DEVELOPMENT OF INFORMATION SYSTEM IN SUPPLY CHAIN MANAGEMENT AT CV. SENTOSA ANDALAN WURMB

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ABSTRACT

Areniss is a brand of refined Palm sugar in production by CV Sentosa Andalan Wurmb standard specifications with a healthy, natural and fragrant. Though Palm sugar areniss products have two variants of a product i.e. Palm sugar and dense Palm sugar. Supply chain activities carried out at the CV. Sentosa Andalan Wurmb from upstream to the downstram. CV. Sentosa Andalan Wurmb do massive production process to create sufficient stock to meet the needs of the consumer of the product ordering. At the moment of booking to suppliers of raw materials is carried out at regular intervals i.e. booking was done one month one time, this poses problems if the customer product decline then raw material buildup will occur resulting in a decrease in the quality of the raw materials will be processed into a product areniss, and vice versa if the booking experience increase in shortage of raw materials which resulted in the production process does not run with optimal. Distribution of products to the customer is done using the services of the expedition, this requires that the company has a good product distribution scheduling so that the delivery of the product is not experiencing delays. Supply chain strategies used i.e. push supply chain, it is based on the fact that happens in corporations currently using the strategy of make-to-stock. A method of divination used i.e single exponential smoothing. The calculation of availability of raw materials and products using the method of safety stock.

Keywords: *supply chain management, push supply chain, make-to-stock, single exponential smoothing, safety stock*

1. INTRODUCTION

Areniss Indonesia is a brand product with the standard Palm sugar spesifaki products that are healthy, natural and fragrant communicated globally by CV. Sentosa Andalan Wurmb. Areniss Indonesia has two variants of Palm sugar products namely aren ants and aren. Activities supply cahin conducted at CV Sentosa Andalan Wurmb from the upstream to the downstream. The activities conducted in the upper reaches include the procurement of raw materials to suppliers, receiving raw materials, and performing the processing of raw materials into products or areniss good palm sugar and dense palm sugar. Activities conducted at the lower reaches include the acceptance of orders from consumers to perform the delivery of the product to the consumer. Areniss Indonesia do strategy make to stock that is making a final product to be stored, and the need for consumers to be taken from the inventory in the warehouse [1]. The production process is done continuously by the company in order to make enough product inventory in anticipation of ordering products by. Arenis Indonesia has raw material suppliers among others, suppliers of raw materials, sub-materials nira form granules aren and supplier packaging.

Based on the interview with Mr. Firman as the manager at CV. Sentosa Andalan Wurmb,

the procurement of raw materials carried out by the warehouse to suppliers is currently carried out periodically with the monthly ordering period and payment of raw material purchases is made in cash. As a result, problems occur when the demand for products by consumers are experiencing an increase in the amount of the shortage of raw materials available, resulting in the production process does not run with optimal and when ordering products from the consumer, the request can not be supplied. So also when booking request decline happened buildup of raw materials resulting in a decrease in the quality of the raw materials will be processed.

Based on the interview with Mr. Nurjaman as the head of the warehouse department stated that the scheduling of distribution to current customers often experience a mismatch of delivery time, this is due to the amount of the preparation of a finished product that is available can not meet the needs of consumers. Resulted in the delay of the delivery process to consumers because it must wait for the process of production and packaging in advance. The products will be sent to the Subscriber are packaged in advance by the warehouse that will be delivered to consumers through a third party (the expedition). Therefore, when an aggrieved parties delay i.e. consumers, it can decrease consumer confidence towards the company.

Based on the problems that exist today in Sentosa CV Mainstay Wurmb (PBUH), then it needs

a system that can manage the procurement of raw materials management, production planning and inventory management as well as coordination with all parties involved in the company using the method of the approach to Supply Chain Management [2]. The construction of this system would be expected to facilitate the coordination of the production and flow of information between related parts such as supplier, part warehouse, part manufacturing, marketing/sales, to the consumer.

