Distribution System for RP Food Products (Thailand) Co., Ltd.

by

Ms. Sunee Surawannroj

A Final Report of the Three-Credit Course
CS 6998 System Development Project

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Computer Information Systems
Assumption University

November 2002

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Project Title	Distribution System for RP Food Products (Thailand) Co., Ltd.
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Academic Year	November 17, 2002

The Graduate School of Assumption University has approved this final report of the three-credit course, CS 6998 System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information Systems.

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ABSTRACT

Product Distribution System Project was developed to improve the company operation and performance, including communication between the company and wholesalers which are the company's major customers. The purpose of developing this system to provide a quick and efficient service to wholesalers who order company's product. Running business in the globalization era, quick responding and providing services to customers is the most important way to compete with its competitors. Communication is the most important and the way to communicate with customers by using computer and technology can help reduce the cost of operations and create efficiency.

Product Distribution System will help the company's customers to easily contact the company by using this system to make an order, to check the stocks, to get the market details and the company's promotions. On the other hand, the company can provide services to customers by providing market information, statistics to help the customers to get the market's overview, to help giving the selling statistics to make the customers ease to forecast their sales target. The proposed system will also provide the company the details of orders to make the company forecast its sales volume, target and trend.

Customers will feel that the way to deal and make an order with the company is very easy to handle, as the system will provide details that wholesalers would like to know. For example, the delivery date of the shipment, the safety stock that the customers should order and the promotion which the company will make to support the wholesalers to easily sell the company's product.

With this proposed system, the manufacturers can predict the demand and forecast the production. The system will give the details of order which the manufacturers are authorized to view the orders and to get the order's details.

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I. INTRODUCTION

1.1 Background of the Project

RP Food Products Distribution System is the system to control the flow of selling and production of company's food product. When the products have been sold out, the selling record will be made. As RP Food Products has sold the company products through wholesalers and retailers, the stocks record will be made by both the company and wholesalers.

The wholesalers will stock the company's products and the payment will be settled upon selling out of the company's product. The wholesalers will record the stock cut when the product has been sold out. The record of selling by the wholesalers will be sent to the company twice a month, in middle and end of the month.

When the company gets the report of product selling from the marketing, the marketing will send the selling report to the company's factory in order to prepare for ordering the raw material for the next production. The factory will order the raw material once it receives the selling report from the marketing office.

The factory will check the raw material and the production whether the raw material in stock, is enough for the next order. If they find out that the raw materials are not enough in stock, they will place an order for the raw material immediately.

The factory will not be responsible if the product is over supplied. Once it gets the selling report and check at the factory's warehouse and find out that the raw material are in the lower level of ordering quantity, it will immediately order the raw material but it will not check the stock of products in its warehouse.

1.2 Objectives of the Project

The objectives of this project are as follows:

(1) To analyze the existing system and design the computerized system for more effective works.

(2) To define user and business requirements on a proposed Distribution system.

(3) To design a new computer-based Distribution system for the company.

(4) To improve the efficiency and effectiveness of services providing to the distributor and the company's factory and marketing office.

(5) To reduce the paper costs and to shorten the ordering process time.

(6) To support the data gathering and collecting for both organizations and customers.

(7) To implement and test the proposed system.

1.3 Scope of the Project

The project is to develop a new computerized distribution system for RP Food Products (Thailand) Co., Ltd. to replace the existing distribution system, which is currently based on manual operations. The project will cover major parts of the distribution, which can be classified as follows:

(1) Manage and maintenance the ordering processes, which come from the customers which are wholesalers and retailers.

(2) Support customers by giving information about their order and the promotion and checking their stock level.

(3) The system should be able to produce various kinds of reports, i.e. monthly sales for each customer, Minimum Quantity Orders, stocks' level etc.

(4) The system should be able to handle a large number of database, processes and transactions.

(5) Control the inventory and distribution of the organization.

(6) The system must meet all existing company requirements, i.e. all users must have an authority to access the system.

1.4 Project Plan and Schedule

This project plan and schedules of RP Food Products (Thailand) Ltd. Distribution System is given in Figures 1.1 It is classified into 3 Phases:

(1) Analysis of the Existing System

(2) Analysis and Design of the Proposed System

(3) Implementation of the Proposed System.

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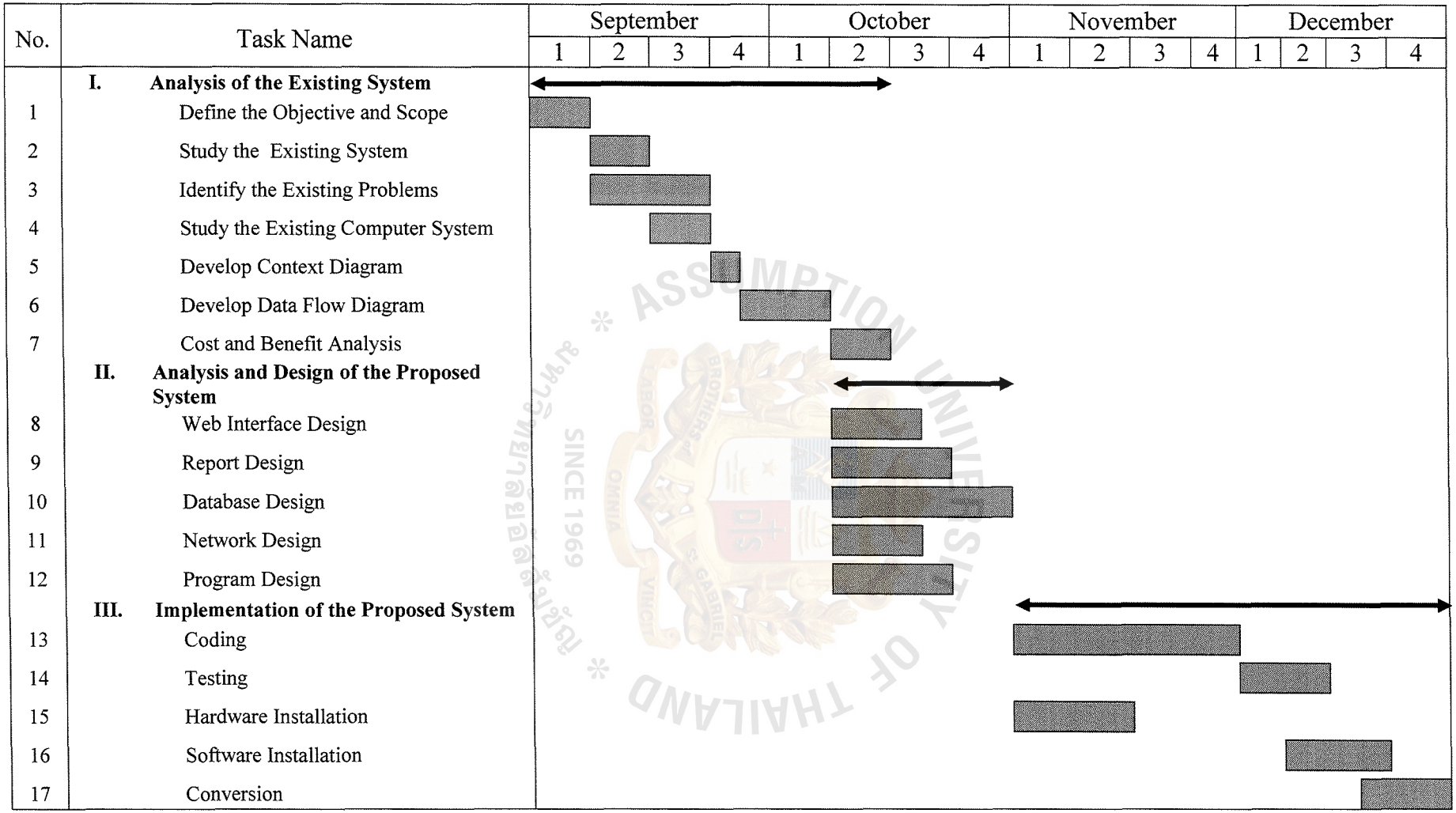

Figure 1.1. Project Plan of Corporate Node Information System.

II. EXISTING SYSTEM

2.1 Background of the Organization

RP Food Products (Thailand) Ltd. was founded in 1989. The company's office is located at Bangkok at 21/3 Bui Building, 8th Floor, Surawongse Road, Bangkok, and factory and warehouse is located in Laem Chabang at 235 Laem Chabang, Chonburi Province. RP Food Products is a manufacturer which produces canned fruits and vegetable and fruit juice. Most of the raw materials are supplied by local farms. Our manufacturer produces many different kinds of canned products such as canned pineapple, canned bamboo and canned pineapple juice etc.

Due to the high competition in the market, RP Food Products tried to keep its competitive prices as well as its customer bases. RP Food Products' management team has set up its strategic plan to meet with the company's customers' need by providing the best services to our marketing channels which are wholesalers and retailers. On the other hand, we also control our operating costs including the inventory costs. The company needed to get immediate and updated statistics and information in case of setting up and following its business plan, checking the raw materials' utilization and maintaining its customers' database.

2.2 Existing Business Functions

The overall system of the company can be divided into three main sections:

(1) Marketing Department

Marketing Department will be responsible for the marketing promotion, marketing plan, providing services to customers and handling all orders from wholesalers.

(2) Finance Department

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The responsibilities of this department are controlling company's finance, controlling budgets, controlling company cash flow.

(3) Factory

The main responsibility of the factory is to produce the finished goods and arrange the goods to stock in warehouse before its delivery to wholesalers.

The organization chart will be shown in Figure 2.1.

