DESIGN OF ELECTRONIC SUPPLY CHAIN MANAGEMENT INFORMATION SYSTEM IN PT XYZ

Marwan[1, a], Harmein Nasution[2,b] Aulia Ishak[3,c]
[1]Jln KL Yos Sudarso KM 10,5 Medan, Indonesia
[2]Jln. Prof M Yusuf No.6 Kampus USU Medan, Indonesia
[3]Jl Tridarma No.32 Kampus USU Medan 20155, Indonesia
[a]marwan297@ymail.com, [b]harmein_nasution@yahoo.com, [c]aulia.ishak@usu.ac.id

Keywords: Supply chain management, e-scm, suppliers, customers, applications.

Abstract. PT XYZ is a company engaged in the production of beverages. PT XYZ has several suppliers and distributors spread across several locations. PT XYZ requires a web-based application that can simplify business processes with suppliers, distributors and product ordering processes by reducing the level of supply chain management uncertainty. The method used in this study is the *Lot Sizing* method, which is a process to determine the optimal size of individual orders based on the results of the calculation of net requirements. The design of the application in the study also consists of 2 fields, namely the stages of analysis using the preliminary step and the design stage. At the analysis stage, an analysis of the company's readiness in implementing *e-scm* is carried out. While in the design phase consists of developing *e-scm*, customer and service management strategies, manufacturing and supply chain planning, supplier relationship management, resource logistic management and *e-scm* architecture. Applications designed to provide information to suppliers, customers and internal parties of the company. Information provided can facilitate suppliers in controlling the inventory of raw materials in the company. Information will also make it easier for customers to process products offered by PT XYZ. The final result of this research is an *e-scm* application which can facilitate PT XYZ to conduct transactions with suppliers and customers.

Introduction

In facing business competition, the ability to minimize internal and external uncertainty is needed in making decisions. Uncertainty in the business environment requires companies to have flexibility in their supply chain. Supply chain is a network of companies that work together to create and deliver a product to the end user. These companies usually include suppliers, factories, distributors, stores or retail, as well as supporting companies such as logistics companies. [4]

The success of the company to achieve the target of the company must be supported by various important elements of the company, especially the availability of resources and good cooperation with various parties. The ability to send products to consumers in a timely manner and sufficient number of products also greatly determines the level of service to customers. The ability to manage this distribution network is one component of competitive advantage that is very important for the company. If the availability of resources and cooperation in managing the network does not contribute according to expectations, the company's performance will be disrupted.

Electronic-supply chain management (*e-scm*) is one of the revolutions in the field of distributing goods based on internet technology. *e-scm* technology has many advantages such as optimizing the recording of goods data, distributing goods, and facilitating the audit of goods from upstream to downstream. Data collection systems and product distribution that are not integrated can result in supply chain uncertainty as happened at PT XYZ.

Supply chain activity process at PT XYZ often experiences several obstacles, especially constraints that occur on customer demand problems that are not yet known by the company so the company does not have definite data in carrying out production plans. Then the other supply chain problems are

problems in the procurement of raw materials. The problem is the uncertainty of the supplier in the form of uncertainty in the delivery lead time, as well as the quantity of material sent. Uncertainty on the lead time of delivery of raw material and auxiliary materials influences the company's decision to order these raw materials both in terms of quantity and time.
Based on the background of the problem that has been elaborated, the problem that will be resolved through this research is how to overcome or minimize supply chain uncertainty that often occurs in companies caused by the large variation in demand and inventory caused in avoiding stock out products at PT XYZ by designing an *e-scm* application on the company.
By designing an *e-scm* application it aims to minimize the level of uncertainty in the supply chain that exists in the company. So that in the decision making of the inventory system there is no excess inventory, both the raw material inventory and the finished material.

Method

The method used in this study is the Lot Sizing method, which is a process to determine the optimal size of individual orders based on the results of the calculation of net requirements. Some techniques are directed at adding message costs and storage costs, there are also simple by using the concept of the number of fixed orders or with a fixed order period.

