems, the basic concepts, information technology, business applications, process development, and management challenges. [8]

a. The basic concepts, the basic concept consists of the basic concepts of behavioral, engineering, business, and managerial as well as the role of information systems, such as the concept of competitive advantage that is used to develop business applications of information technology in a competitive advantage.
b. Information technologies are key concepts, development, and information technology management issues that include hardware, software, network (network), data management, and Internet-based technologies.
c. Business applications, is the main use of the information system for the operation, management, and competitive advantage.
d. The development process, how business practitioners and experts information to plan, develop, implement information systems to meet business opportunities.
e. Management challenges, challenges effectively and ethically to manage information technology at the level of end users, companies and global business.

2.2. Supply Chain Management

Supply Chain is a network of companies that jointly work to create and deliver a product into the hands of end users. Such companies typically include suppliers, manufacturers, distributors, stores or retail, as well as supporting companies such as logistics services company.

If the supply chain is the physical network, the companies involved in supplying raw materials, produce goods, and deliver it to end users, then the supply chain management is a method, apparatus, or its management approach. [3]

So in this research approach to supply chain management in question is the supply chain management approach that occurs in the CV. NJ using a tool that is a web-based information systems. Here are the parts of the supply chain management.

2.2.1. Supply Chain Management Process

The process of supply chain management is the process the product from start still made from raw, semi-finished products to finished products obtained are then sold through a variety of facilities connected by a chain along the flow of products and materials. If depicted in chart will appear as following:



Figure 1. Supply chain processes and 3 kinds of managed flow [3]

Figure 1 shows that the supply chain management is the coordination of materials, information and financial flows between the participating companies.

a. Flow of material involving the flow of physical products from the supplier to the consumer through a chain, as well as feedback from returns a product, service, recycling and disposal.
b. Information flows include forecast demand, transmission of orders and order status report.
c. Financial flows include credit card information, credit terms, payment schedules, assignment of ownership and delivery.

Supply Chain Management has three main components that support the passage of a business process as following: [3]

1. Upstream Supply Chain

Upstream (upstream) supply chain includes the activities of a company manufacturing with distributors (which may be manufacturers, assemblers, or both) and their connections to suppliers of their (second-tier suppliers). Relationships suppliers can be extended to several strata, all the way from the source material (eg ore, plant growth). In the upstream supply chain, whose main activity is the provision.

2. Internal Supply Chain

Part of the internal supply chain encompasses all inhouse processes used in transforming inputs from suppliers into the organization's output. It extends from the time of entry into the organization. Within the internal supply chain, the main concern is the management of production, manufacturing and inventory control.

3. Downstream Supply Chain

Downstream (downstream) supply chain encompasses all activities that involve product delivery to the customer end. In the downstream supply chain, attention is directed to the distribution, warehousing and transport before and after-sale service.

2.2.2. 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 market demand and actually done at the request of the customer.

Push the Supply Chain is a strategy of production make-to-stock. The push system is essentially a system of planning and controlling production-based material requirments planning (MRP) [7]. The push strategy is more popular than with pull systembecause the system of production based forecasting and forecasting or to produce output in large quantities that would later go into inventory before it is transmittedto the customer. Strategy production make-to stock production process that is done in terus–menerus to make stock (make to stock) before the existence of orders from consumers, this strategy is used to anticipate the needs of the excess as an effort to reduce the possibility of running out of stock. This approach was conducted to find out how the preparation of the product can fill orders coming in from customers. The chain Groove strategies make-to-stock moving from upstream to downstream. Upper activities namely conducting production planning, procurement of raw materials to the supplier, the reception of raw materials, and performing the processing of raw materials into tofu. While downstream activities do the selling and delivery of the tofu to the customer.

2.2.3. Manage Inventory in *Supply Chain*

Supplies could emerge because it is planned or is a result of lack of understanding of the information to a. So there are companies that have inventory because it deliberately makes the product much earlier or more banyakdari time, there is also because it is the result of a query that is too little compared with the original estimate.

Uncertainty on supply chain not only appeared from the direction of demand but also from the direction of the supply and the internal operations. The uncertainty of delivery and the price of raw materials caused the factory to build up their supplies of raw materials. the uncertainty of delivery from the factory causing the distributor should save the backup inventory (safety stock).