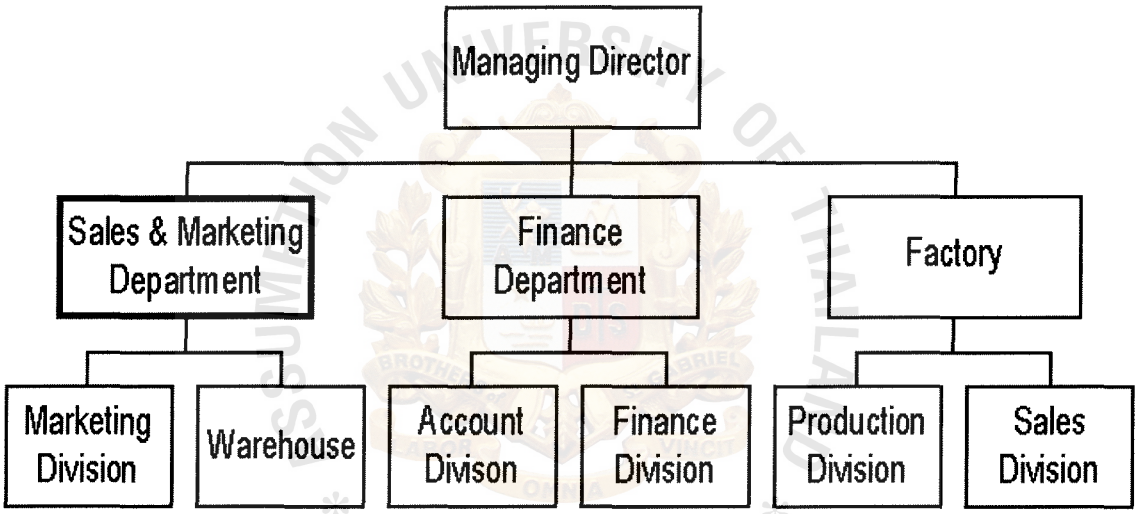

Figure 2.1. Organization Chart of the RP Food Products (Thailand) Co., Ltd.

The existing system is a manual system and staffs will handle all activities manually and all activities recorded and kept in file. The overall function of the existing system is described as follows:

(1) When the transaction of orders have been made, the wholesalers will send the order form to both marketing department and factory of the company while the retailers will send the order form to marketing department alone. Sometimes, there will be a double record for the order placing by wholesalers and retailers. Once wholesalers forget to send the order form to

either marketing department or factory, their stock recorded will be different and wrong.

(2) When the factory gets the selling report, it can't check the exactly quantity of product in the warehouse and it, sometimes, mislead the production's schedule and quantity. The consequence is the factory has too much raw material and product in its stock. Sometimes, the stock is empty or best selling products are out of stock.

(3) The record of stock and selling between the wholesalers and the company are not the same figure. Once the wholesalers send the report too late, the factory can't produce the product to serve customer on time.

(4) The marketing department will print out the company report showing the order made by the wholesalers and the retailers at the end of the month while the factory will print out the selling order, which were sent to the factory by the marketing department. Both reports were generated by Microsoft Excel. However, sometimes, the handwriting record for the monthly order sending by the marketing department to the factory is also accepted. These reports will be kept in a Box file at both the marketing department and factory.

2.3 Current Problems and Areas for Improvement

From our study and interviews, the critical area that needs to be developed and improved is the distribution system.

2.3.1 Current Problems

(1) Manual Process

All transactions and information are manually input and kept in box file for hard copy and a soft copy will be put in the excel format which is

kept in hard diskettes of sales' computers. When mistakes happened by human error, the management will get the wrong information, which caused, wrong decisions. And when the sales' computers are broken down, the important information ie. Customer order and other information etc. might be lost and might not be retrieved. Most errors from the manual process are as follow :

(a) Data writing error

At present, customers will place an order by sending the invoice via facsimile machine and all orders will be recorded by marketing's staff in the ordering book to get the order number.

(b) Data entry error

Sales staff will make a sales record by putting all the orders of each day in the excel file at the end of the day. There is no specific program to validate the amount, price and total amount of the orders.

(c) Data missing

After getting the sales order at the end of the day, sales staff will send the orders to the factory via facsimile machine. Some times, it was an error on the transmission and it caused some orders being missed, as the factory staff didn't get the whole order.

(2) Stock Information

Mistakes on the stock numbers might happen due to the oversight of the factory's staffs. The factory's staffs get the unclear order via facsimile machine and do not verify with the sales and get the wrong number of order. Sometimes, sales staffs forget to send the order to the factory at the end of

the day or sales team get a big lot of orders and there is no stock to be delivered to customers.

(a) Data Inconsistency & Redundancy

Once customers place an order by fax, marketing staffs will write the order in the order record, then, sales' staffs will put it in excel at the end of the day and print the whole order out to send to the factory by fax. Sometime, the factory's staffs receive the same order twice and put the order in the production record twice, it will make the duplicate order. Both the sales & marketing office and the factory will keep the same order record, sometimes; the order records are not the same.

(b) Lack of Information & Inaccurate Information

Sales don't have an estimated figure of the order that customer placed as it takes a long time to get the figure from both the sales and the factory due to inaccurate figures. The factory can't give accurate stock information due to uncertain amount of order. Sometimes, goods are out of stock and sometimes, goods are over stock.

The system analysis technique will be used to clarify the mentioned problems into the specific categories for further analysis and design of the proposed computerized system. We will use the technique called Problem, Opportunities Analysis and the analysis result is presented in the Table 2.1 as below:

Table 2.1. Problem, Opportunities, Analysis and the Analysis Result

Brief Statements of Problem, Opportunity, or Directive	Urgency	Visibility	Priority	Proposed Solution
Purchase order from customers is not recorded properly.	ASAP	High	1	Develop the computerized system for customer to place an order and to record customer's order.
Order figure is not accurate.	High	High	1	Develop the computerized system to keep the record of customer's order once customers place an order.
Required sales figure and Information are not received as soon as requested.	Medium	Medium	3	Develop the searching index for the order & customers' nformation.
Information from sales office and factory are not inconsistent and accurate due to the separate storage.	High	High	2	Assign the data storage place and how to keep the data storage.
No data sharing among department / unit.	High	Medium	3	Develop the computerized system which is sharing among sales & factory.
Inadequate information to make the sales and inventory forecast.	ASAP	Medium	2	Develop the computerized system that provide the details of order and inventories.
Data is not secure due to the unreliable storage and no back up.	ASAP	High	1	Provide the storage place to keep data and make the data back-up.

Most of the above-mentioned problems occur due to the current process being operated manually. Once the computerized system is implemented, it will help our customers to easily contact us to place an order, our sales team to track an order, our factory's staffs to well control the product inventories and our management to make the right decision on the sales forecast etc. It will reduce duplication or inconsistent

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information and increase accurate data and more reliable information than the existing manual process.

2.4 The Existing System

The existing infrastructure in the sales & factory of RP Food Products is based on human work process which used the computer to keep the data. Office and factory will have their individual computers to keep all information. Those computers are not sharing or link with each other.

The working process of existing computer resources within RP Food Product are as below:

(1) Order replaced by customers

Regular customers will send an order to RP Food Product by facsimile machine if customers would like to place an order. Once the marketing staffs get the order from facsimile machine, they will put it in the incoming order's tray for the sales to record the order.

(2) Order recording by marketing & sales

The sales team will put the record of the order from the order book in order to get the order number once they get the order at the incoming tray. At the end of the day, sales team will put all orders of each day in the excel sheet and save it in the hard disk, then, they will print it out and send to the factory by fax.

(3) Order sending to the factory

The factory staffs will check the incoming order at the facsimile machine and take those orders to process for the daily production and delivery.

(4) Order making & delivery to customers by the factory

Once the products are produced and the delivery date is due, the factory staffs will deliver product to the customers and inform the sales & marketing for the delivery.

Sales & marketing staffs are unlikely to recheck the order amount and the delivery with the factory. Sales & marketing will rely on the fax that they received from the customers while the factory will strictly process according to the fax sent by the sales & marketing. Once the customers would like to check their order and delivery, they can't get accurate information. Figure 2.2 is a context data flow diagram of the existing system.

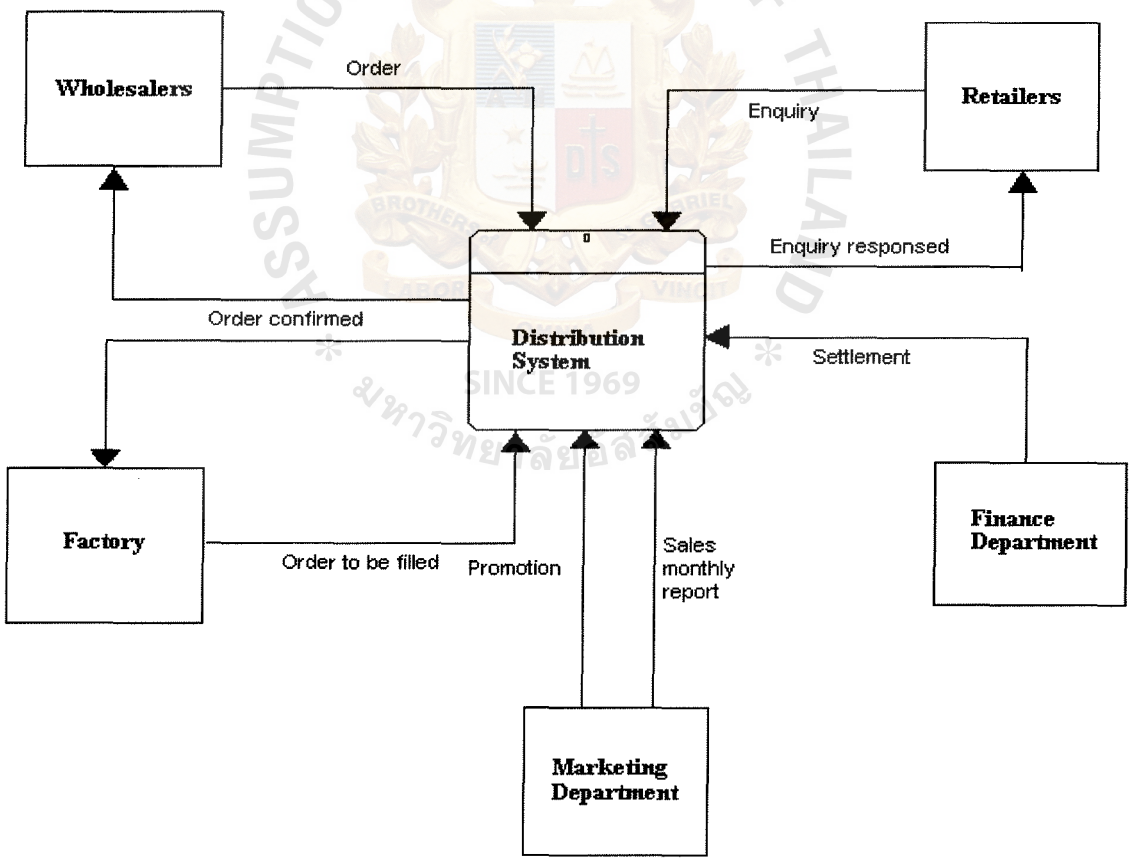

Figure 2.2. Context Data Flow Diagram of the Existing System.