The design of the application in the study also consists of 2 fields, namely the stages of analysis using the preliminary step and the design stage. At the analysis stage, an analysis of the company's readiness in implementing *e-scm* is carried out. While at the design stage consists of developing *e-scm* strategies, customer and service management, manufacturing and supply chain planning, supplier relationship management, logistic resource management and *e-scm* architecture.
The stages used to build this system consist of:

1. Stages of Analysis
   a. Preliminary Step
      - Energize The Organization
        Aims to synchronize and include relationships ranging from suppliers, companies, to distributors in the company.
      - Enterprise Vision
        Aims to produce products that have high selling value for their customers where the products produced are of the highest quality and in accordance with the customer's desires to achieve the company's mission.
      - Supply Chain Value Assessment
        Aim to find out the supply chain process that is running on the company
      - Opportunity Identification
        Aim to develop the *e-scm* system that you want to design.
      - Strategy Decison
        Aim to obtain some of the benefits generated by the *e-scm* system
2. Designing stages
   a. Development of Electronic Supply Chain Management (*e-scm*) Strategy
      - Constructing The Business Value Proposition
        Implementation of *e-scm* at PT XYZ aims to create changes in terms of services.
      - Defining the Value Portfolio
        Aim to support the business value proposition effectively
      - Structuring The Scope Of Collaboration
        Aim to collaborate on existing data on the company, as well as supplier data, customer data and production data.

b. Customer and Service Management
   - On-line catalogs
     Through this catalog, consumers can find out the names and forms of products offered through the images provided.
   - On-line order processing
     For the distributor page, so the order is made by making a product requirement that will be sent to PT XYZ and accepted by *ppic*.
   - Contact Management
     PT XYZ has data about distributors.
   - Account Management
     PT XYZ has an account management that is used to provide detailed information about sales activities that occur.
c. Manufacturing and Supply Chain Planning
   - Manufacturing Planning
     Providing accurate data and information to support the decision making process in production planning.
   - Production and Process Management
     Aim to provide information to *ppic* regarding the production status of each product requirement so that *ppic* can make a decision to accept or reject the product requirements received from domestic distributors.
   - Product Design and Engineering
     Product design development and innovation at PT XYZ is still done by the company.
   - Plant Maintenance and Quality Management
     maintain factory machinery manually by the production department
d. Supplier Relationship Management
   - Procurement History
     Serves to be able to find out various information about the amount of raw material inventory based on company statistical records.
   - Accounting
     Provide information about the status of purchase order payments to suppliers.
   - Purchasing Planning
     Serves to carry out planning of purchasing raw materials to suppliers after knowing the stock of raw materials available at the company.
   - Performance Measurement
     For the level of effectiveness of the process of raw material flow that occurs in the company
   - Supplier Search
     Contains data about suppliers, starting with name, address, telephone number and e-mail address.
   - Product Search
     Contains data about raw materials that can be used to facilitate companies in ordering raw materials to suppliers.
   - Purchase order configuration and tracking
     To be able to order raw materials by making purchase orders that will be sent to suppliers electronically
   - Logistics
     The delivery of product raw materials is carried out by the supplier by checking the company's raw material inventory.

e. Logistics Resource Management
   - Warehouse Management
     Aiming at regulating and optimizing existing raw material inventories, giving a warning to the *ppic* section to make a purchase if there is a raw material that reaches a minimum stock quantity.
   - Transportation Management
     Delivery of raw materials from suppliers to the warehouse at PT XYZ is carried out by the supplier itself. Where the supplier will send an electronic path to the PT XYZ. Delivery of manufactured goods to the distributor carried out by production (finishing), wherein this section will send a letter to the distributor of the delivery of electronic production. [11]

Design Results

The results of the design stage can be seen through the use case diagram below. In software development use case diagrams are used to explain relationships and actors in the form of input or output in a system. The use case diagram for the information system developed is like figure 1 below:

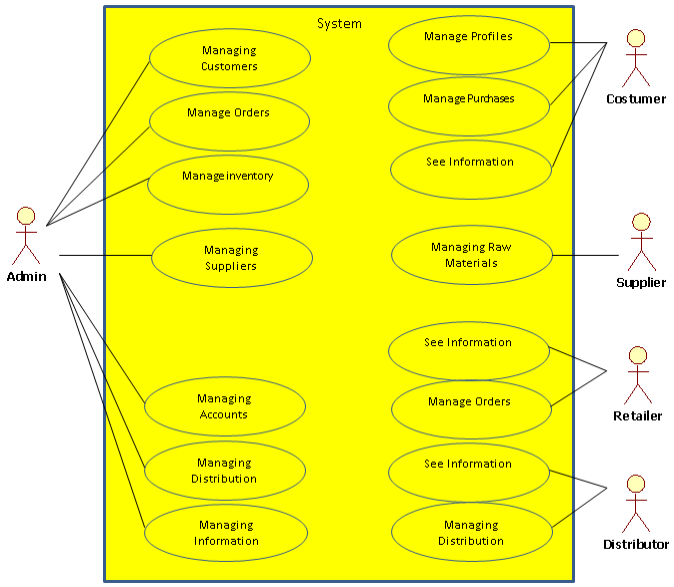

Figure 1 Use Case System Diagram

The Supply Chain Management System use case diagram in figure 1 can be explained as follows:

a. The main task of the administrator is to add and manage users for customers, suppliers, distributors and retailers. Administrators are also tasked with managing information and distribution and managing customer orders and administrators also monitoring product tables from customer ordering systems.
b. Customer and Retail have the same function, which can order the desired product on the customer form, before ordering the customer can also do profile management in advance which functions so that the company can easily contact the customer if needed. In addition, customers can also access information about the company that can be seen in the main menu of the application.
c. The supplier is in charge of managing the raw materials available at the company. With this application, suppliers can immediately see the stock of raw materials that exist in the company.
d. The distributor itself is responsible for carrying out product delivery transactions. From the application that has been designed, it can be seen where the product destination will be delivered.

Literature References

1. Definition of Information Systems

The system in general is a group of elements that are integrated with the same goals to achieve a goal. There are two groups of systems approaches in defining systems, namely approaches to procedures where the system is a network of interconnected procedures, collected together to carry out an activity or for a specific purpose, and approach to components or elements. [1]
Information is the result of processing data so that it becomes an important form for recipients and has uses as a basis for making decisions that can be felt directly as a result at that time or indirectly in the future. [2]
Information system is a system that has the ability to gather information from all sources and use various media to display information and a set of data that are integrated and complementary by producing good output to solve problems and make decisions. [1]

1.1 Information System Design and Development Phase

The stages and steps of each design and construction of information systems are general strategies adopted in the collection and analysis of data needed to answer the problem at hand. One of the models used is the *classic life cycle paradigm* (*water fall model*). The application and system information development cycle is as follows: System engineering, software requirements analysis, designing, coding, testing, maintenance. [3]

2. Definition of Supply Chain Management

Supply chain is a network of companies that work together to create and deliver a product to the end user. These companies usually include suppliers, factories, distributors, retail, as well as supporting companies such as logistics companies. [4]
The term supply chain management was first put forward by Oliver & Weber in 1982. If the supply chain is a physical network, companies are involved in supplying raw materials, producing goods, or sending them to end users, while supply chain management is a method, a tool or management approach. But it should be emphasized that supply chain management requires an integrated approach or method with the basis of the spirit of collaboration. [4]
Supply chain management is a series of approaches that are applied to integrate suppliers, companies, warehouses and other storage places efficiently so that products are produced and distributed with the right quantity, location and time to minimize costs and satisfy customer needs. Designing and implementing an optimal supply chain globally is quite difficult because of its dynamism and the occurrence of conflicting objectives between facilities. [5]
The term supply chain means that there is only one player involved at each stage of the supply chain. In fact, a factory can receive raw materials from several suppliers and then supply the finished products to several distributors. Based on this, in fact most supply chains are a network. In general, the supply chain involves several parts including: Consumers, retailers, distributors, factories, raw material suppliers. [6]
In a supply chain there are usually 3 types of flow that must be managed. The first stream is the flow of goods flowing from upstream to downstream. Examples are raw materials that are sent from suppliers to factories. After the product is finished in production, they are sent to the distributor, then to the retailer, then to the end user. Second, the flow of money and the like that flows from downstream to upstream. The third, is the flow of information that can occur from upstream to downstream or vice versa. [4]
The supply chain management process is the process when products are still made from raw materials, semi-finished products and finished products are obtained, converted and sold through various facilities connected by chains throughout the product and material flows. In a supply chain there are usually 3 types of flow that must be managed. First is the flow of goods flowing from upstream to

