# DEVELOPMENT OF SUPPLY CHAIN MANAGEMENT INFORMATION SYSTEM AT CV. CIHANJUANG INTI TEKNIK DIVISI MINUMAN TRADISIONAL

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## ABSTRACT

CV. CINTEK Divisi Minuman Tradisional is a company that engaged in beverage industry to production traditional instant drinks at West Java which is called bandrek and bajigur that named trademark is Hanjuang. The exist problems are production process sometimes was not being calculated and estimated correctly because there is no determination of the product to be produced based on the type and packaging. In addition, at determining the amount of raw material purchases often using only estimate which is if they see raw material in inventories was about to run out. The other problem is they don't have scheduling at organizing product delivery with the information about the transportation that being used and amount of product to be delivered.

Based on the problems exist, so it's needed a development of information system by using supply chain management approach. The purposes of this system are to make the production head easier at determining the estimated amount of production product and monitoring the product inventory, make the procurement head easier at determining the estimated amount of raw material purchases and monitoring the raw material inventory, and make the distribution head easier at organizing schedule of delivery product, determining transportation type and amount of product to be delivered. Forecasting method for determining the estimated amount of production product is single exponential smoothing. The calculation of monitoring product inventory and raw material at warehouse is using securing minimum inventory stock which is listed on the company's business rules and the scheduling at product delivery to consumers is adjusted to business rules.

Based on the result of black box functional testing, UAT and end user acceptance testing after the system was applied at the company can be concluded that this system helped at determined estimated amount of production product to be built and monitoring stock of product, helped at determined estimated amount of raw material purchases to be ordered, and monitoring stock of raw material, helped at organized schedule of delivery product to consumers with transportation that will be used and the amount of product to be delivered.

Keyword: supply chain management, single exponential smoothing, black box

## 1. INTRODUCTION

CV. Cihanjuang Inti Teknik (CIT) or often referred to as CV. CINTEK especially Divisi Minuman Tradisional is a company engaged in the beverages industry to produce instant drinks traditional West Java, named trademark Hanjuang. CV. CINTEK founded by Mr. Edi Permadi. The traditional drink is produced that is bandrek and bajigur. CV. CINTEK Divisi Minuman Tradisional use strategies that make to stock their production process before their booking. The marketing system in CV. CINTEK Divisi Minuman Tradisional is divided into two types, namely outlet and retail. System outlet that sales of the company's direct to consumer and retail system that is the sale of the company to the agent and then to consumers.

Based on the interview with Mrs. Ine Marini as head of production and data analysis has been done, it is known that the production of the product is done every day according to the working hours are Monday- Saturday 08:00 to 16:00 hours with the number of production days per month is 25 days. Total production of products which do each day range from approximately 30000 sachet but in the process of production of these products sometimes are not calculated and estimated correctly because production has not determined the amount of stock the products that must be manufactured bedasarkan its kind and includes the packaging, if there is an error in the calculation the number of stocks the manufacture of such products can lead to excess that makes the accumulation of products in the warehouse and void stockpiling product in the warehouse which makes the non-fulfillment of consumer demand.

Based on the interview with Mr. Solahudin as head of procurement and data analysis has been done, it is known that the process of procurement of raw materials is now done regularly and in determining the amount of raw materials are ordered often still use

an estimate that is only when seen raw material inventories held in warehouse is almost gone because of the impact on the determination of the amount of stock production of products that are not calculated and estimated correctly. This creates considerable uncertainty in determining the amount of raw material supply needs to be ordered so that the impact also on the number of stocks of raw materials in the warehouse often have advantages that can result in the buildup or void that can inhibit the production process.

Based on the interview with Mr Sumardi as head of distribution and data analysis has been done, the product delivery will be carried out during working hours are Monday - Friday (08:00 to 16:00) and Saturday (08:00 to 12:00). Problems in the delivery of products occurs when a reservation request is high but shortages of products in the warehouse, it will result in the delivery process is inhibited. Delays in the delivery process will certainly affect the level of profit the company generated views of the marketing system used is the retail system. The decline in shipments this will certainly affect the level of sales resulting company is not able to meet consumer demand. Also sometimes to determine the amount of product that will be shipped to the consumer is not calculated to be properly so the charge product to be delivered often have a mismatch with a cargo vehicle. It also causes problems in the distribution is often difficult to arrange the shipment as determine the type of vehicle used and determine the amount of product that will be shipped.

Based on the description of the problems that exist today in the CV. CINTEK Divisi Minuman Tradisional, hence the need for an information system construction method approach, Supply Chain Management (SCM).