2.2.4. Information Technology in Supply Chain Management

Information is one of a very important aspect in the management of the supply chain because it became the basis for managers in making decisions. Information technology is a tool that is used to identify the information, analyze it, and then use that information to improve the performance of the supply chain.

The purpose of the IT application in supply chain management is following: [3]

a. Gather information about a products ranging from production to delivery and purchase patterns and provides perspective for all parties in the supply chain.

b. Provide access to all data and information that exist in the system through a single point of contact. The goal was all the information available either to customers orfor internal needs should be accessible in one step and remains the same regardless of the way to access the data either via phone, fax, or internet, or anyone who needs the data.
c. Analyze, plan and make the tradeoff based on information from all components in a supply chain.
d. Collaboration with partners to cope with uncertainties, among others through thesharing of information, and achieve global optimization.

2.3. Single Forecasting Method Eksponential 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 the single moving average and the moving average weight because of its ability to use past data by administering the weighting based on the present data. More data is now being given greater weight in comparison with previous data. The assumption is that more data is now always have a stronger influence against the results of the forecast compared with the moreobsolete data [7]. The formula for the single exponential smoothing can be seen in the following equation :

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

where:

$Fn + 1$ = results forecasting in the period n + 1

Fn = forecasting results for the previous period

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

Yn = true value for the previous period

2.4. Safety Stock

Safety stock inventory serves to protect the errors in predicting demand during lead time. Inventory security will function when the actual request is greater than the average value of [3]. To get an idea of how uncertain demand during lead time, companies need to collect data to get distribution. The formula to find nilaisafety stockdapat seen in the following equation :

$Safety\ Stock = Z \times S_{dl}$ Equation 2.5

Where,

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

S_{dl} = Determined from the request with conditions of uncertainty can be seen in Figure 2.

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

Figure 2 interaction between demand and lead time on penetuan safety stock [3]

2.5. Calculate Fault Forecasting

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 errorsdoing the calculations. The method used to calculate the fault forecasting (forecasterror) is a method of MSE (Mean Squared Error). MSE is the average of the difference in the squares of the values predicted with observed [4]. 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 inequation 2.4.

$$MSE = \frac{\sum(At - Ft)^2}{n}$$ Equation 2.4

Where,

A_t = Actual Demand in the period t

F_t = Demand forecasting in the period t

n = The number of forecasting period involved

2.6. System analysis

System analysis is the phase to identify and evaluate the problem. In the analysis ofthe system will note staples of the problems faced by CV. Nj at the moment and needs what are required in the system. Phases of systems analysis is needed to adjust the system to be built with the needs of users and can help resolve problems that occur on the system.

2.5.1. The analysis of SCM

Analysis of Supply Chain Management is the approach used in the finished productwarehouse information system will be built. The proposed approach is based on the analysis of a system that is running.

Supply chain management methods have the framework consists of three elements that are interlinked with each other, namely:

1. The structure of supply chain network
2. supply chain business processes
3. supply chain management Components.

Here is a model of scm in CV. NJ:

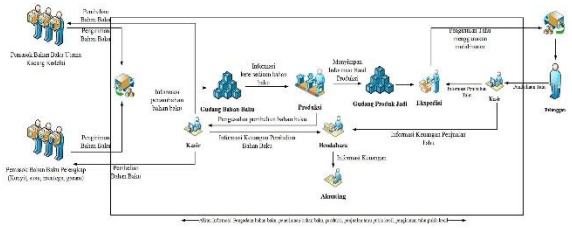


Figure 3 structure of a network of Supply Chain Management in CV.NJ

2.5.2. Analysis Of Tofu Sales

Analysis of tofu sale done by viewing data tofu sales in January to August 2016. Analysis of tofu sales do to perform the valuation of sales the following month.

Here is the step that must be performed to do forecasting product sales in the period to come.

1. Prepare the sales data from the previous period to be processed as data input.
2. Calculate the value of a forecast on sales data by using a method or technique of singlemoving weight average, moving average and single exponential smoothing.
3. Find the value of error with MSE of forecasting techniques third expressed beforehand to find out the most accurate method.
4. MSE smallest Value from all three of these methods will be used as a result of forecasting for the next period.

Proceeds from bake sales forecasting September using single exponential smoothing is as much 1,082,289.