The purpose of Areniss Information System builder in CV. Sentosa Andalan Wurmb with Supply Chain Management approach is as follows:

1. *Assist the head of the warehouse in determining the amount of ordering of raw materials required to the supplier.*
2. *Assisting the head of the warehouse to plan the scheduling of product distribution.*

2. RESEARCH CONTENTS

2.1 The Cornerstone Of The Theory

The cornerstone of the theory of writing thesis outlines the process analysis systems as well as support the development process of information system areniss CV. Sentosa Andalan Wurmb approach to supply chain management.

2.1.1. *Information System*

The system is a structure consisting of a number of functional components that are interconnected and simultaneously aiming to meet a specific work process. [8]

Generally the information is data that has been processed into a form that is more meaningful and useful to the recipients that will be used to decide the present or future. The function of information is to reduce uncertainty in the decision making process regarding a state.

So the notion of information system is a set of components that are interconnected and work together to collect, process, store and distribute relevant information to support the decision-making process, coordination and control in it.

2.1.2. *Supply Chain Management*

Supply Chain is a system of funneling goods organization places of production and services to its customers. The chain is also a network of interconnected organisations which have the same purpose, namely as best we can organise the procurement or distribution of the goods. [5]

The concept of the supply chain is a new concept in terms of looking at the question of logistics. In the old concept, more as a matter of internal logistics of each company, and a possible solution was placed on solving in intern in the company respectively. While in this new concept, the problem of logistics is seen as a problem that is more widespread, stretched very wide, starting from raw materials to finished goods used the end consumer. It can be said that the supply chain is the logistics NetworksIn this connection, there are a few major players which are the companies that have the same interests, i.e. [5]:

1. *Suppliers;*
2. *Manufacturer;*
3. *Distribution;*
4. *Retail outlets;*
5. *Customers;*

2.1.2.1. *Proses Supply Chain Management*

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

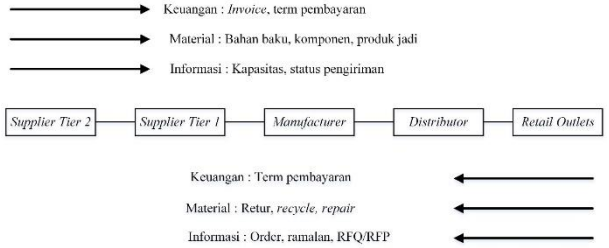


Figure 1 Process supply chain and 3 kinds of managed stream [2]

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

2.1.2.2. *Komponen Supply Chain Management*

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

1. *Upstream Supply Chain*

The upstream section (upper) supply chain covering activities of a manufacturing company with the penyalurnya (which may be manufacturers, assemblers, or both) and their connection to the retailer (the second-tier supplier). The supplier relationship can be extended to multiple strata, all the way from the origin of the material (e.g., ore mines, plant growth). On the component placed on the procurement.

2. *Internal Supply Chain*

Part of the internal supply chain encompasses all process inhouse used in transforming input from the retailer into the output of the organization. It extends from the time of input into the organization. On the internal supply chain components, the main concern is the management of the production, fabrication and inventory control.

3. *Downstream Supply Chain*

Downstream section (lower) supply chain encompasses all activities that involve product delivery to the customer end. On downstream supply chain components, attention is directed to the

distribution, warehousing, transportation and after-sale service.

2.1.2.3. ***Area coverage of Supply Chain Management***

SCM has the important principle i.e. the nature of transparency of information and collaboration between internal functions that exist in the company or on the parties that are outside the company in the scope of the supply chain. When referring to a manufacturing company, the major activities that fall into the classification of SCM are [2]:

1. *Product Development*
2. *Proceurement, purchasing, control*
3. *planning & control*
4. *production*
5. *distribution*

The fifth classification is usually reflected in the form of a division of the Department or Division with the activities performed. Distribution and forms of activities that normally exists at manufacturing companies can be seen in table 1.