III. PROPOSED SYSTEM

3.1 Requirement Analysis

The proposed system must meet the organization's and customer's needs so interviewing the relevant sources have been done to get the users' requirements on the proposed system. The scope of the proposed system is classified into five major categories as Input, Process, Output, Database and Location

(1) Input

The customers order input is designed to get the information and details of customers order into the database. Major information in the system is wholesalers, retailer, product, unit and price.

(2) Process

This will replace the manual system for the process of order placing from customers to sales & marketing and factory through the web browser inquiry, friendly user interface and powerful database management systems.

(3) Output

The information and details of order placing by customers will be shared between sales & marketing and factory. Inventories' figure can be viewed and controlled by the proposed system to check the quantities minimum order etc. Customers can view their order information to trace the delivery of their order. Besides, the periodical reports can be generated as requested.

(4) Database and file

The system must be able to store the customers' and orders' information in the main server and also provide the daily backup file. All

information records must be accessible by customers name and customers ID and the purchase record must be accessible by the order and its ID.

(5) Location

The computerized system must meet the needs of various sources within the organization and its environments ie customers. It should allow the users to share necessary data concurrency through Local Area Network within the organizations.

As problems are identified, the analysis is needed to define the cause and effects of the problems. Then, the improvement objectives will be set with the prescribed constraints of the system. Table 3.1 shows the analysis results.

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Table 3.1. Problem, Opportunities, Objectives and Constraints

Cause and Effect Analysis		System Improvement Objective	
Problems	Causes and Effectives	System Objective	System Constraints
Response time of order placing & delivery are not acceptable	Customers can get/trace their order Sometime, an order has been delivered to customers twice and customers were asked to accept the duplicated order by getting some discounts	Increase the response & delivery time by80%. Decrease the searching time by85%.	Hardware and Software are used in the proposed computerized system to determine the response, delivery and searching time.
Data inaccuracy	Human error in data input and transferred process Multiple storage caused the date inconsistency and creates unreliable information	Eliminate the human error for data entry by70%.	Data verification with the information source is impractical
Redundant data in organization	Sometimes, manual operation caused no data updated and lack of the cooperation for the data/information updated The diskette's media storage can't be held big amount of data which is required an update once the data has been changed Media storage will keep at the sales & marketing department, while the factory will make their own record by writing and sometimes, put the order information in the diskette	Replace a manual operation with computerized system to reduce the paper work and work load Increase work collaboration through computerized system	No new employment on the data entry operator Diskette to keep the data will be reduced

3.2 System Analysis

3.2.1 Data Modeling

It is a technique for organizing and documenting a system's data. The complete data model is usually implemented as a database. Typically, the data model is called an entity relationship diagram (ERD). There are three levels of entity relationship diagram:

context data model, key-based data model and fully attributed data model. The context data model, key based entity relationship diagram and fully attributed entity relationship diagram are depicted in Appendix A.

The context data model represents only the entity and relationship between each entity. There are four entities that were discovered in the system: Customer Information, Order Record, Product Information. Each entity has the relationship, when combined with the entity name, in form of simple business sentences or assertions.

In key-based data model, the primary and foreign keys are added to each entity to exhibit the unique characteristic of each entity. Customer Information has a single attribute, primary key, whereas Order Record, and Product Information have two attributes that uniquely identified an instance of the entity. All relationships contributing foreign key from their parents (Customer Information) to child (Order Record and Product Information) are defined instances of the child entity.

The final data model, fully attributed data model, shows all attributes of each entity. To identify all attributes, it requires the understanding of the data attributes for the system. These facts can be discovered through the study of the existing reports and documents to be the naming standard for attribution.

3.2.2 Process Modeling

Process modeling is a technique for organizing and documenting the structure and flow of data through a system's process and/or the logic, policies, and procedures to be implemented by a system's process.

The context diagram is drawn to establish the initial project scope for the constructing of the process model. It defines how the developed system interacts with other systems and the business as a whole. Figure 3.1. illustrates the context data flow diagram of the proposed computerized system.

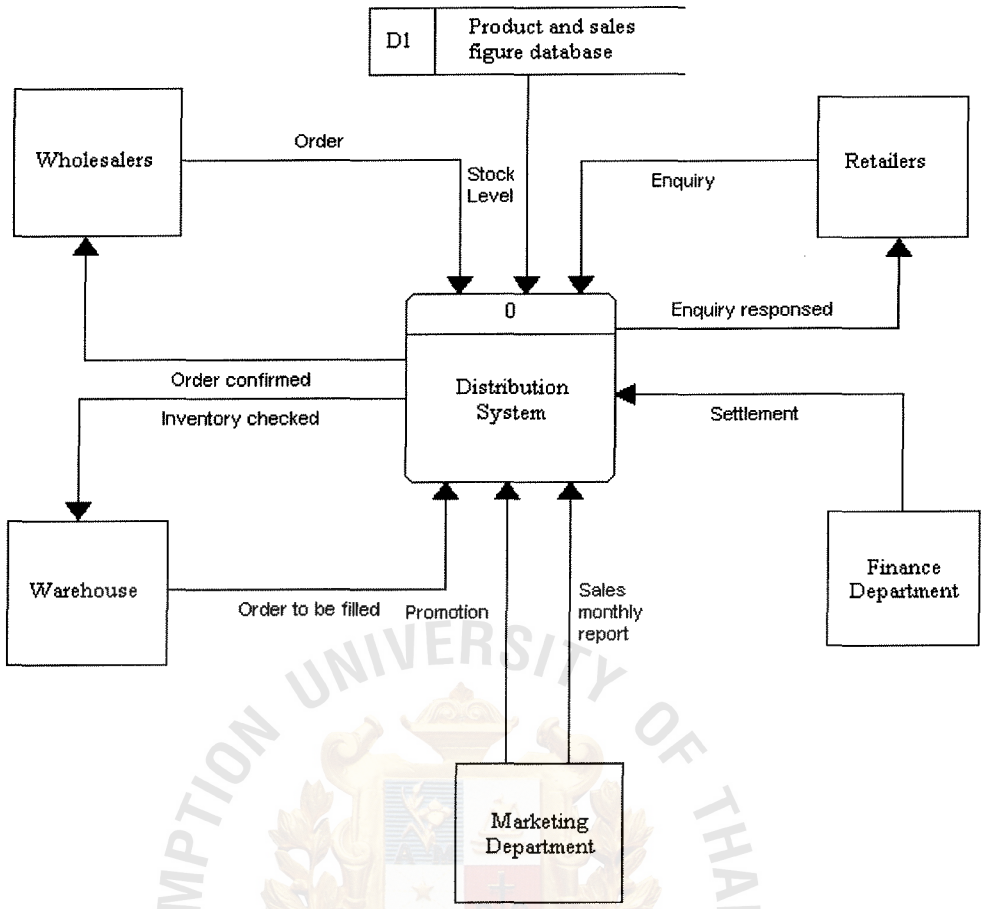

Figure 3.1. Context Data Flow Diagram of Proposed Computerized System.

Once Context Data Flow Diagram is defined, the next step is to specify more details about the proposed system. The Data Flow Diagram consists of processes, data store, external entities and data flow. If there is any process in the data flow diagram that has more details about the process, then it needs to decompose into more specific processes to illustrate more on how each process operates.

Distribution System consists of five major subsystems. They are Enquiry & Order Placing, Customer Verification, Inventory Verification, Report Generating and Order Delivery and Billing process.

Next, the funtional decomposition diagram is created to show the top-down structure of a system. This diagram will also serve as an outline for drawing the data flow diagram. The functional decomposition diagram of the proposed computer system is shown in Figure 3.2 which composes of five main subsystems.

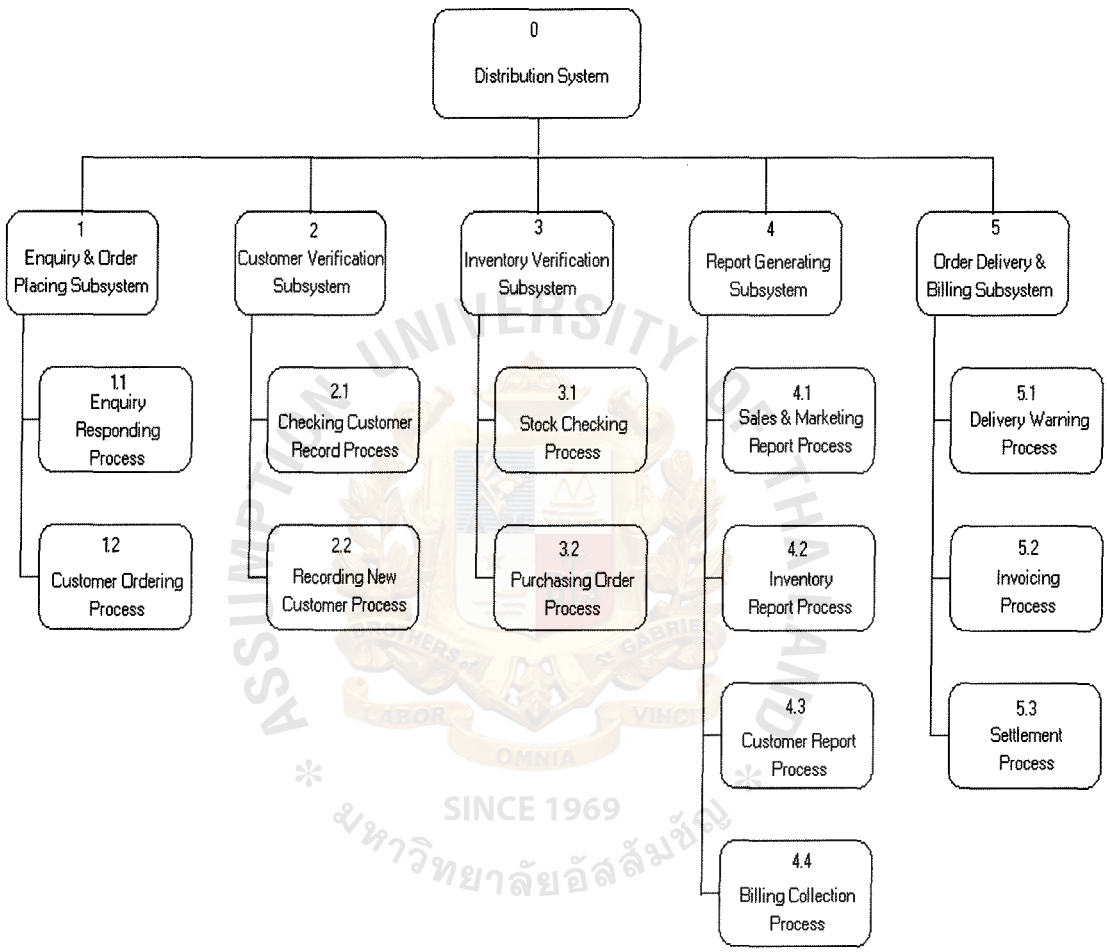

Figure 3.2. Functional Decomposition of the proposed computer system.