Based on the problems studied, the purpose of this thesis is to build Information Systems Supply Chain Management (SCM) in the CV. CINTEK Divisi Minuman Tradisional. While objectives to be achieved in this study are:

a. Facilitate head of production in determining the approximate amount of production and inventory monitoring products contained in the warehouse so that the production of products which can be done according to need so as not to result in a surplus or a product void in the warehouse.
b. Facilitate head of procurement in determining the approximate amount of purchases of raw materials and monitoring inventories of raw materials contained in the warehouse so that raw materials can be ordered according to need so as not to result in a surplus or a vacancy in warehouses and raw materials for the production process is not hampered.
c. Facilitate the distribution section chief in regulating the scheduling of delivery of products to consumers, determine the type of vehicle and determine the amount of product that will be shipped so that shipping the product becomes obstructed and consumer demand for products ordered can be met properly.

## 2. CONTENTS RESEARCH

### 2.1. Theoretical Basis

The theoretical basis of this thesis will explain the theories relating to information systems that will be built in the CV. CINTEK Divisi Minuman Tradisional.

#### 2.1.1. Information Systems

a. The system is a network of procedures that are interconnected, gathered together to perform an activity or to accomplish a certain goal, while information is data that is processed into a form that is more useful and more meaningful for those who receive. The source of information is data. Data is the plural of the singular form datum or data item. Data is the fact that illustrates an events and real unity. [2]
b. The system could be interpreted as a unitary element which is connected. Some elements can be combined into a unit, group, or component system with a particular function while bearing the meaning of benefits information, if we can use it. Information connotes the meaning of effort, to get it, understand it, use it, pass it, store it and combine it with other information into a new information. [6]

With reference to the notion of the two sources can be concluded that the information system is one unit consisting of various components that are integrated aiming to complete a certain goal with the help of the results of the processing of the data that has been dlakukan that into information that can help in peyelesaian these objectives.

#### 2.1.2. *Supply Chain Management*

a. 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, retail stores or while Supply Chain Management is a method, apparatus or its management approach that not only focused on the company's internal affairs, but external affairs concerning relationships with companies partner. [4]
b. Supply Chain Management is a system for implementing a total approach to managing the entire flow of information, materials, and services from raw materials through factories and warehouses to the final consumer. Supply Chain Management is a method or an integrative approach to managing the flow of products, information, and money in an integrated manner involving parties from upstream to downstream. An important principle in SCM is transparency

of information and collaboration between the company's internal functions as well as with the parties in the company along the supply chain. Supply Chain is a physical network, the companies involved in supplying raw materials, produce goods, and deliver it to end users. Such companies typically include suppliers, manufacturers, distributors, retail as well as companies such as logistics services company supporting. [1]

With reference to the notion of the two sources can be concluded that the Supply Chain Management is a method or approach an integrated manner to manage the flow of products, information and money in an integrated manner involving parties from upstream to downstream, consisting of suppliers, factories, distribution networks and consumers.

Supply chain there are usually three kinds of streams that must be managed. Three kinds of streams that must be managed in the supply chain is as follows: [4]

a. The first is the flow of goods flowing from upstream (upstream) to downstream (downstream).
b. The second is the flow of money and the like that flow from downstream to upstream.
c. The third is the flow of information that can occur from upstream to downstream or vice versa.

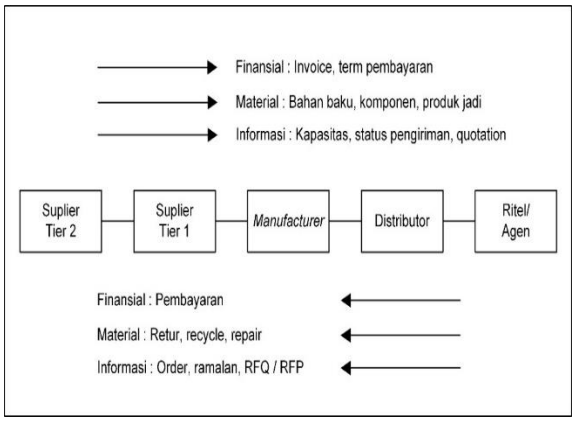



**Figure 1 Supply Chain Model Simplification And Three Kinds Of Flow Is Maintained**

Supply Chain Management has three main components that support the passage of a business process as follows: [4]

a. Upstream Supply Chain

Overall activity manufacturing company with distribution or distributor relationship may be extended to the several levels. The main activity in the Upstream Supply Chain is procurement.

b. Internal Supply Chain

Internal Supply Chain is the delivery of goods to the warehouse. The main activity in the Internal Supply Chain is a production management, manufacturing, and inventory control.

c. Downstream Supply Chain

Downstream Supply Chain activities within process involves the delivery to the end consumer. The main activity in the Downstream Supply Chain is the distribution of goods, warehouse, transportation.