Table 1 main parts Coverage SCM *[2]*

Section	***scope of activities,***
Product development	*Doing market research, designing new products, involve suppliers in new product design*
Procurement	*Selecting suppliers, evaluating the performance of suppliers, purchases of raw materials and components, monitors the supply risk, build and maintain relationships with suppliers*
Planning & Control	*Demand planning, demand forecasting, capacity planning, production planning and inventory*
Operation/Production	*The execution of the production, quality control*
Delivery/Distribution	*Distribution network planning, scheduling deliveries, find and nurture relationships with corporate service delivery, monitor service level in each distribution center*

2.1.2.4. ***Push and Pull Supply Chain***

Pull supply chain is a strategy of production make-to-order "that the main benefit is avoiding waste or inventory is a strategy the company mainly manufacturing companies where new production done always after the market demand and actually done at the request of customers.[3]

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) [3]. The push strategy is more popular than with pull system because the system of production-based forecasting and forecasting or to produce output in large quantities that would later go into inventory before it is distributed to customers.

2.1.3. ***Monitoring***

Monitoring is monitoring that can be described as awareness (awareness) of what is like to note, containing high-level monitoring carried out in order to make the measurement through time that shows movement towards or away from it. Monitoring will provide information on the status and trends of that measurement and evaluation is completed repeating from time to time. [3]

So the Monitoring activity is an activity monitor or supervise the whole activity is performed by a person. The activities of this Monitoring can be done in two ways, namely directly or indirectly. Monitoring directly by way of the review directly against the ongoing activities such as the review of incoming goods, goods that come out and others. While the indirect Monitoring is done through activities see the written reports, oral reports or observe the interviewing one of the few people involved in an activity.

2.1.4. ***the method of Forecasting is Single Exponential Smoothing***

Forecasting is done based on the exponential smoothing method (exponential smoothing) is generally used to estimate sales of products individually. This method is often considered better than the previous two methods, namely simple average and a single moving average because of its ability to use past data by administering the weighting based on the present data. More data is now being given greater weight in comparison with previous document [3]. The formula for the single exponential smoothing can be seen in equations 1.

$$Fn_{+1} = \alpha Y_n + (1 - \alpha)F_n \quad (1)$$

where :

Fn_{+1} = *results of forecasting in the period n + 1*

F_n = *forecasting results for the previous period*

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

Y_n = *the actual values for the previous period*

2.1.5. ***Mean Square Error (MSE)***

Calculate the forecasting error is used to know the accuracy of forecasting results that have been made against actual data. There are many models for forecasting errors doing the calculations. The method used to calculate the forecast error is a method of MSE (Mean Squared Error). MSE is the

average of the difference in the squares of the values predicted with observed [2]. The formula for the MSE can be seen in the Parallels 2.

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

where :

A_t = *The actual demand in the period t*

F_t = *Demand forecasting in the period t*

n = *The number of forecasting period involved*

2.1.6. *The method of inventory control*

A method of inventory control is done based on the basis of mathematics, statistics and optimization as the main tool to answer quantitative issues that occur on a system inventory. This method is in fact trying to find the optimal answer in determining inventory policy, i.e. a policy relating to the Economic Order Quantity, Reoder Point, and Safety Stock. The approach used mathematical modeling is doing against the alternative answer to the problem so that the optimal answer can be determined analytically. [2]

2.1.6.1. *Persediaan Pengamanan (Safety Stock)*

Persediaan pengamanan atau safety stock berfungsi untuk melindungi kesalahan dalam memprediksi permintaan selama lead time. Persediaan pengamanan akan berfungsi apabila permintaan yang sesungguhnya lebih besar dari nilai rata-rata [2]. Untuk mendapatkan gambaran seberapa tidak pasti permintaan selama lead time tersebut, perusahaan perlu mengumpulkan data untuk mendapatkan distribusinya. Rumus untuk mencari nilai safety stock dapat dilihat pada persamaan 3.

$$Safety\ Stock = Z \times S_{dl} \quad (3)$$

Diana :

Z = *Service Level (Kemampuan perusahaan untuk melayani permintaan atau diterjemahkan dari keputusan manajemen)*

S_{dl} = *ditentukan dari ketidakpastian permintaan dengan ketentuan sebagai berikut :*