The brief description of each subsystem is explained as follows:

(1) Enquiry & Order Placing

It is a process for customers sending enquiries or sending an order to the system.

(2) Customer Verification

It is a process to verify the customer data in the database to ensure the customer information is valid.

(3) Inventory Verification

It verifies an order receiving from customers with the inventory system to ensure that the products exist and stocks are available.

(4) Report Generating

It is a process for generating reports of the requested activities. The generated reports are designed as per requirement of users. Then users will use this information according to their intention.

(5) Order delivery and billing

It is a process of informing when an order will be delivery to customer and when the billing is sent to the customers.

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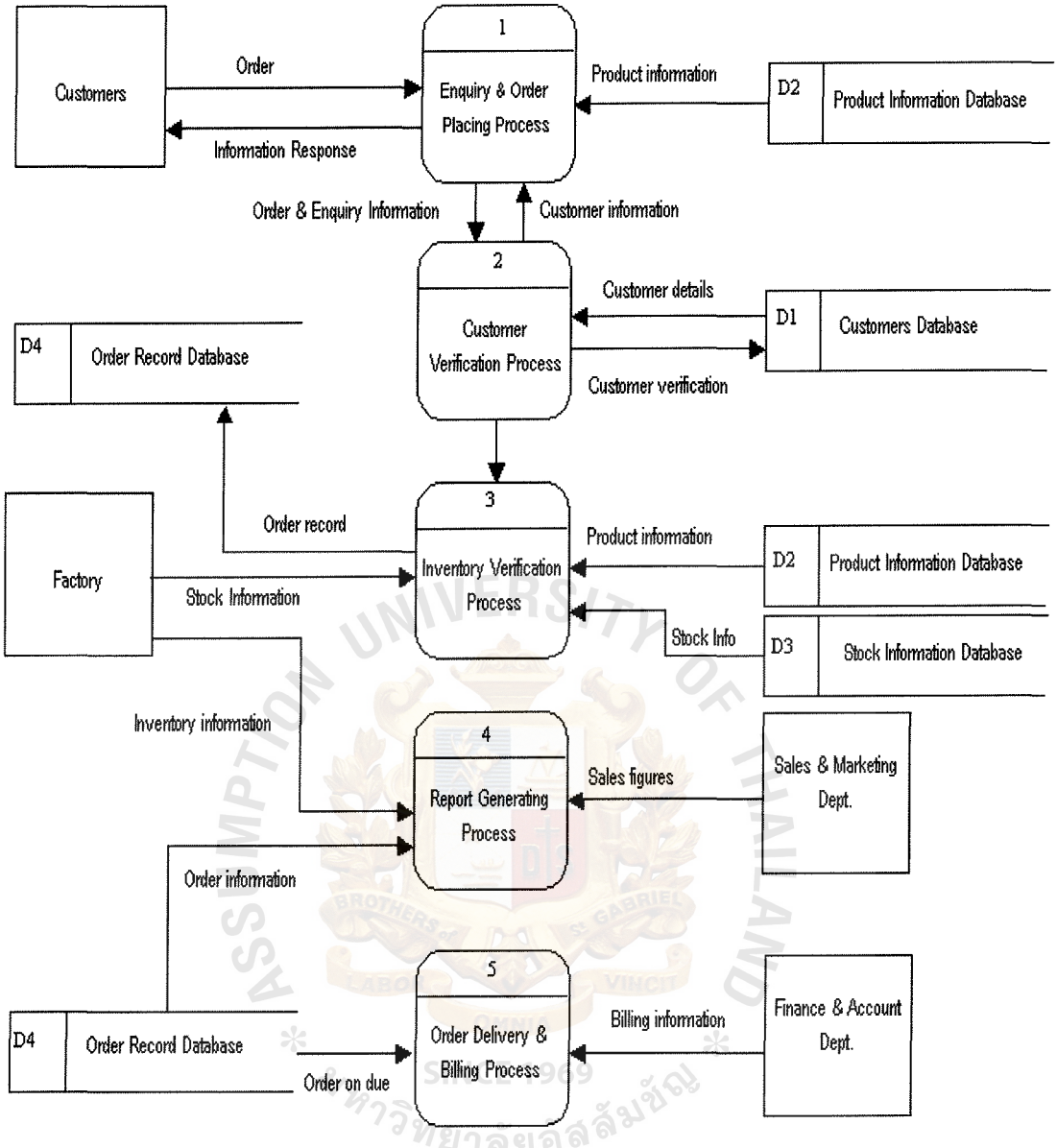

Figure 3.3. Context Data Flow Diagram of Proposed Computerized System.

3.2.3 Network Modeling

Network modeling techniques describe what data is captured and how it flows along the system. It is the technique for documenting the proposed system in terms of business locations. Location Connectivity Diagram is employed for depicting business location of the proposed computerized system. It outlines the geography of business in term of its users, data, process and interface location.

Location is a place where users interface with the proposed computerized system or where the business transaction takes place The connectivity are communications that occur between business locations. It defines the means for data transmission from one to another place. It also represents the possibility of data flows between locations.

3.3 System Design

The previous requirement analysis section primarily focuses on the logical aspects of a system, whereas system design deals with the physical implementation aspects of a system. Various design techniques are applied to construct the system to accomplish the objectives of the project. The details of each design technique can be explained as follows:

3.3.1 Candidate Solution Analysis

The business requirement established in the previous section. The alternative candidate solutions can be identified from the idea and opinion of the development team and users. Along with reviewing the system specification, the three candidate solutions are defined for the proposed system.

(1) Candidate 1: Resources Sharing LAN – File Server

MS Visual Basic 6.0 is a very popular development tool. The programmer can use it without any technical assistance. As a visual style of MS product, it facilitates the programmer to develop the new application quickly. For network architecture, the file server is used in this candidate to store the database, and the Client PC executes all database instructions. This means that the entire database and tables may have to be transported to and from the client across the network. The database software, MS Access 97, is used to manage data in the system.

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It is easy to implement because MS Visual Basic 6 is available for the programmer to use, and the current network architecture, Local Area Network (LAN), also supports this kind of configuration. Thus, this candidate takes less time to design and implement in the current environment.

(2) Candidate 2: Oracle Developer 2000 & Personal Oracle 8.0

Oracle Developer 2000 is the development tool in this solution, while DBMS is Personal Oracle 8.0, because it is an efficient DBMS with a flexible application development tool that is suitable for dealing with relational database. However, it is difficult to use and implement. Its cost is also high.

(3) Candidate 3: Two Tier Client/Server Computing – Web Database

Active Server Page 3.0 and MS SQL Server are used in this candidate to develop web-based Application. The network architecture for this solution is Two Tier Client/Server Computing. The database server serves not only as the system database, but also as the web server for the developed program. Thus, this kind of architecture is called Corporate Intranet. This candidate can be implemented very quickly because it requires only a web browser to run the developed application. No additional software is installed in Client PC. Active Server Page (ASP) 3.0 is the best solution in developing application, and Internet Information System (IIS) 5.0 serves as a web server to respond to any requests from Client PC.

Table 3.2 Candidate Systems Matrix

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized Brief description of the portions of the system that would be Computerized in this candidate	Full supported all relevant departments involved in distribution process	Same as candidate 1	Same as candidate 1
Benefits Brief description of the business benefits that would be realized for this candidate	Easy to develop with the existing tools.	Powerful DBMS and application enable user performing their tasks more efficiently and effectively.	Quickly implemented on client PC and easy application development.
Servers and Workstations A description of the servers and workstations needed to support this candidate.	Pentium 4, MS Windows 2000 servers, and MS Windows 98.	Same as candidate 1	Same as candidate 1
Software tools needed Software tools needed to design and build the candidate (e.g., database management system, emulators, operating systems, languages etc,) Not generally applicable if applications software packages are to be purchased	Microsoft Visual Basic 6.0 Microsoft Access 97	Developer 2000 Personal Oracle 8.0	Microsoft ASP 3.0 Microsoft Internet Information System 5.5 Microsoft SQL Server 7.0
Application software A description of the software to be purchased, built, accessed, or some combination of these techniques	Custom Solution	Same as candidate 1	Same as candidate 1
Method of data processing Generally some combination of: on-line, batch, deferred batch, remote batch, and real-time.	Database stored on server and processed on workstation	Oracle uses a twotier Client/ Server architecture with a powerful database server	Database stored and process on MS SQL Server and GUI on workstation.
Output Devices and Implications A description of output devices that would be used, special output requirements (e.g., network, preprinted form, etc.), and output considerations (e.g., timing constraints).	Display Monitor HP laser printer	Same as candidate 1	Same as candidate 1
Input Devices and Implications A description of input methods to be used, input devices (e.g. keyboard, mouse, etc.), special input requirements (e.g., new or revised forms from which data would be input), and input considerations (e.g. timing of actual inputs)	Keyboard and mouse	Same as candidate 1	Same as candidate 1
Storage Devices and Implications Brief description of what data would be stored, what data would be accessed from existing stores, what storage media would be used, how much storage capacity would be needed, and how data would be organized	File Server with 100 GB storage capacity	Oracle SQL Server DBMS with 50 GB storage capacity.	MS SQL Server DBMS with 100 GB storage capacity.