The main activities included in the classification SCM is: [4]

a. The activities of designing new products ( product development)
b. Activity obtain raw materials (Procurement, Purchasing or Supply)
c. Production planning and inventory activities (Planning & Control)
d. Undertake production activities (Production)
e. Sending or distribution activities (Distribution)
f. Event Management product returns or goods ( Return)

Into six classifications are usually reflected in the form of the division of departments or divisions in manufacturing companies. The division is often called functional division because they are grouped according to function. Generally, a manufacturing company will have product development, parts purchasing or procurement (in the English language is called purchasing, procurement, or supply function), part of the production, the production planning (often called part of Production Planning and Inventory Control, PPIC), and parts transmission or distribution of finished goods.

### 2.1.3. Forecasting theory (Forcasting)

Resolve problems in the future is uncertain, people always trying to solve with models of approaches in accordance with the actual behavior of the data, as well as in forecasting. Forecasting (forecasting) demand for products and services in future and its units is very important in the planning and supervision of production. A forecasting many have meaning, then the forecasting needs to be planned and scheduled so would have required a time period of at least the period of time required to create a policy and set a few things that affect these policies. Forecasting is required in addition to predict what will happen in the future also the decision makers need to transform and make planning. Forecasting is very diverse in forecasting time horizon, the factors that determine the actual result, the type of pattern and various other aspects. To deal with such widespread use, several techniques have been developed. One technique in which forecasting method Smoothing (smoothing). [3]

### 2.1.4. *Single Exponential Smoothing Forecasting Method*

Smoothing Methods used in conditions where the weight of the data in the period differs from the data in the previous period and form Exponential functions that can be called exponential smoothing. The method includes, namely Single Exponential Smoothing.

$$F_{t+1} = \alpha X_t + (1- \alpha) F_t \quad (1)$$

Keterangan:

$F_{t+1}$ = The results forecast for the period t + 1
α = smoothing constant
$X_t$ = The actual demand data for the period t
$F_t$ = Forecast in period t

In the method of exponential smoothing α value can be determined freely, meaning there is no sure way to get the optimum value of α. The selection of the value of α is done by trial and error. The amount of α lies between 0 and 1.

### 2.1.5. Calculating Forecasting Error MSE (Mean Square Error)

The accuracy or precision is a criterion to test the performance of a method of forecasting. To test the performance of forecasting to use required size forecasting error. Best forecasting method is a method that provides the smallest error rate than other methods. There are many models for calculating the forecast error. Mean Squared Error (MSE) which is the average of the squared forecasting errors.

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

MSE = Values mean squared error
$X_t$ = The actual data in period t
$F_t$ = Forecast data from the model used in period t
n = Much of the data forecast results

### 2.1.6. Testing System (Black Box Testing)

Testing is the process of examination or evaluation of a system or system component either manually or automatically to verify whether the system meets the needs that is specified or identify differences between the expected results with the results that occurred. Classification of black box testing covers some testing,: [5]

a. Functional testing

In this type of test software tested for functional requirements. Tests conducted in written form to check whether the application is running as expected. Although functional testing is often done at the end of the development cycle, each of the components and processes can be tested at the beginning of development, even before the system is functioning, this test can be performed on the entire system. Functional testing covers how well the system is performing its functions, including the use of commands, data manipulation, search and business processes, user screens and integration. Functional testing also includes the clear surface of the type of functions, as well as backend operations (such as security and how to improve the system.

b. User acceptance (user acceptance)

In this type of test software will be handed over to the user to determine whether the software meets the expectations of users and works as expected. In software development, user acceptance testing (UAT), also called beta testing (beta testing), testing the application (application testing) and testing of end users (end user testing) is the stage of development of the software when the software was tested in the real world that is intended by the user. UAT can be done by in-house testing by paying volunteers or test subject using software or software is usually distributed widely with a test version available for free for download via the web. The initial experience with the user will be forwarded back to the developers who make changes before finally releasing commercial software.

## 2.2. Analysis and Design System

System analysis is the decomposition of a complete information system into its component parts with a view to identify and evaluate the problems, opportunities, barriers that occur and needs expected to be proposed improvements. While the design will be formed after going through a situation analysis phase to produce a summary of the system will be implemented. Designing in the identification of a process system applications that will have the techniques and principles for the objectives to be achieved, able to provide a system that is easy to use at the time of use as well as adequate from the desired goal.