Variable	Konstan	Variabel
Permintaan	Sdl = Sd x $\sqrt{(l)}$ Safety Stock ditentukan oleh ketidakpastian permintaan.	Sdl = $\sqrt{d^2 x\ Si^2 + l\ x\ sd^2}$ Safety Stock ditentukan oleh interaksi dua ketidakpastian.
	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 2 *interaction between demand and lead time on the determination of safety stock*

2.2. *Analysis of problems*

Problem analysis is an assumption of the problem that will be described in the data processing procedures in Information Systems Areniss in CV. Sentosa Andalan Wurmb. Analysis of the problems of the system that is running at the moment is :

1. *The head of the warehouse have difficulty in booking the amount of raw materials to the supplier, so the impact on the production process does not run optimally due to shortage of raw materials that are available or when there is a buildup of raw materials resulting in a decrease in the quality of the raw materials that will be in the process of.*
2. *The head of the warehouse have difficulty scheduling distribution plan that have not been run well due to unavailability or lack of finished product.*

2.3. *Analysis of Supply Chain Management*

Analysis of supply chain management is used to apply the approach to supply chain management supply chain system to be built. Supply chain management has a framework that is a component of the development for the system.

2.3.1. *Model Supply Chain di CV. Sentosa Andalan Wurmb*

Based on the analysis of SCM which have been presented as a model of supply chain in CV Sentosa Andalan Wurmb can be seen in Figure 3.

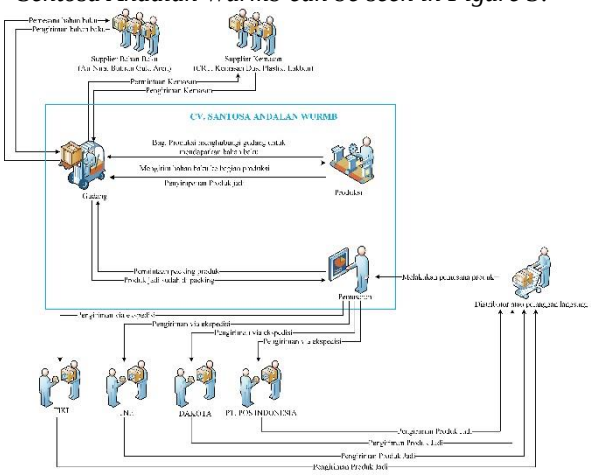


Figure 3 *Model in Supply Chain Management at CV. Sentosa Andalan Wurmb*

2.3.2. *Analysis of Supply Chain in CV. Sentosa Andalan Wurmb*

Supply chain analysis conducted to describe the supply chain management process will be built on Sentosa CV Mainstay Wurmb based on supply chain model in Figure 3, as for the analysis of supply chain's Flagship Wurmb Sentosa CV can be seen in Figure 4 :



Figure 4 *Supply Chain in CV. Sentosa Andalan Wurmb*

1. Analysis of forecasting the amount of procurement of Products

Demand forecasting needs raw materials based on the actual data, which used the actual data i.e. sales data earlier. Forecasting method used is the single exponential smoothing. The following sales data in the period 2017 from January until June :

Table 1 *Data product sales APK*

No	period 2017	product sales
1	January	228
2	February	258
3	March	226
4	April	326
5	May	283
6	June	134

The value of forecasting can be searched by using the formula in Equation 1, while for alpha (α) that will be used is the value range between zero to one, namely the alpha = 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 and 0.9 [9]. The following example calculation for forecasting July 2017 using α = 0.1 :

F_{Juli} = (0,1 * 134) + ((1 – 0,1)* 283)

F_{Juli} = 268,10

Based on the results of forecasting by using a value of α = 0.1 for the July number of product procurement 268.10 rounded into 268.

2. The analysis of the monitoring of products and inventory of raw materials

After a stage of forecasting, the next stage i.e. do monitor supplies of raw materials and determine the limits of safe raw materials which must be in the warehouse of raw materials aim to avoid shortage or raw material using the vacuum method of Safety stock.