downstream. An example is raw material that is sent from the supplier to the warehouse. After the raw materials have been produced, they are sent to the distributor, then to the retailer, then to the end user. The second is the flow of money and the like that flows from downstream to upstream. The third is the flow of information that can occur from upstream to downstream or vice versa. [4]
Managing a supply chain is not an easy thing, because supply chains involve very many parties inside and outside the company that handle a very broad scope of activities. Coupled with the various uncertainties that exist along the supply chain and the increasing market competition. Supply chain Management also requires a robust management model and approach to survive in the business world. This is also coupled with various rules and demands from the government and society to safeguard environmental aspects in supply chain activities. The following are some of the challenges that must be faced in managing supply chain, namely:

Supply Chain Structure

Supply chain is usually very complex which involves many parties inside and outside the company. These parties often have different interests, sometimes not even conflicting with each other. [4]

Uncertainty

Uncertainty is the main source of difficulty in managing a supply chain. Uncertainty raises self-confidence in the plans that have been made. As a result, companies often create safeguards along the supply chain. This security can be in the form of supplies (safety stock), time (safety time), or production or transportation capacity. On the other hand, uncertainty often leads to promises that cannot be fulfilled. In other words, customer service levels will be lower in situations where uncertainty is quite high. [4]

2.1 Drivers of Supply Chain Management (SCM)

The supply chain has a driver that greatly influences the supply chain's performance. [7] supply chain drivers are as follows:

a. Inventory
   Are all raw materials, in the process and items that have been completed. Inventory is one of the most important drivers of supply chain because changes in inventory policies can dramatically change the level of responsiveness and supply chain efficiency.
b. Transportation
   Transportation is moving inventory from point to point in the supply chain. The choice of transportation also has a large impact on the level of responsiveness and supply chain efficiency.
c. Amenities
   Facilities are places in a supply chain network where inventory is stored, assembled or produced. Determination of facilities has a large impact on the level of responsiveness and supply chain efficiency.
d. Information
   Information consists of data and analysis related to inventory, transportation, facilities and customers throughout the supply chain. Information provides an opportunity for management to make supply chains more responsive and efficient. Information is potentially the biggest driver of supply chain performance.

3. Definition of Electronic Supply Chain Management (E-SCM)

Electronic-supply chain management (*e-scm*) is a management concept where companies try to use internet technology to integrate all business partners of the company, especially those related to the supply system of materials or resources needed in the production process. [8]

Electronic-supply chain management is a collaborative use of technology to improve business-to-business processes, speed, performance, real-time supervision, and customer satisfaction. This includes the use of information technology to improve supply chain activity and supply chain management (eg planning, coordination and control). *e-scm* is not just about technological change, but includes changes in management policies, organizational culture, performance matrices, business processes, and organizational structures along the supply chain. [9]
Electronic-supply chain management is a strategic and tactical management philosophy aimed at interacting the combined productive capacity and other resources in a supplier network system (supply channel system) through internet technology, to find innovative solutions and synchronize network capabilities, and to create value added to consumers. [10]
Electronic-supply chain management collaborates or combines the use of technology, with the aim of expanding the process and increasing speed, agility, real time control and customer satisfaction (example: planning, coordination and control).
The difference between *e-scm* is not just the difference in the use of internet technology, but also the fundamental change / supply channel concept itself. Where, Supply chain management focuses on optimizing the flow of products and information, while *e-scm* which is a Web-based supply channel focuses on adding value to consumers (both internal and external consumers).
So the conclusion is that e-Supply chain management is a collaboration between the use of technology and strategic management to improve the speed, performance, real-time supervision of business processes aimed at interacting the combined productive capacity and other resources in a supplier network system through internet technology, to search for innovative solutions and synchronize network capabilities, and to create added value for consumers.