### 2.2.1. SCM Model CV. CINTEK Divisi Minuman Tradisional

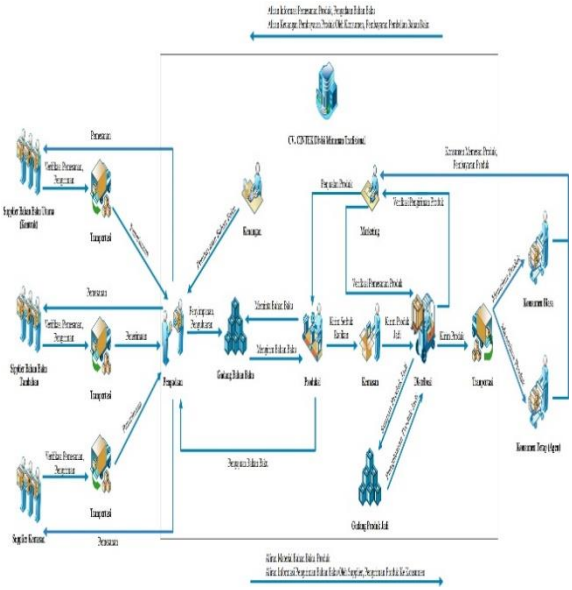


**Figure 2 SCM Model CV. CINTEK Divisi Minuman Tradisional**

### 2.2.2. Stages SCM CV. CINTEK Divisi Minuman Tradisional

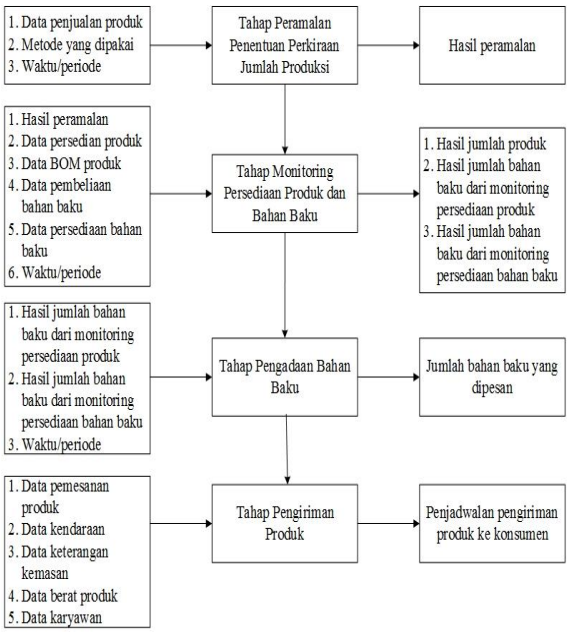



**Figure 3 Stage SCM CV. CINTEK Divisi Minuman Tradisional**

a. Stage Forecasting Determining Estimated Total Productionp

Actors involved in the forecasting stage of determining the approximate amount of production is the head of production. The production department will forecast the determination of the amount of product to be produced based on the type and the packaging for the next period. One forecasting or results of forecasting can be used within one production period or during the 25 days of production.

b. Phase Monitoring Inventory Product and Raw Material

Actors involved in monitoring product inventory is head of production and raw materials is the head of procurement. After doing stage forecasting, enterprise monitoring product inventory in the warehouse and determine how safe limits of products that should be available in the warehouse. In addition, the company conducts control product inventory to avoid the occurrence of a vacancy or surplus stock of products in the warehouse using a minimum stock of products specified by the company. Inventory control product made at the time of the stock in the warehouse is less than the safe limit is the minimum amount of stock products as much as 40 to pack (paper bags and plastic bags) and 30 for the packaging box (jointly and severally). If the stock is less than the minimum amount has been determined, the company will re-produce products to meet product inventory in the warehouse. To determine the amount of the purchase of the stock of raw material ordered is based on the raw material needs in getting out of the calculation results of monitoring product inventory or can also be done from the calculation of monitoring inventories of raw materials, namely when each raw material is already experiencing shortages or gaps and less than minimal stock that supply has reached 20% of the total raw material inventory in the prior period.

c. Stage Raw Material Procurement

Actors involved in the procurement of raw materials is the head of procurement. Make the purchase of raw materials to suppliers based on the results of the calculation of product inventory monitoring or monitoring the results of the calculation of raw material inventory has been done.

d. Stage Product Delivery

Actors involved in the delivery of products is head of distribution. To schedule the delivery process involves determining the date of shipping, where the delivery destination, whom the officer who made the delivery, the type of vehicles used, type and packaging of any product shipped and the amount, content and booking anywhere that has been met or delivery status.

### 2.2.3. Determination of Estimated Total Production Forecasting Product

a. Forecasting is used to determine the approximate amount of production of the product to be stocked each day conducted by the head of production and to do the forecasting takes a parameter that is by using sales data of products.
b. One forecasting or forecasting the result of which is the estimated number of product stocks to be produced can be used within 1 month of production.