3.3.2 Feasibility Analysis

The feasibility analysis will be done for each candidate after the candidate solutions are identified. The following feasibility criteria should be considered if the development team wants to choose the best solution to implement in the production environment.

(1) Operational feasibility

It measures how well the solution of problems or a specific solution will work in the organization, and how people feel about the system/project. All candidates are fully supporting the current business process but candidate 3 is the most feasible because it can be implemented very quickly without additional software installation and hardware upgrades.

(2) Technical feasibility

It measures the practicality of a specific technical solution and the availability of technical resources and expertise. Candidate 2 is the most difficult to implement. Candidate 1 and 3 are easy to design and implement and the current programmers can easily learn and understand how to write MS Visual Basic 6.0 and Active Page Server 3.0 by sending them to get the training on MS Visual Basic 6.0 or Active page Server 3.0.

(3) Economic feasibility

It measures the cost-effectiveness of a project or solution. Candidate 1 and 2 require only a medium hardware and a system analyst to implement and operate the developed system. However, Candidate 3 is the most economical as it consumes the smallest amount of investment with shortest payback period, while Candidate 2 takes the largest investment among all candidate solutions.

(4) Schedule feasibility

It measures how reasonable the project timetable is. Candidate 1 takes the least time to implement because the development tool, MS Visual Basic 6.0, is the company standard and a rapid application development solution. Candidate 3 spends slightly more time than Candidate 1 but it is also a quickly implemented solution. Conversely, Candidate 2 consumes the most time to design and implement the proposed system because the oracle product is very complicated and difficult to learn without any technical assistance from Oracle Company.

All four feasibility criteria assessments are provided for each candidate solutions. Each feasibility criteria for each candidate will be scored, and multiplied by the weight, which is expressed in percentage, distributed from the total 100% to all four-feasibility criteria according to their degree of importance. The weight scores of each feasibility criteria are summed up for each candidate to rank the candidate solution of the proposed system.

The feasibility analysis result indicates that Candidate 3 has the highest scores in Operational, Technical and Economic Feasibility except in Schedule Feasibility. Thus, Candidate 3 has the highest total score, and ranks the best solution for the proposed system.

Table 3.4 Feasibility Analysis Matrix.

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility Functionality. A description of to what degree the candidate would benefit the organization and how well the system would work.	30%	Fully supports the user requirements in terms of both functionality and business process. Score: 85	Fully supports the user requirements in terms of both functionality and business process. Score: 95	Fully supports the user requirements in terms of both functionality and business process. Score: 95
Technical Feasibility Technology. An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate.	20%	Programmer is familiar with Microsoft products therefore this reduces development process. Microsoft Visual Basic 6.0 and MS SQL Server 7.0 is a company standard for application development. Score: 80	Oracle is the leading DBMS software that provides high efficiency. But programmers have no experience with oracle product. This requires the continuous training course for operating and maintaining the system. Score: 75	Microsoft SQL Server is Company Standard for DBMS. While ASP is a widely accepted technology in Intranet application development. Internet Explorer is available in all company PCs and is suitable to support a system with a large number of users. Score: 90
Economic Feasibility Cost to develop (Baht) :	30%	Approximately 650,000 Score: 90	Approximately 755,000 Score: 80	Approximately 500,000 Score: 95
Schedule Feasibility An assessment of how long the solution will take to design and implement.	20%	Approximately 8 months Score: 80	Approximately 11 months Score: 70	Approximately 6 months Score: 90
Ranking	100%	84.5	81.5	90.5

3.3.3 System Architecture

The Feasibility Analysis Matrix indicates that web-based application should be selected. Therefore design of the proposed computerized system is based on Intranet architecture. Intranet architecture has two major components – web server and web client. Web server provides a set of shared user services to all clients while performing data management and storage function concurrently. On the other hand, web client

provides Graphical User Interface (GUI) to users for accessing the data received from the web server.

For authoring web pages, both webs authoring software and graphic design software are needed. The web page development tool should be an object oriented application, because it is user-friendly and reduces development time. For graphic design software, the standard software should be selected.

Technologies for developing the proposed computerized system are identified in the following four components: Data, Interface, Process and Network.

(1) Data Architecture

Intranet technology allows the proposed computerized system to have a centralized control through distributed relational databases. This kind of database stores data in a tabular form, in which each file contains data in rows (records) and columns (fields). All data are stored on the server and all access and update commands are executed on the server. Business logic and user interface are programmed and executed on clients through the use of a web browser.

(2) Process Architecture

Software Development Environment (SDE) for the proposed computerized system consists of programming languages with built-in SQL connectivity, such as Java, Visual Basic etc. It provides Rapid Application Development (RAD) for building Graphical User Interface, automatic code generation with associated system events, various database connectivity and interoperability, report writing tools, and more.

(3) Interface Architecture

The proposed computerized system will store all user interface and business logic on clients. On-line processing is used, because some users can do transactions or inquire some information from the system. In addition, input devices, output devices, and middleware are identified as follows:

(a) Input Devices

Computer mouse and keyboard are major input devices of the proposed computerized system.

(b) Output Devices

PC Monitor and printers are output devices of the proposed computerized system.

(c) Middleware

The proposed computerized system interfaces with other systems via a standard interface feature. The Open Database Connectivity (ODBC) is selected as a standard for system interface.

(4) Network Architecture

At present, there is no network infrastructure for the company. For the proposed computerized system, web server will store database that is accessed by client web browser through LAN. It will increase data sharing between users, retain data integrity through centralized control and reduce data inconsistency.

3.3.4 Structure Design

To facilitate the development of the computerized system, structure design technique is used to break up the program into a hierarchy of modules that results in a

program that is easier to implement and maintain. Data Flow Diagram (DFD) from requirement analysis section is used as input of structure design. The logical DFD, which depicts the business requirement of the proposed computerized system, is converted to Program DFD, which illustrates the technical aspects of the proposed computerized system. The output of structure design is partitioned data flow diagram and structure chart.

3.3.5 Process Specification

It is to define what the system does to transform inputs into outputs. The details of system processes in table format, which is easier to look at all related input, output, and relevant process than in a diagram, is provided.

3.3.6 Data Dictionary

To support system design, data dictionary provides a list of terms and definitions for all data items and data stores within the developed system.

3.3.7 Database Design

ERD in the data model requires some additional processes called data analysis to convert the designed logical data model into implemented database. In data analysis, a normalization technique is used to transform all data in ERD into applicable database. The result of database design is database structure in table format.

3.3.8 Input Design

To design system input, it needs the information from data flow diagram. These system inputs are shown as data flows that connect external entities to process, and process to process. The selected attributes are reviewed to define the appropriate caption or label that clearly identifies these attributes appearing on the input screen. Input control is used to ensure that the data input to the computer is accurate and that the system is protected against accidental and intentional errors and abuse, including fraud.

3.3.9 Output Design

Output requirements come from data flow diagram. These system outputs are easily identified and examined through the data flows that are connected to external entities. More details of output design can be gathered from interviewing the system users about their output requirements.

3.4 Hardware and Software Requirements

The selected candidate solution requires one database and application server to implement the system. As the existing manual operation has only few stand-alone PCs, the proposed computerized system will acquire a new server to be used as a database and application server. The software of the proposed computerized system is composed of four major modules which are the operating system, web server, application server and database server. Tables 3.3 and 3.4 show the hardware and software specification of the database server in the proposed system.

Table 3.3. Database Server Specification.

Device	Specification
Processor Type and Speed	INTEL Pentium 4 1200 MHz or higher
Cache Memory	256 KB
Primary Memory	SDRAM 512 MB or higher
Hard Drive Capacity	100 GB or higher
CD-ROM Drive (X)	40X or higher
Floppy Drive	3.5" 1.44 MB
Display Monitor	IBM SVGA 14"
UPS	UPS, 500 VA Power Line

Table 3.4. Server Software Specification.

Software	Specification
Operating System	Microsoft Windows 2000 Server (Service Pack 2)
Web Server	Microsoft Internet Information System 5.5
Application Server	Microsoft Active Server Pages
Database Server	Microsoft SQL Server 7.0

With Intranet technology, the existing personal computers (PCs) can be used as client machines without any upgrading hardware capacity. The client machine requires only a web browser, such as MS Internet Explorer, to run the developed application, and some application programs, such as word processing and spreadsheet, to perform the general function. Therefore, the client machine must have hardware specification high enough to run MS Windows 2000 and Microsoft Office 97 as general standard. The hardware and software specifications for each client machine are shown in the Tables 3.5 and 3.6 respectively.

Table 3.5. Client Machine Specification.

Device	Specification
Processor Type and Speed	INTEL Pentium II 500 MHz or higher
Cache Memory	256 KB
Primary Memory	SDRAM 64 MB or higher
Hard Drive Capacity	6.40 GB or higher
Floppy Drive	3.5" 1.44 MB
Display Monitor	IBM SVGA 14"

Table 3.6. Client Software Specification.

Software	Specification
Operating System	Microsoft Windows 98
Web browser	Microsoft Internet Explorer 5.0 or higher
Application Software	Microsoft Office 97 Professional Edition

The connection between Database server and client machine will be established through the new network system. There will be investments in network peripheral, which specification is shown on Table 3.7.

Table 3.7. Network Peripheral Specification.

Network Peripheral	Specification
Network topology	Star topology
Hub	16 Base-T Hub
Card	Network interface card
Interconnection	3 Com 12 10/100 Mbps
Wiring and cable	UTP 4 pair CAT5

The network configuration of the proposed computerized system is Intranet which user can easily interface to access application and information. Intranet applications are also easy to develop with the widely used development tool. The users do not need to install the developed software on client as the web browser software can be used to execute the developed application stored in the database server. The network architecture of the proposed computerized system is shown on Figure 3.4 Network Configuration of the Proposed Computerized System.