3. Analysis of the procurement of raw materials

On the analysis of procurement this raw, warehouse fields of booking based on the results of the submission of the raw materials is done by the production. Reservations against suppliers, among others, Palm sugar, crt, packaging box, duct tape and plastic. The procurement process is carried out by means of the agreed cooperation, particularly for raw materials preferred Palm sugar from farmers assisted the company in order to maintain the quality of the raw materials.

From the results of forecasting has been done we can calculate the needs of raw materials by way of forecasting the amount of product at the time of the composition of the product. The calculation to determine the amount of raw materials needed based on the results of the forecasting for the product Aren Solid Box can be seen in table 3:

Table 2 *Calculation of raw materials based on the results of the forecasting*

Raw Materials	composition of the product	number of products	Needs raw materials
	A	B	A X B
Sugar	2,5 kg	268 crt	670 kg
CRT	1 crt		268 crt
cardboard	10pcs		2680 pcs
Duct tape	0.75Y		20,1 Y
Plastic	10 pcs		2680 crt

4. product distribution scheduling Analysis

n the supply chain there is distribution or shipping activities. The scope of activities, among others, schedule delivery, monitoring the status of delivery and choose the expedition which will be used in the distribution of products. Monitoring the status of the delivery was done so that the company can figure out a finished product that has produced what is ready to be shipped, or already delivered and the product gets to the consumer at the right time and place. Distributing products made by the company using a third party (the expedition). The expedition party commonly used by companies, TIKI JNE, DAKOTA and PT. Pos Indonesia, While the proposed expedition parties namely Cargonesia Express and Express transport types Herona, delivery capacity, delivery mileage and delivery time varies so that consumers have plenty of choices in determining the expedition which will be used.

2.4. Data Base Analysis

Data base analysis on information system areniss CV. Sentosa Andalan Wurmb are constructed using Entity Relationship Diagram (ERD). ERD is a data model that uses some notation to describe the data in the context of the entities and relationships described by the data. As for the chart depicted in Figure 5.

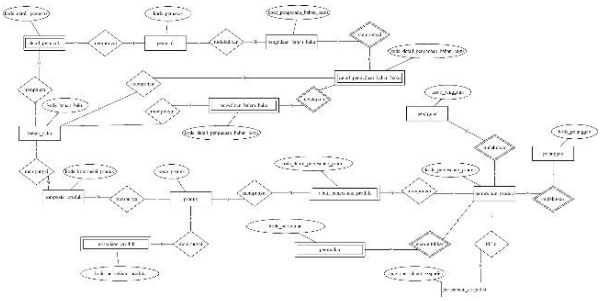


Figure 5 *Model ERD*

2.5. Context Diagram

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

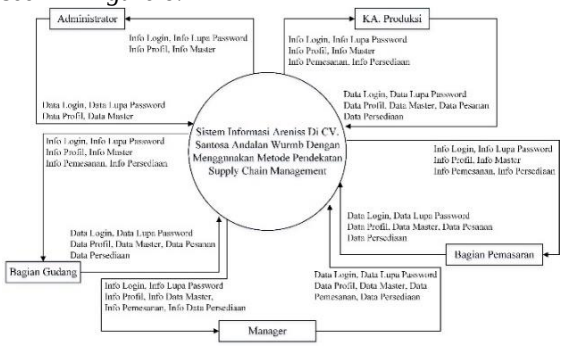


Figure 6 *Context Diagram*

2.6. Table Relations

Table relation describing relationships between data, meaning data and their boundaries. The process of relationship between attributes is a combination between an attribute that has the same primary key, so that these attributes into a single entity linked by the key field. Table relations arenisa information system can be seen in picture 7.