2.5.3. Safety Stock Analysis

After forecasting results in September is known, the next step i.e. do determine the limits of safe amount of pukis tofu and raw materials which must be in the warehouse finished products aim to avoid shortage or void the product in the sales process.The method used to perform the security of supplies is using the method of Safety stock.

Safety stock or inventory serves to protect security errors in predicting sales during lead time. Application of the method of safety stock used to make tofu supplies security pukis period in September. The formula used to calculate safety stock using the equation 2.5 with Sdl uncertainty is determined from the formula of sales (see Chapter 2). In calculations using the method of safety stock, there are variables thataffect the value of safety stock, namely the value of the z and z values Sdl taken from policy management while to figure the value of Sdl that will be used in research that is using Sdl which has a value of sales is fickle (variable), while the value of lead time has a fixed (constant). The following example calculation of inventory products pukis tofu method using safety stock :

Note:

The number of forecasting September 2016 (d) = 1,082,289 tofu/30 day = 36,076.3 or rounded be 36,077 tofu

Standard deviation number of forecasting September 2016 (sd) = 36.077/10 = 3.607.7

Production lead time tofu (l) = 1Lead time tofu production (l) = 1

Service level (z) = 90% in the form of normal inverse = 1.2816

The solution :

$Sdl = Sd \times \sqrt{(l)}$

$= 3.607,7x \sqrt{1}$

$= 3.607,7$

Safety Stock = Z x Sdl

Safety Stock = 1,2816 x 3.607,7

Safety Stock = 4623,62832 or rounded into 4,624 tofu/day

Calculation based on safety stock before, then CV NJ requires at least a small pukis tofu 4,624 per day for security of supplies. Meanwhile, to find out the needs of safeguarding supplies of raw materials from products, then it should be done in order to safeguard the raw material production process is not interrupted due to the absence of raw in the warehosue of raw materials. Securing raw materials done by multiplying the results of safeguarding supplies of products with varying quantities of raw materials, so it will be known how safe limit supplies of raw materials in the warehouse of raw materials to support the production process.

2.5.4. Analysis Of Production Planning

Analysis of production planning used to analyze production planning will be undertaken by the head of production. Production planning is done after determining forecasting and inventory safeguards. These data will be of value to specify the amount of production to be performed at the next period.

The calculation of the amount of production planning is done in the following:

Note :

The rest of the stock in August = 10,827 pcs tofu

Forecasting results in September = 1,082,289 tofu/30 day = 36,076.3 or rounded into 36,077 tofu

The number of production = Results forecasting – (leftover stock-safety stock)

The number of production = 36.077-(10,885-4,006) = 29.874 pcs tofu/per day

Based on the results of the calculations above, the amount of the proposed production planning is as much 29,874 pcs pukis tofu per day in September 2016. The proposed data are taken on the basis of the facts and the results of the forecast in the previous period as well as the results of calculation of security of supplies. The amount of product planning so it will be a picture needs tofu pukis in September, therefore the amount of the proposed production planning can be a material consideration for the decision making of production in part determine the amount of production to avoid a void

or excess stock of finished products warehouse in the finished product.

2.5.5. The analysis of procurement of raw materials

Raw material procurement analysis conducted to analyze and determine the amount of need and amount of raw materials to meet the needs of production. Based on the results of production planning, it will be retrieved how much needs raw materialsin September. The amount of raw material procurement is adjusted by the amount of production planning and added with secure supplies of raw materials so that at the time of the production process, production does not suffer a shortage of raw materials.

2.5.6. Analysis of shipping (Distribution)

Analysis of delivery or distribution made to analyze how the process of delivery of the product to the customer.

2.7. Data Base Analysis

Database analysis is the analysis of the data sets are interlinked with each other so that it can support the information system will be built. The data obtained will be used to design the database accompanied by attributes-the attributes of each of the entities and the relationships between these entities. in designing the database, the data model that will be used is an Entity Relationship Diagram (ERD). Model ERD information system in finished product warehouse CV NJ can be seen in the following image:

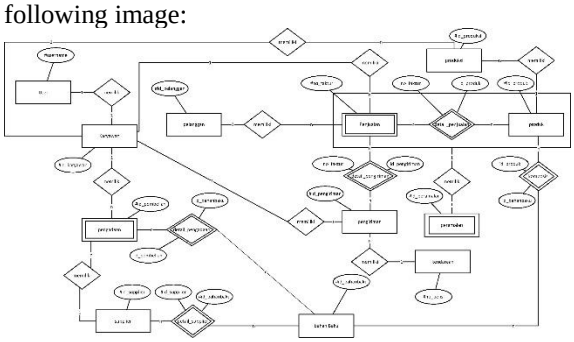


Figure 4. ERD Product Warehouse Information System at CV. NJ Aproach Supply Chain Management

2.8. Diagram Konteks

Context diagram is a model to explain globally how data is used and is transformedto the process or describe the flow of data into or out of the system. The diagram context on this system can be seen in the following image:

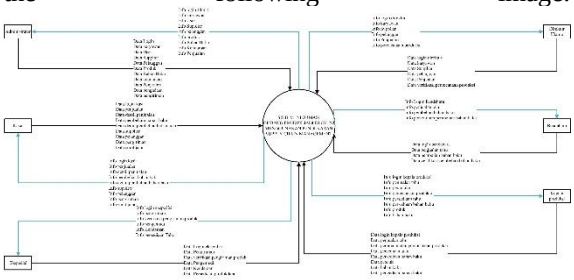


Figure 5. Context Diagram of Product Warehouse Information System at CV. NJ Aproach Supply Chain Management

2.9. Data Flow Diagram

Data Flow Diagram (DFD) is the description of the data flow from the source data (input) the giver to the receiver data (output). Here is information on system DFD warehouse finished products:

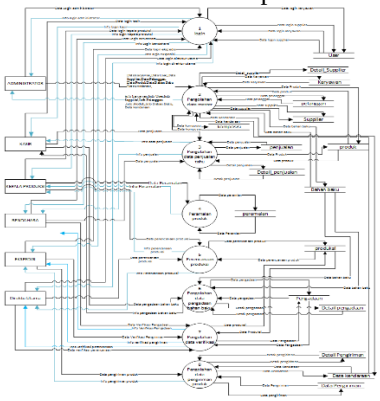


Figure 6. DFD Level 1 of Product Warehouse Information System at CV. NJ Aproach Supply Chain Management

2.10. Table Relations

Table relation is used to describe the relationships between tables in the system in detail or clear. Table relation will be illustrated in the following figure:

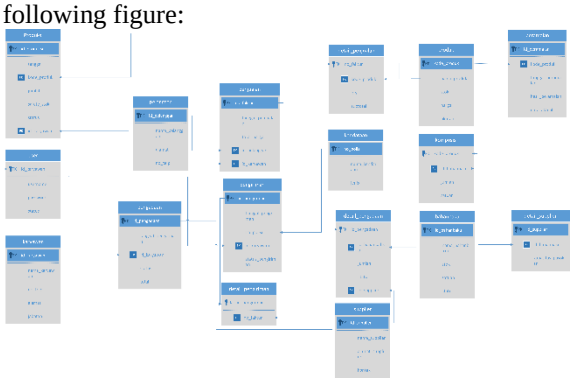


Figure 7. Tabel Relations of Product Warehouse Information System at CV. NJ Aproach Supply Chain Management

2.11. The design of the Interface

The design of the interface used to describe the appearance of information systemsthat will be used by the user to interact with the system are made. The design of interfaces on the system information

warehouse finished product in CV. NJ using Supply Chain Management approach are as following:

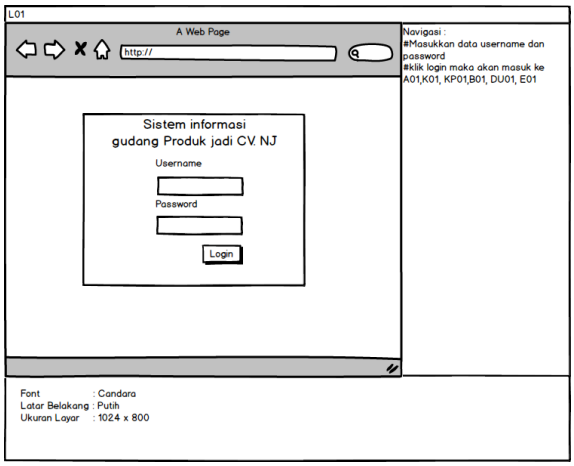


Figure 8. 2.1. The design of the Interface Login of Product Warehouse Information System at CV. NJ Aproach Supply Chain Management