### 2.2.4. *Stock Monitoring Products and Raw Materials*

a. Minimum stock of products in the warehouse to pack as many as 40 (paper bags and plastic bags) and 30 for the packaging box (jointly and severally).
b. Calculations for monitoring product inventory is done when the product inventory in the warehouse is already experiencing a shortage of a minimum of the existing stock.
c. The results of the calculation monitoring product inventory used as acauan to produce products that have a shortage of stock as well as guidelines for the procurement of raw materials.

### 2.2.5. Procurement of Raw Materials

a. Determining the approximate amount of raw material purchases can be made based on the needs of raw materials get from the calculation results of monitoring of inventory products that do or do when monitoring inventories of raw materials, namely when each raw material is already experiencing a shortage or emptiness that is less than the minimum stock.
b. Minimal stocks of raw materials is when the amount of supply of raw materials has reached 20% of the total requirement for the production of products in the period.

### 2.2.6. Shipping Products

a. Scheduling the delivery process involves determining the date of shipping, where the delivery destination, whom the officer who made the delivery, the type of vehicles used, type and packaging of any product that is sent along with the number, content and booking anywhere that has been met or delivery status.

### 2.2.7. Analysis Databasealisis Basis Data

Analysis of the data base on infornasi system will be built using the ERD. ERD is a data model that uses some notation to describe the data in the context of the entities and relationships described by these data.

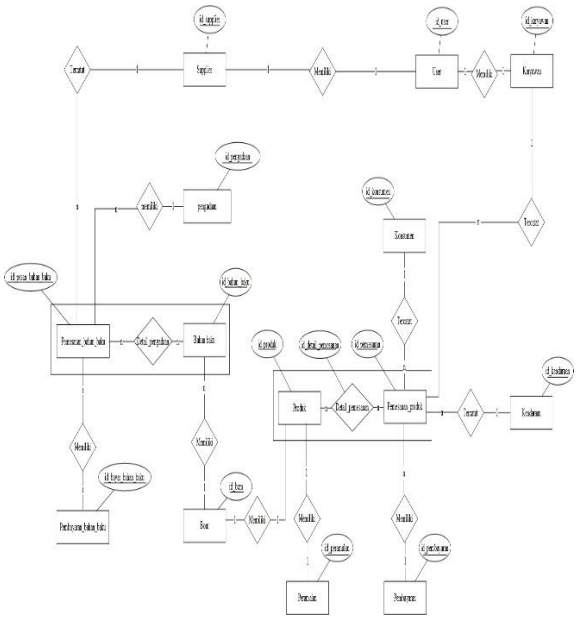


**Figure 4 ERD Diagram SCM CV. CINTEK Divisi Minuman Tradisional**

### 2.2.8. Diagram Context

Diagram context is a global model to explain how the data is used and transformed to the process or describe the flow of data into and out of the system.

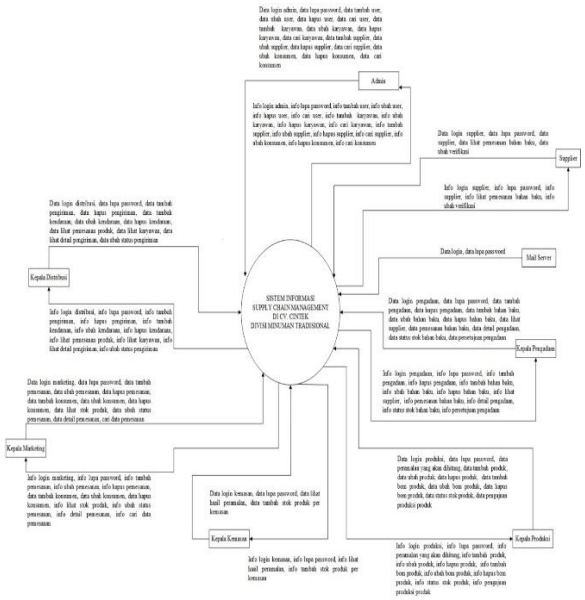


**Figure 5 Diagram Context SCM CV. CINTEK Divisi Minuman Tradisional**

### 2.2.9. Data Flow Diagrams (DFD)

Data flow diagrams show how the flow of data and outlines the processes that occur in the system to process more detail. processes that occur in the system to process more detail. In the context diagram of information systems such as Figure 5 can be broken down into several DFD. DFD will be described starting from DFD Level 1.