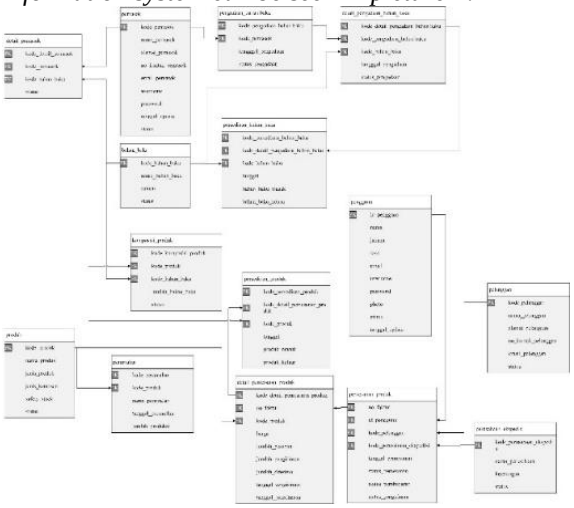


Figure 7 *Relationship Tables Areniss information system*

2.7. Interface Design

The design of the interface is created to describe the display control rogram which will be used by the user to interact with the system to be built. The design is based on the display of the input as well as output either interface to be generated when the application is implemented. The following is an example of a login interface design can be seen in Figure 8.

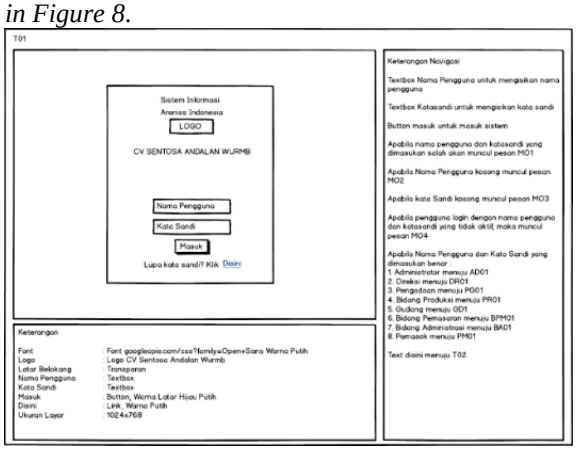


Figure 8 *Design of Login Interface T01*

2.8. The design of the Semantic Network

The design of the semantic network is a representation of the design interface that shows where each interface is connected. The design of semantic networks in the information system Areniss can be seen in Figure 9.

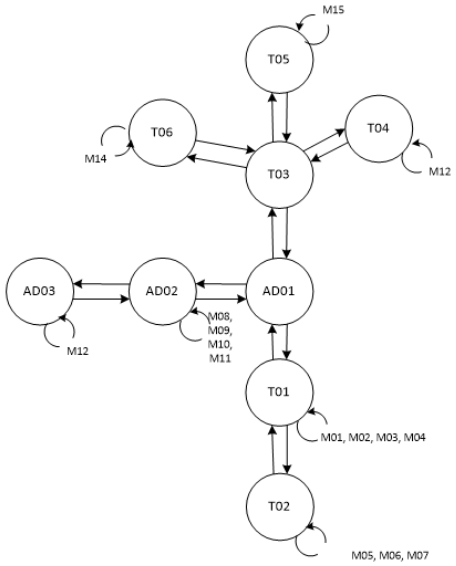


Figure 9 *Designing Semantic Network Administrator*

2.9. Testing System

System testing is the most important thing that aims to find the mistakes or shortcomings in the system that was tested. Testing is intended to find out which system is made meets the performance according to the purpose of design.

The test plan is done by way of a test system that is built in the functional (black box). The first functional testing (black box) that is focused on testing the functional requirements for information systems are built. Functional testing covers how well the system carry out its functions, including the use of commands, data manipulation, searches and business processes, user screens and integration.

The second test focused on the acceptance of the user (end user) using the UAT (User Acceptance Testing) that aims to find new defects (defects) that are not found by the developer and in the software testing process involves prospective users in the company that is selected by the developer as well as chaperoned when done. The third test which focused on the acceptance of the user (end user) that the end user acceptance testing after the system is implemented in an enterprise environment by using the interview to end users who use the software.

1. *Black Box Testing*

Black box testing is focused on the functional requirements of the software being built. Testing conducted by testing each process for possible errors that occurred.