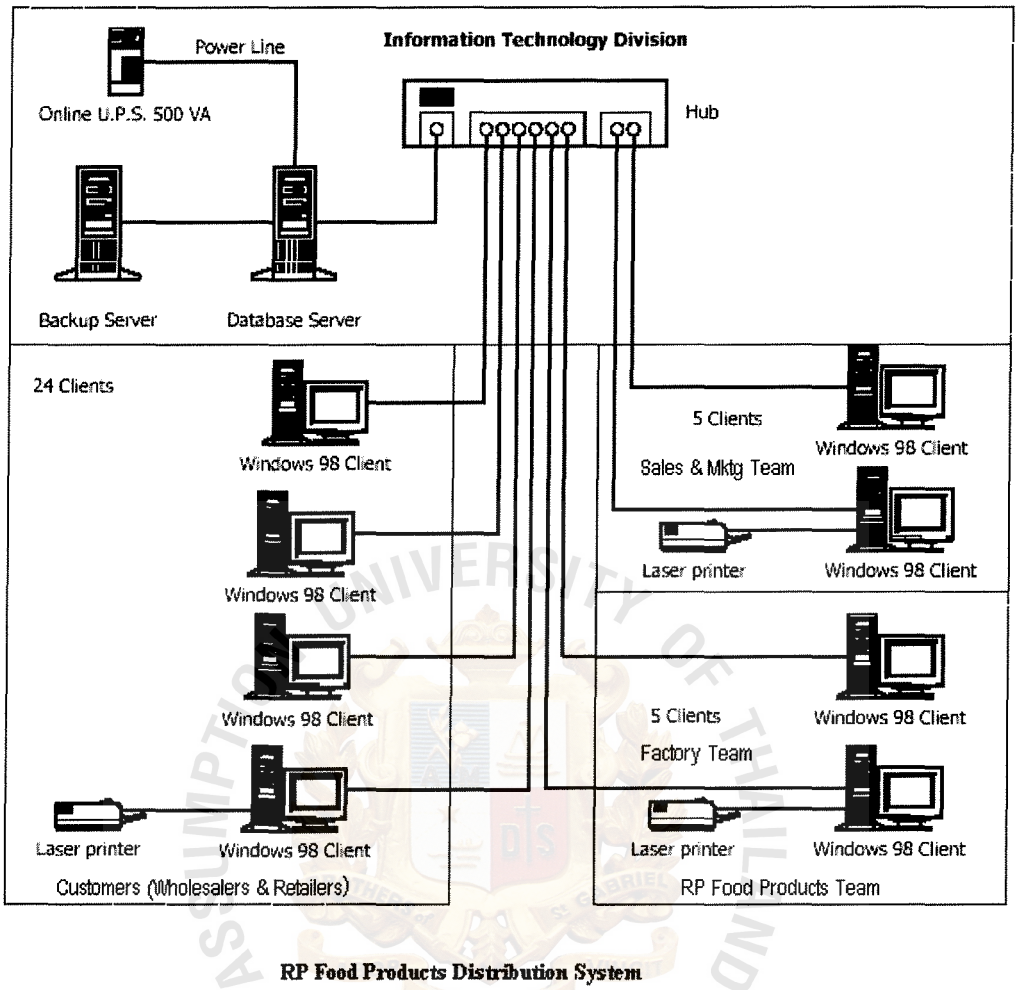

Figure 3.4. Network Configuration of the Proposed Computerized System.

3.5 Security And Controls

According to our IT security policy, the following minimum requirement of security standard must be applied to every computerized system to prevent unauthorized access and alteration to the system.

(1) Identification

The system must have the unique User ID and Administrative System ID. The procedure to control the creating of User ID must be set up to ensure the proper verification over the system users. The user responsibility

to the system must be specified in advance before granting authorized level to each user. Every User ID must have an owner, and can prove their existence. In each department, User ID must not be shared among officers and staffs. Administrative System ID must be carefully assigned to the responsible person for managing all Users ID of the system. System log is required to keep track of all changes made to the system.

(2) Authentication

The password system is required to authenticate the assigned User. The system/security parameter of password feature must be carefully configured to ensure the password is properly defined and monitored. The characteristics of good password feature are the specification of minimum range of password (normally 6 to 8 lengths), non-displaying password on system screen, forces user to change password automatically when the password is expired in specified duration, and locks User ID when entering incorrect password more than specified time. The users must keep their password secret to prevent unauthorized person to use their password to enter the system and cause the unauthorized alteration to the system.

(3) Authorization

The authorized level of each user must be carefully assigned to limit the area of accessing to the system information because of the sensitivity of data and software. The user authorization should be updated when the users change their responsibility or are deleted from the system when the users resign. These user authorizations have to be reviewed every 6 months to ensure that the users have the appropriate authorization in the system.

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(4) Auditing

The system must have audit trail to investigate the system in case of unauthorized access and alteration to the system. The audit trail may be in form of system log to monitor the changes to the system and the access violation. This log has to be reviewed by the assigned person on a consistent basis.

(5) Production Environment

The system must separate the development area and the production area when developing the new application program. This practice ensures the proper control over the unauthorized modification of the developed program in the production area because any new or modified programs must be tested in the development area before migrating into the production area.

(6) Backup and Recovery

The backup and recovery procedures are required to ensure the availability of system information. The backup may be done on a daily, weekly or monthly basis according to backup schedule. The recovery process must be cleared to ensure that all relevant persons know how to restore information from backup media into production.

3.6 Cost-Benefit Analysis

The analysis on the cost of the existing manual operation and the proposed computerized system must be done before the decision making to develop the proposed computerized system. Moreover, the benefits of implementing the proposed computerized system must be addressed. Cost-Benefit analysis provides quantitative analysis for both manual operation and proposed computerized systems for the system owner to make a decision on the system development. Once both cost and benefits are

analyzed, the analysis techniques are used to indicate the value for implementing the proposed system. Break-even, payback and net present value analysis techniques are used in the proposed system.

3.6.1 Cost Analysis

(1) Cost of the existing manual operation

At present, the existing manual operation incurs both fixed and variable cost. The fixed cost is the initial investment for office equipment cost, while variable cost is the system operating expense such as personnel expense, office supplies and miscellaneous expense.

(a) Fixed Cost

The sales & marketing team, including the factory team require workstations to support their tasks. It will cost only once as an investment, but in the later years, the maintenance cost must be allocated for repairing them.

(b) Operating Cost

It is classified into two types. For personnel cost, it covers salary expense of staff who are involved in order receiving and delivering process; while office supplies and miscellaneous cost includes all expenses related to order preparing and sending from sales & marketing office to factory such as stationery, paper, utility and others.

All costs in the existing manual operation will increase by 20% per annum with an exception of personnel cost, which will grow only by 10% per annum.

For comparison purpose, the summarized cost of the existing system is presented in Table 3.8.

Table 3.8. Summarized Cumulative Cost of Existing Manual Operation, Baht.

Cost items	Year 1	Year 2	Year 3	Year 4	Year 5
Fixed Cost	64,800	155,500	55,500	55,500	55,500
Operating Cost					
1. Personnel Cost	996,300	3,200,000	4,180,000	4,880,000	5,680,000
2. Office Supplies&Miscellaneous Cost	158,266	321,000	265,200	318,240	381,888
Total Annual Operating Cost	1,154,566	3,521,000	4,445,200	5,198,240	6,061,888
Total Manual System Cost	1,219,566	3,676,500	4,500,700	5,253,740	6,096,888

(2) Cost of the proposed system

In developing the proposed computerized system, there are two major costs-system development and system operating cost. These costs are expected to increase more than 20% per annum.

(a) System Development Cost

It includes the hardware, software, people-ware and implementation cost. Workstation, UPS, operating system, application and database management system software are major hardware and software. All of these resources need to be provided for the development of the proposed computerized system.

For people-ware cost, it is the salary of the development team, which is composed of system analyst, programmer, network specialist, database specialist, etc. Each personnel cost varies according to their involvement in the system development.

Implementation cost has two main items - training cost and installation cost. Training cost includes training manual and training

course. Installation cost includes hardware and software configuration and installation.

(b) System Operating Cost

It consists of hardware & software maintenance cost, people-ware cost and office supplies and miscellaneous cost.

For hardware & software maintenance cost, the expense is based on the number of workstations and software licenses used in its operation. This expense is the charge for technical support from vendors of both hardware and software.

For people-ware cost, there are two categories of personnel involved - users and system administration. Users include sales & marketing manager, sales & marketing officer, factory staff, account/finance team and customers. The system administrator is a new operation unit in distribution process that is formed to support all teams in technical issues related to the proposed computerized system.

Fifty percentages of their salaries will be shared to all other departments that use their services except customers.

Office supplies & miscellaneous cost will be reduced as a result of implementation of the proposed computerized system. It includes expenses related to the order & delivery operation such as stationery, paper, utility and others. Summarized cost of the proposed computerized system is shown in Table 3.9.

Table 3.9. Summarized Cumulative Cost of the Proposed Computerized System, Baht.

Cost items	Year 1	Year 2	Year 3	Year 4	Year 5
Fixed Cost	64,800	31,250	37,500	45,000	54,000
Operating Cost					
1. Personnel Cost	1,530,241	2,419,163	3,238,593	4,040,769	4,808,518
2. Office Supplies & Misc. Cost	687,400	687,400	687,400	687,400	687,400
Total Annual Operating Cost	2,217,641	3,106,563	3,925,993	4,728,169	5,495,918
Total Proposed System Cost	2,282,441	3,137,813	3,963,493	4,773,169	5,549,918

Table 3.10. Summarized Cost Saving of the Proposed Computerized System, Baht.

Cost items	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost					
1. Hardware Cost	356,500	80000	90000	100000	110000
2. Software Cost	185,000	100000	110000	115000	115000
3. People-Ware Cost	200,200	160000	161600	164600	179800
4. Implementation Cost	168,000	156000	162960	167760	176880
Total System Development Cost	909,700	496000	524560	547360	581680
Operating Cost					
1. Maintenance Cost	160000	147,500	147,500	152,200	157,000
2. Personnel Cost	245000	234,000	244,440	251,640	265,320
3. Office Supplies & Misc. Cost	84800	76,000	81,600	88,700	97,600
Total Annual Operating Cost	489,800	457,500	473,540	492,540	519,920
Total Computerized System Cost	1,399,500	953,500	998,100	1,039,900	1,101,600

(3) Comparison of System Cost

Once the system cost of both existing manual operating and proposed computerized systems has been calculated, this information can be used to construct the system cost comparison table to evaluate the cost saving from implementing the proposed system. The figures are summarized in the Table 3.10.