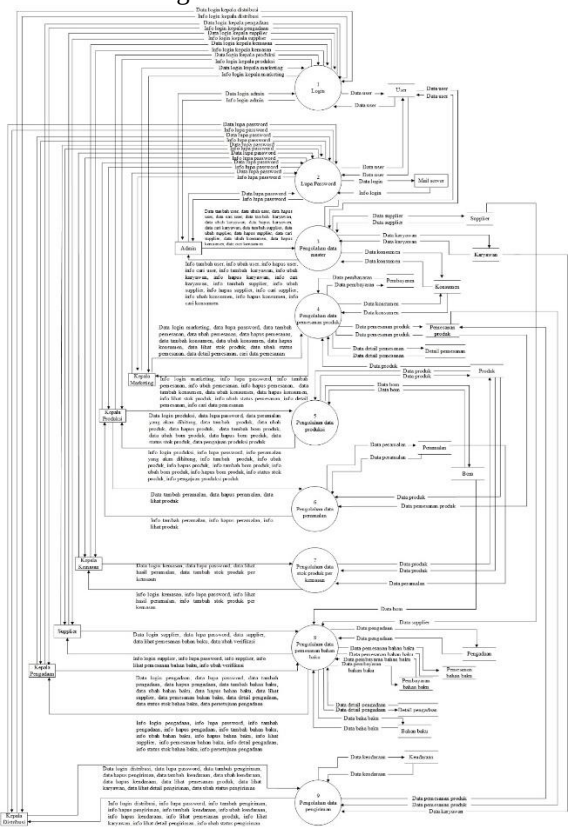


**Figure 1 DFD Level 1 Supply Chain Management CV. CINTEK Divisi Minuman Tradisional**

### 2.2.10. Table Relationships

Table relationships describe the relationship between the data, meaning data and limits. The process of relations between attributes is a combination between the attributes that have the same primary key, so that these attributes into a single unit that is connected by the key fields.

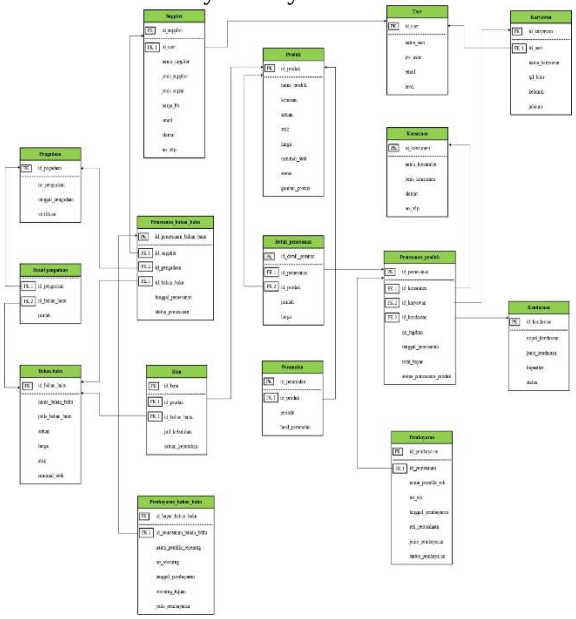


**Figure 2 Table Relationships SCM CV. CINTEK Divisi Minuman Tradisional**

### 2.2.11. Designing Interfaces

The design of the interface is made to describe the view that the program used by the user or the user to interact with the system to be created. The design is based on the interface display both input and output that will be generated when the application is implemented. Here is the interface design of Supply Chain Management at CV. CINTEK Divisi Minuman Tradisional the login menu.

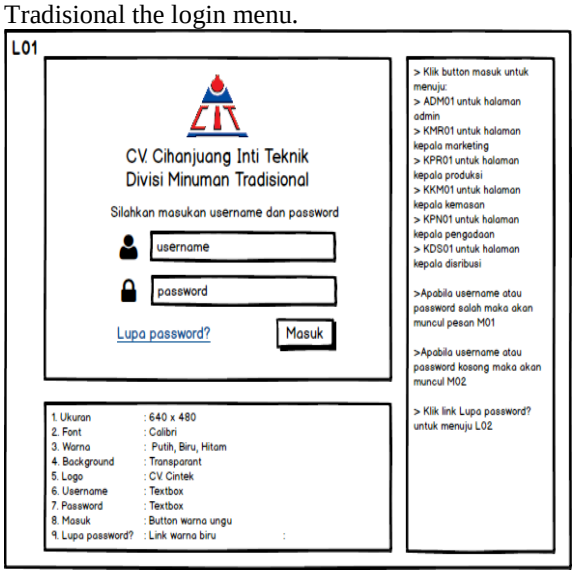



**Figure 3 Login Interface Design**

### 2.2.12. Network Design Semantics

The design of the semantic network representation of the design interface that shows where each interface is connected. Here is an example design of a semantic network in the Admin menu.