Based on the test results to the case sample test has been done gives the conclusion that the process is correct. Error filtering process in the form of landing page views message is sufficient. Functionally the system can already produce the expected output.

2. *Testing a User Acceptance Testing (UAT)*

The testing focused on the acceptance of the user (end user) using the UAT (User Acceptance Testing) that aims to find new defects (defects) that are not found by the developer and in the software testing process involves prospective users in the company that is selected by the developer as well as chaperoned when done.

Based on end user acceptance testing has been conducted with the Managers of the system Areniss information in the mainstay Wurmb Sentosa CV, it can be concluded that the system had already been received by the user and can proceed to the next stage.

3. *End User Testing*

The testing focused on the acceptance of the user (end user) that the end user acceptance testing after the system is implemented in an enterprise environment by using the interview to end users who use the software. Interview conducted for the users of the system composed of Administrators, managers, Production Section, part of the warehouse and part marketing. This research was conducted in CV. Sentosa Andalan Wurmb in order to find out the extent to which the system is built can be a solution and the resolution of problems that have been described earlier.

Based on the testing that has been done to the user's system, it can be concluded that:

1. *The system helps administrators, part warehouse, part of the production, marketing and Manager in performing his job each*
2. *Built-in systems are easier to use after the use of instructions.*
3. *Display interface on a system must be developed to improve the comfort of returning users.*
4. *Use of languages in the system is fairly easy to understand.*
5. *Use of languages in the system is fairly easy to understand.*

3. CLOSING

In this section, describes the conclusions contains the results obtained after the analysis, design, and implementation of the design of software built and have been developed as well as suggestions that will provide an important record of and possible improvements that need to be done to further software development.

3.1. Conclusions

ased on the results obtained in the writing of this final task, then the following conclusions can be drawn :

1. *Information systems that are built can already simplify parts warehouse in determining the amount of raw materials that must be reserved to the supplier to avoid shortage or a buildup of raw materials.*
2. *Information systems that are built can make it easier for the head part of the warehouse in determining product distribution scheduling.*

3.2. Suggestions

Development of Areniss information system could be developed further with a higher specification and performance are better. Here are a few suggestions that can be used for development against this research :

1. *Display interface on the research of the next expected more attractive for the users of the system.*
2. *Information systems are built on the research of the next expected the presence of development on processing financial and personnel, for the existing financial system built on incomplete and not to the existence of the staffing system in the system are built.*
3. *Information systems are built on the research of the next expected the presence of E-commerce development to facilitate the transaction of booking products.*

REFERENCES

[1] Khairani Sofyan, ST., M.T., Diana. (2013). Perencanaan Dan Pengendalian Produksi. Yogyakarta : Graha Ilmu.

[2] Pujawan, I Nyoman. (2005). *Supply Chain Management*. Surabaya: Guna Wijaya.

[3] Sinulingga, Sukarya. (2009). *Perencanaan dan Pengendalian Produksi*. Yogyakarta: Graha Ilmu

[4] Afriyudin. (2008). *Pemprograman Dinamis*

dengan Kolaborasi PHP & Java. Yogyakarta: Andi Offset

[5] Indrajit, Richardus Eko,. Djokopranoto, Richardus. (2002). *Konsep Manajemen Supply Chain : Cara Baru Memandang Mata Rantai Penyediaan Barang*. Jakarta: PT. Gramedia Widiasarana Indonesia

[6] Nugroho, Bunafit. (2011). *Membuat Sistem Informasi Penjualan Berbasis WEB dengan PHP dan MySql*. Yogyakarta: Gava Media

[7] Sommerville, Ian. (2003). *Software Enginering Rekayasa Perangkat Lunak*. Jakarta: Erlangga

[8] Fathansyah. (2007). *Basis Data*. Bandung: Informatika

[9] Fachrurrazi, Sayed, S.Si., M.Kom., "*Peramalan Penjualan Obat Menggunakan Metode Single Exponential Smoothing Pada Toko Obat Bintang Geurugok",* Teknik Informatika, Universitas Malikussaleh Reuleut, Aceh Utara, Aceh-Indonesia