Table 3.11. Comparison of Accumulated Cost of the Existing Manual Operation and the Proposed Computerized System, Baht.

Year	Accumulated Cost of Existing Manual Process	Accumulated Cost of Proposed Computerized System
1	1,219,566	2,282,441
2	4,896,066	5,420,254
3	9,696,766	9,383,747
4	14,950,506	14,156,916
5	21,047,394	19,706,834

The above table indicates the accumulated cost of both existing manual operation and proposed computerized systems. It shows that the existing manual operation has a lower accumulated cost than the proposed system only in the first two years.

(4) Break-even Analysis

Break-even Analysis shows the point where the accumulative cost of the existing manual operation is equal to the accumulative cost of the proposed computerized system. At the beginning, the cost of the proposed computerized system is higher than the cost of the exiting manual operation. This difference comes from the development cost incurred at the first year of the new system implementation. But, for the long term, the proposed computerized system will be reduced the annual operating cost, especially salary cost and office supplies cost.

The break-even point of the proposed computerized system is depicted on Figure3.5. The proposed computerized system cost is less than the existing manual operation cost when the time passes the second year. Thus, it can be concluded that the break-even point will occur approximately 1.8 years after the system has been operated.

This result is satisfactory for investing and implementing the proposed system because it will incur less operating cost than the existing system in the long run operation.

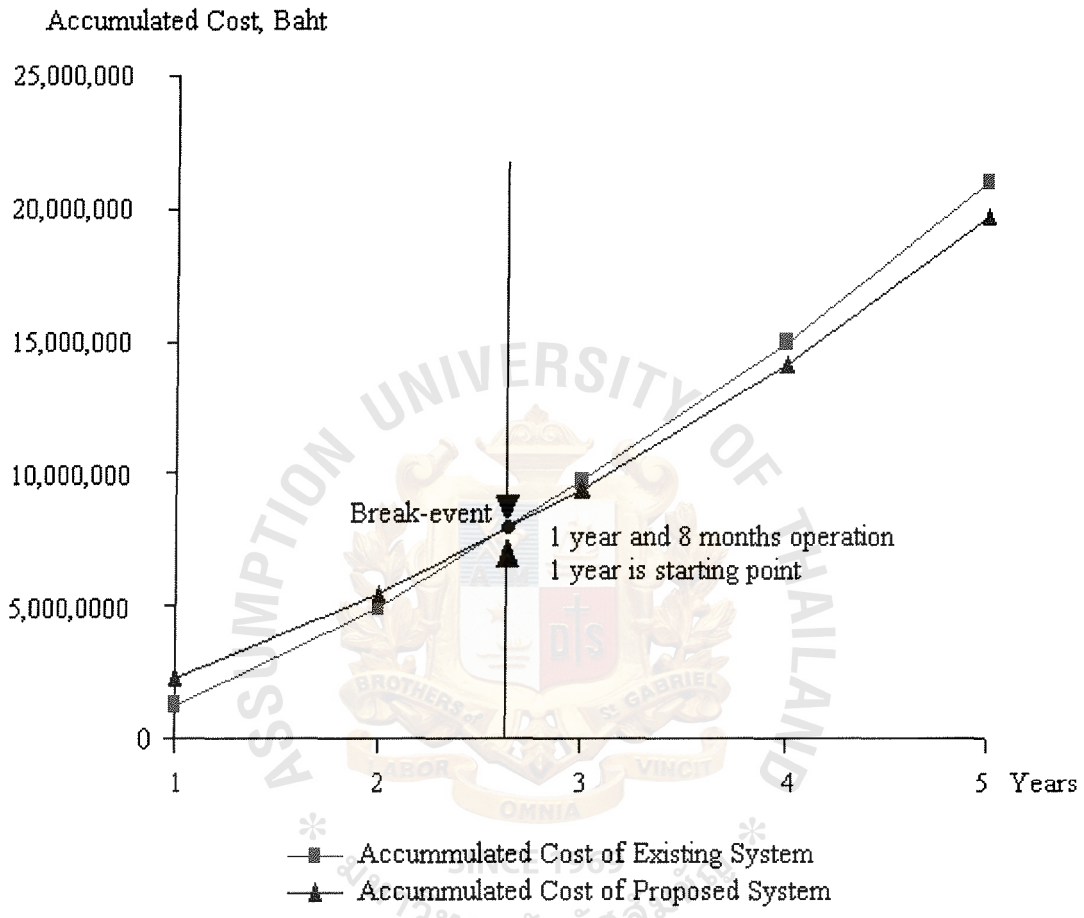

Figure 3.5 Break-Even Point Analysis

(5) Payback Period

Payback period analysis is a commonly used technique to evaluate the investment value of the project. It represents a time period that cash inflow can recover all initial investment of the project. In other words, it measures how quickly the project will return its original investment. In order to evaluate the investment, the maximum pay back period must be specified. The specified payback period is based on the management perspectives on size of investment, which is around five years for this project.

Nevertheless, payback period is not accountable for time value of money concept that reflects the real value of investment. Thus, time value of money concept should apply in the payback period analysis. The discount rate must be specified for calculating discount value of all cash inflows and outflows at present year. It normally refers to deposit interest rate that investment amount would receive if the investment is not made.

Payback period is generally represented in number of years that comes from dividing initial cash outflows by cash inflows. The project will be accepted only when it is less than or equal to the maximum payback period that has previously been specified.

For the proposed system, the desired payback period is assumed to be three years and the discount rate is 8.00 % per annum as per the current deposit interest rate. The analysis results show that payback period of the proposed system is 1.4 years, thus its payback period is acceptable.

The detailed calculation of payback period for each candidate solution is illustrated in Appendix C.

(6) Net Present Value

Net present value analysis is the discounted cash flow approach for evaluating the most effective investment alternatives. The cash flow includes both cash inflows and outflows from the system implementation.

With this technique, the discount rate must be set for calculating the present value of all cash flows in the project. The discount rate is the required rate of return on investment that generally equals to interest rate that investment amount would receive if the investment is not made.

After all required parameters are collected, the calculation will be done. Then the calculation results will be used for ranking the investment alternatives. The project will be accepted only when its net present value is greater than zero. If all alternatives have the positive net present value, the decision will be based on the net present value. Whichever alternative gives the highest net present value, that alternative will be selected.

For the proposed system, the required rate of return is equal to current deposit interest rate or 8.00% per annum. The analysis indicates that net present values of all candidates are positive. But candidate 3 gives net present value of 3,834,784 Baht, which is the highest value among all alternatives. And the return on Investment of candidate 3 also gives the highest value among all alternatives at 41%. The detailed calculation of net present value analysis for each candidate and return on investment is shown in Appendix C.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

After the analysis and design of the proposed computerized system have been done, it is ready to be implemented in the current operation. The typical processes of system implementation are presented in brief details as follows:

(1) Hardware and Software Acquisition and Installation

The proposed computerized system can utilize some existing hardware and software resources with some additional maintenance cost and license fee except for Database server, which must be newly purchased and installed as it does not exist.

(2) Personnel Training

The training will be provided for both end-user and system administrator to give them more understanding of the new system. All relevant users will be trained for the software using, and the system administrator will be trained for configuring the system and doing the control adding, updating, and deleting User ID and password of all system users.

(3) Site and Data Preparation

The IT Department will responsible for preparing the site to implement the new system. LAN connection and other facilities should be ready before the developed system is implemented. All relevant users will prepare data to input into the proposed computerized system.

(4) System Testing

Unit Testing, System Testing, and Integration Testing will be conducted to ensure that the proposed computerized system is working properly.

(5) Conversion Plan

Before converting the existing manual operation to the new system, the conversion plan must be prepared to serve as a guideline for the entire conversion process.

4.2 Stage of Project Implementation

To simplify the implementation process, the overall processes can be categorized into two main stages, which the details are as follows:

(1) Construction Stage

The purpose of the conversion stage is to build and test a functional system to ensure that the new system meets the business and design requirements. This stage includes the processes of installation and acquisition of the new hardware and software, preparation of data and site for the new system, and conducts the various types of testing to ensure there are no errors in this new system.

(2) Delivery Stage

In the delivery stage, the conversion plan is prepared to provide a smooth transition to the new system. Database is installed, and network is configured for the new system. The training and documentation are provided to relevant persons. Finally, the existing manual operation will be converted to the new system with a predefined procedure to ensure the smooth transition. After the new system is operated, the system evaluation

will be conducted to measure the new system performance, and to discover any trouble that may occur in the new system.

4.3 Training and Documentation

Before the new system is fully implemented, the training and documentation must be prepared for the system users. In addition, the document that may prove useful in developing the new system must be collected. The user manual must cover all system functions. Relevant persons must attend the training course and the training course must be arranged for a specific group ie. users training, system administration training etc.

4.4 Conversion

This project selects the parallel conversion to convert the existing manual operation to the new system. Both the old and new systems are operated for some time to ensure that there is no error and problems in the new system before the existing manual operation is discarded.

4.5 System Support

Once the proposed computerized system is implemented, ongoing maintenance of the system needs to be done. The four major areas of system support are as follows:

(1) System Maintenance

It aims to fix any possible program errors that occur after the system is implemented. The System analyst and programmer must coordinate to solve the program bugs and, sometimes, advise the users to fix the system troubles by themselves.

(2) System Recovery

As system failure is inevitable, it generally results in system crash and possible loss of data. Thus, a recovery plan must be specified to identify the roles and responsibilities of each unit in recovering the system.

(3) End-User Assistance

Although the training session has been conducted, users still need assistance in day-to-day operation of the system. It includes observing the system usage, conduct user satisfaction survey, change procedures, provide additional training, etc.

(4) System Enhancement

After the proposed computerized system operates during some periods of time, it is necessary to evaluate its performance against a standard measurement of system capacity. The evaluation result will serve as the criteria in deciding to improve the system or not. The objective is to modify the proposed system to respond to the new requirements, technology and maintenance cost.