3.1 Basic Principles of Electronic-Supply Chain Management (E-SCM)

There are three basic principles that must be considered in planning an *Electronic-supply chain management* (*e-scm*) [8], namely:

a. Seeing that the nature of information in this case must be a substitute or substitution of the existence of inventory (the largest cost of the average company), then information must be treated exactly as inventory management.
b. Of the three elements (cost, speed and quality) the real competition lies in the speed and accuracy of information. Information flowing from business partners to companies and vice versa must be such that it truly provides significant benefits to the process of creating and distributing products or services (creating value).
c. Management must assume that the relationship between business partners is a strategic asset of the company that must be fostered truly

Conclusions

The supply chain management information system can help the ordering department to know the exact schedule of completion of each order to inform customers, no longer rely on intuition in calculating the completion of orders, so there are no complaints from customers because the information delivered will be timely and timely.
The supply chain management information system can assist the procurement department to determine the calculation of the amount of raw material procurement that must be purchased according to the needs needed, so that production activities run smoothly there are no more problems or excess raw materials so the production stage and shipping stage run well and right time in product delivery according to the specified production time.
The supply chain management information system can assist the shipping department in determining the product delivery schedule that must be sent by looking at the production status, shipping is done

when the product has been produced according to the length of the product ordered by the customer, and makes it easier to choose the vehicle that must be used in the company.

Acknowledgements
This research was supported and funded by the Potensi Utama University. And great moral support provided by the Sumatera Utara University. Thank you, I say to Mr. Prof. Harmein Nasution and Mr. Aulia Ishak, Ph.D, who have helped a lot in writing this paper so that the writing of this paper can be completed perfectly as expected.

References

[1] Yakub: Pengantar Sistem Informasi (2012)

[2] Edhy Sutanta: Basis data dalam tinjauan konseptual (2011)

[3] Ai Rosita: Perancangan Sistem Informasi Supply Chain Management (Pengadaan Barang) Bengkel Perawatan dan Penjualan suku cadang Pesawat Studi kasus: Bengkel perawatan Pesawat (2010), Seminar dan Call for paper Munas Aptikom Politeknik Telkom

[4] Pujawan, I.N Supply chain management (Edisi 3) Andi, Yogyakarta et al (2017)

[5] Shimchi-Levi Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies et al. 2003

[6] Chopra, Sunil Meindl, Peter Supply chain management strategy, planning, and operation Pearson edition six Global Edition (2016)

[7] Chopra, Sunil. Meindl, Peter. 2004. SCM Strategy, Planning, and Operation. 2nd Edition. Prentice Hall.

[8] Indrajit, Richardus Eko dan Djokopranoto. 2003. Konsep Manajemen Supply Chain : Strategi Mengelola Manajemen Rantai Pasokan Bagi Perusahaan Modern di Indonesia, PT Gramedia Widiasarana Indonesia, Jakarta.

[9] Turban, Efraim, Aronson, Jay E, dan Liang, Ting Peng. 2005. Decision Support Systems and Intelligent Systems. 7th Edition. Upper Saddle River: Prentice- Hall, Yogyakarta : Penerbit ANDI

[10] Ross, David F. 2003. E-Supply Chain Management: Engaging Technology to Build Market-Winning Business Partnership. St. Lucie Press, Florida

[11] Rudy, Nancy Octavia, Novitriana Tjong, Tri Harsoyo : Analisis Dan Perancangan E-SCM Studi Kasus : PT. Multi Megah Mandiri at Seminar Nasional Informatika 2008 (semnasIF 2008) UPN ”Veteran” Yogyakarta