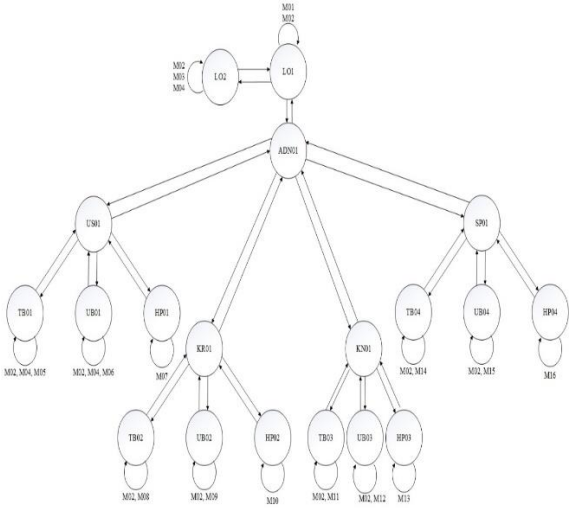


**Figure 4 Semantic Network Admin Menu Design**

### 2.2.13. Procedural Design

Designing procedural transform the structural elements of the architecture program into a procedural description of the components of the software. As an example of procedural design of downstream for applications to be built are as follows:

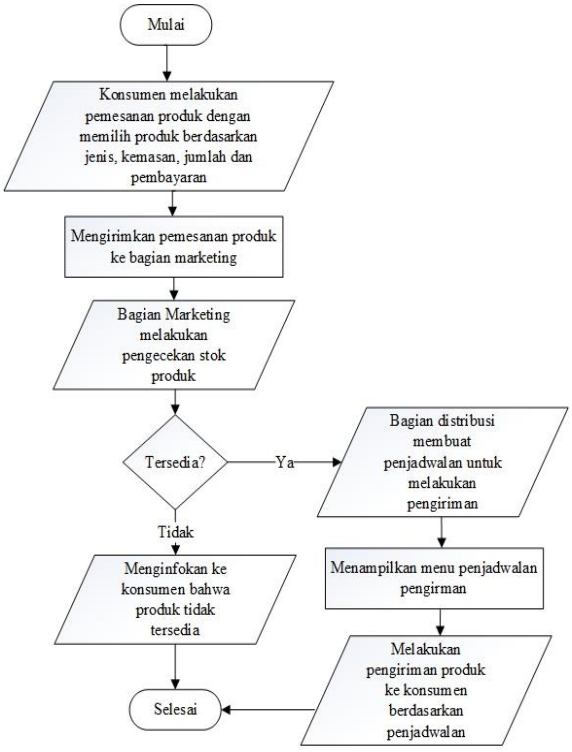



**Figure 5 Procedural Design Downstream SCM**

### 2.3. Testing Systems

Testing is the process of examination or evaluation of a system or system component either manually or automatically to verify whether the

system meets the needs that is specified or identify differences between the expected results with the results that occurred.

Test plan is carried out by means of testing systems built black box. The first black box testing focused on testing the functional requirements of information system is built. Functional testing covers how well the system is performing its functions, including the use of commands, data manipulation, search and business processes, user screens and integration. The second black box testing that focuses on user acceptance (the end user) using UAT (User Acceptance Testing) which aims to find defects (defects) that can not be found by the developer and the software testing process involves prospective users contained in the company selected by the developer and accompanied when doing testing. The third black box testing that focuses on user acceptance (the 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.

### 2.3.1. Functional Testing

Testing was conducted by examining every process on the system to determine the likelihood of errors occurring. Based on the results of functional tests on the information system built using functional test scenarios that have been done on the whole it can be concluded that the existing processes in Supply Chain Information Systems Managemnet that have been built already has a functionality of the system to produce the expected output.

### 2.3.2. User Acceptance Testing (End Users)

User acceptance testing (end users) is a test that is conducted objectively where tested directly into the field, a company that circumstances regarding user satisfaction with the content of the points that meet the needs of the initial objectives and the interface of the information system of the Supply Chain Management. In user acceptance testing (end users), there are two scenarios that test will be conducted are using UAT (User Acceptance Testing) is conducted software testing process involving the potential users who are on the company chosen by the developer and accompanied when doing testing. This is done with the aim of finding defects (defects) that can not be found by the developer. Then do 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.

Interviews were conducted with the testing of each user's page consists of the head of marketing, head of production, head of packaging, the head of procurement, head of distribution and supplier representatives. Tests conducted on the end-user acceptance testing after the system is implemented in a corporate environment is done directly in the corporate environment or a place to study the CV. CINTEK Divisi Minuman Tradisional. This is done in order to know whether the software that was built to provide a solution of some problems faced by the company.