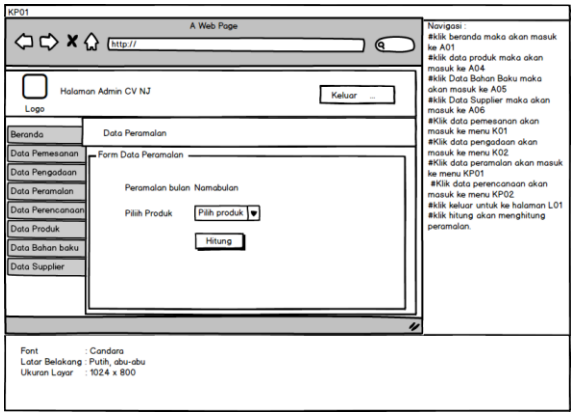


Figure 9. 2.1. The design of the Interface Sales Forecasting of Product Warehouse Information System at CV. NJ Aproach Supply Chain Management

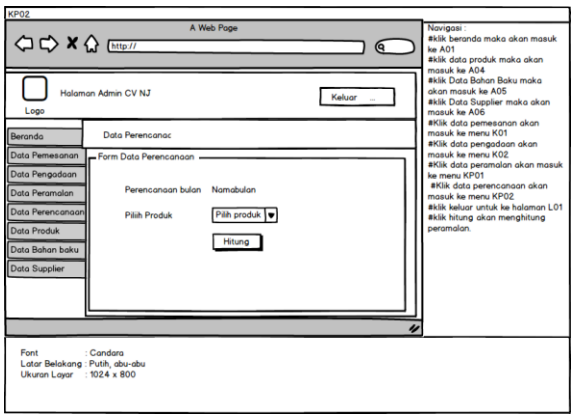


Figure 10. 2.1. The design of the Interface Production Planning of Product Warehouse Information System at CV. NJ Aproach Supply Chain Management

2.12. Semantic Network Design

The design of the semantic network head of production illustrates the process that connects the menus which can be accessed by the head of the production with theerror messages that occur at each process. The design of the semantic network head of production can be seen in the following image:

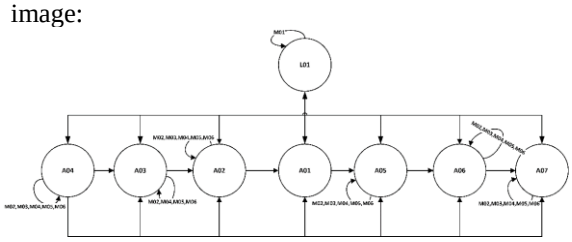


Figure 11. The Design Of The Semantic Network

2.13. Testing

System testing is the most important thing that aims to find errors or deficiencies in the information system tested. Testing intends to find out the information system created has met the performance according to the purpose of design.

2.11.1. The results of Black Box Testing

Based on the results of testing against each process contained in the software are built with sample test has been done, then the conclusion from the testing is any process on the software that had been built in accordance with the filtering functionality, the error in the form of granting the error message to any process that happens is already good and was enough of a maximum, as well as the output (output) are produced in accordance with expectations.

2.11.2. Beta Test Results

Based on beta testing done before, it can be concluded that bahwa :

1. The finished product warehouse information systems that are built can already make it easy to determine the amount of Production Head needs raw materials must be available to meet the production process.
2. Finished product warehouse information system built was able to ease the head of production to determine the amount of production to fit the needs of sales knew to customers.

3. Cover

This section will explain about the conclusions of research based on the results obtained after the analysis, design, and implementation of the design of systems that were built as well as suggestions that will provide an important record of and possibleimprovements that need to be done for the development of the system.

3.1 Conclusions

Based on the results of the implementation and the testing that has been done in writing this final task, then a conclusion can be drawn as following:

4. The finished product warehouse information systems that are built can already make it easy to determine the amount of Production Head needs raw materials must be available to meet the production process.
5. Finished product warehouse information system built was able to ease the head of production to determine the amount of production to fit the needs of sales knew to customers.

3.2 Advice

As for suggestions for the development of information systems in finished productwarehouse CV NJ using supply chain management approach are as following :

1. Information systems still need to be developed more of a side view of the interface and the language to make it more attractive and easy to use.
2. Information systems are built on areas of development need for financial management, because the existing financial system built is still not complete.

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