#### 2.3.2.1. Testing UAT (User Acceptance Testing)

The new software is built to be tested for compliance and reliability through the test UAT (User Acceptance Testing) as a condition that the software has to be accepted by a user or users. UAT can be said as a test of finding defects (defects) that can not be found by the developer. The software testing process involves prospective users will be conducted by admin at CV. CINTEK Divisi Minuman Tradisional.

Based on test results using testing scenarios UAT (User Acceptance Testing) has been done can be concluded that the existing process on Information Systems Supply Chain Managemnet that has been built already be forwarded to the stage of user acceptance testing end after the system is applied in corporate environments because of the results testing using the test procedures including testing login, forgotten password, the addition of user data, the conversion of user data, the addition of employee data, converting data of employees, additional consumer data, converting data consumers, the addition of supplier data, converting data supplier, the addition of ordering data, additional product data , the conversion of product data, additional data bomb, converting data bombs, additional data forecasting, additional data packs, additional procurement data, additional data is the raw material, converting data of raw materials, the addition of data delivery, the addition of vehicle data and converting data of vehicles that have been made to produce conclusions were acceptable and expected outputs.

#### 2.3.2.2. Scenario After the End User Acceptance Testing System Implemented At Company

End user acceptance testing once the system is implemented at this company by performing live testing in a study using interview techniques. Based on test results obtained conclusions:

a. Supply chain management information system that is built can be easy admin to manage the data of employees, suppliers and customers.
b. Supply chain management information system that is built can facilitate head of marketing in managing customer data and product ordering.
c. Supply chain management information system that is built can facilitate head of production in determining the approximate amount of production of product to be made and to monitor the stock of existing products in warehouse.
d. Supply chain management information system that is built to facilitate the packing head in managing the data stock products per package.
e. Supply chain management information system that is built to facilitate the procurement heads in determining the estimated amount of the

purchase of raw materials to be ordered and monitor existing stocks of raw materials warehouse.

f. Supply chain management information system that is built can facilitate the distribution head in regulating the scheduling of delivery of products to consumers, determine which vehicles will be used and determine the amount of product to be shipped.
g. Supply chain management information system that is built to facilitate the suppliers manage demand ordering raw materials dilukakan by the company.

## 2. CLOSING

### 3.1. Conclusions and recommendations

This chapter will explain about the conclusions that contains the results obtained after the analysis, design, and implementation of software design that was built and has been developed as well as suggestions that will provide important records and possible improvements that need to be done to further free software development.

#### 3.1.1. Conclusion

Based on the results obtained from the research that has been done in this thesis concerning the development of supply chain management information system in CV. CINTEK Divisi Minuman Tradisional it can be concluded as follows::

a. Supply chain management information system that is built can facilitate head of production in determining the approximate amount of production of products that will be created with the help of forecasting and monitoring the stock of existing products warehouse with menggunakan.monitoring product.
b. Supply chain management information system that is built to facilitate the procurement heads in determining the estimated amount of the purchase of raw materials to be ordered and monitor existing stocks of raw materials warehouse with menggunakan.monitoring raw materials.
c. Supply chain management information system that is built can facilitate the distribution head in managing delivery schedules to consumer products, to help determine the vehicles that will be used in shipping and to help determine the amount of product to be shipped.

#### 3.1.2. Suggestion

Based on the positive results achieved so far, supply chain management information system in CV. CINTEK Divisi Minuman Tradisional still has some drawbacks. It is advisable to add things to complete the system. The suggestion for the development of supply chain management information system are as follows:

a. This information system can be developed with the approach of CRM (Customer Relationship Management) that can be used in the determination of new product development bandrek form of development based on their flavor or packaging..
b. This information system can be expanded with the addition of features of their online ordering process is done by the consumer to rejuvenate the company in introducing or promoting products to consumers..

## BIBLIOGRAPHY


[1] Jacobs, F. R., & Chase, R. B. (2008). Operations and Supply Chain Management The Core. Boston: McGraw-Hill.

[2] Jogiyanto. (2005). Analisis dan Desain Sistem Informasi. Yogyakarta: Andi.

[3] Lerbian R, & Aritonang R. (2009). Peramalan Bisnis Edisi Kedua. Bogor: Ghalia Indonesia.

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

[5] Simarmata, J. (2010). Rekayasa Perangkat Lunak. Yogyakarta: ANDI.

[6] Sugiyono. (2013). Metode Penelitian Kombinasi (Mixed Methods). Bandung: Alfabeta.