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V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The proposed computerized system is introduced to facilitate the operation of distribution system. Intranet technology is selected for the proposed computerized system, as it would increase work efficiency, and reduce operating cost and time of the existing system.

Based on the cost-benefit analysis section, the existing manual operation has lower operating cost than the proposed computerized system during the first two years as indicated in the break-even point chart. But payback period of the proposed computerized system will take about three years to recover its investment. Table 5.1 illustrates the comparison of time between the proposed computerized system and the existing manual operation in the distribution process.

Table 5.1. The Degree of Achievement of the Proposed System.

Process	Existing Manual Operation	Proposed Computerized System
Enquiries & Order Placing	1 day	20 minutes
Customer Verification	1 day	10 minutes
Stock Verification	1 day	10 minutes
Report Generating	3 hours	10 minutes
Order Delivery and Billing	1 days	15 minutes

The details of how implementation of the proposed computerized system will improve the operating time of each process are summarized as the follows:

(1) Enquiry & Order Placing Process

The proposed computerized system can reduce data entry period by 20 minutes via online information system with the use of graphic user

interface. It is easier for customers to place an online order, and it also prevents data redundancy and human error problem.

(2) Customer Verification

This process will verify whether the customer is the old or new customer. The new customer needs to get registration with the system and waits for the contract to be signed. The existing customer will be allowed to log-in to our distribution system for the order making and it takes less than 10 minutes for the existing customer to place order if the system verifies & find the customer database in the system.

(3) Stock Verification

In the existing manual operation, the factory staffs will get the order by fax from the sales & marketing department and it takes a day or more to get the confirmation of the product delivery as the factory staffs need to check the stock if there are a lot of order during that period.

With the proposed computerized system, customers will know the approximate date of delivery within 10 minutes after the order placing.

(4) Report Generation Process

The existing system uses MS Excel file to generate the reports by searching, reformatting data and printing reports for distribution to relevant units. It spends more than one hour to prepare reports and the report may not accurate. The proposed computerized system will automate the process and reduce the processing time to only 10 minutes.

(5) Order Delivery and Billing process

Once the order is due to deliver, it will take only 15 minutes to notify the relevant parties of the delivery due and the system will generate the

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invoice to attach with the customer order in order to ask the customer for the settlement the payment of the order. Once the customer order has been delivered, the payment date must be recorded in this process.

5.2 Recommendations

After the proposed computerized system is implemented, the system performance must be evaluated to identify the difficulties that occurred during the operation. Then the system capacity standard should be compared with the actual system performance for evaluating the proposed computerized system. The evaluation is discussed among the users and the development team for system enhancement.

In addition, the developed system is expanded to support the related process such as issuing Purchase Order, printing VAT input and output, etc.

The technology trend should be considered, because it grows very rapidly. Intranet system should be used to allow customers to make online enquiries and order. Customer can also check their purchase record and the approximate date of their order delivery to plan their promotions or sales. However, system security is a major concern whenever Intranet system is implemented. If outsiders intercepted confidential information from the system, this would cause damage to the company. Firewall technology will be used as a means to protect the integrity and confidentiality of information within the system. It will identify the differences among users whether they are authorized persons or not. If unauthorized access occurs, Firewall will not disclose the specific and individuals information from the system to them.

APPENDIX A

ENTITY RELATIONSHIP DIAGRAM

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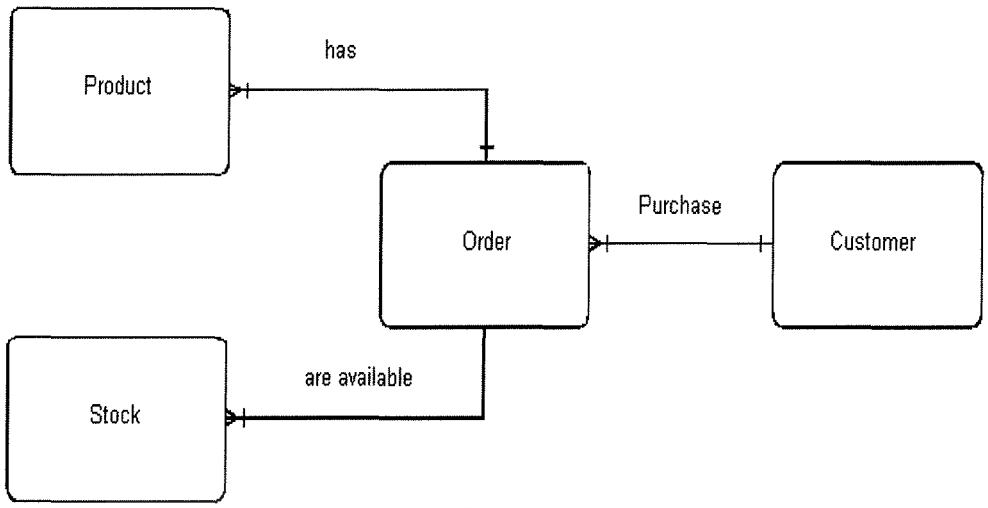

Figure A.1. Context Entity Relationship Diagram of the Proposed System.

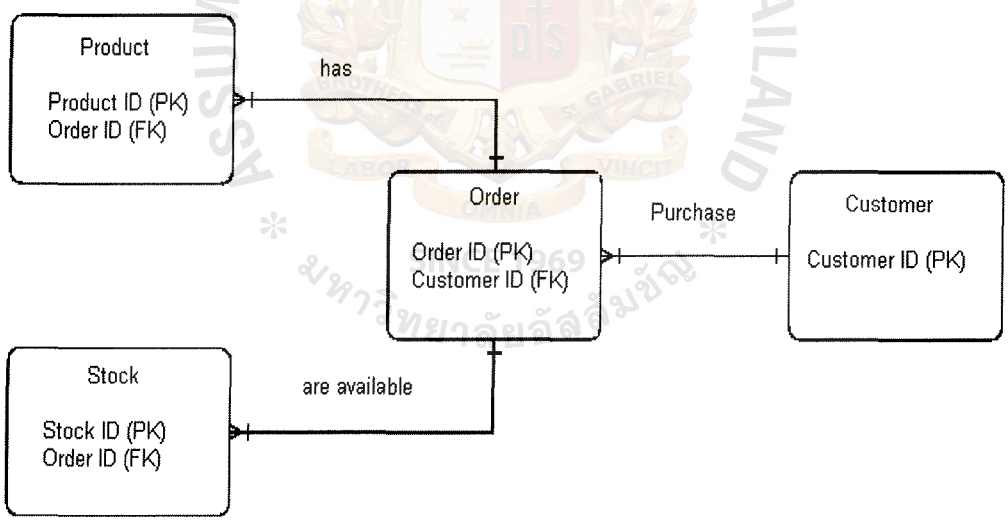

Figure A.2. Key Based Entity Relationship Diagram.

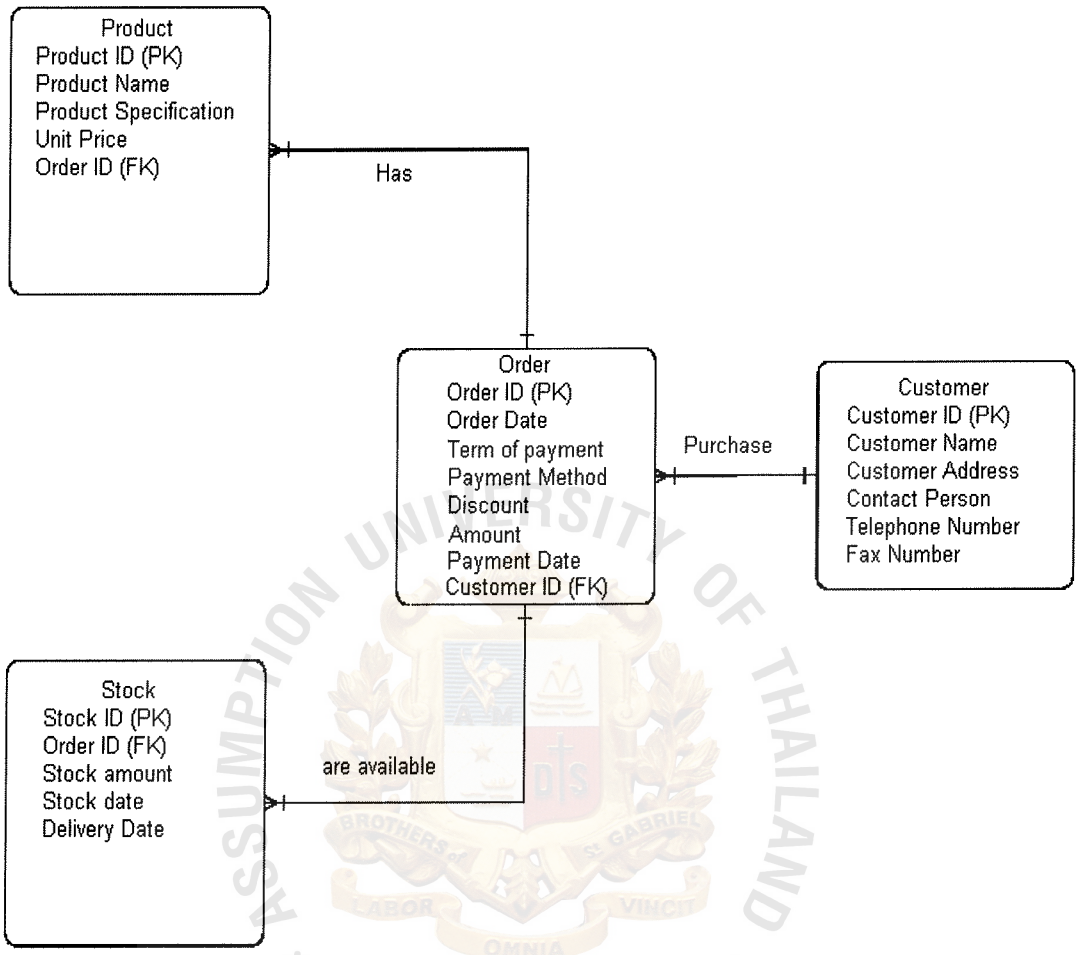

Figure A.3. Fully Attribute Entity Relationship Diagram.

APPENDIX B

DATA FLOW DIAGRAM

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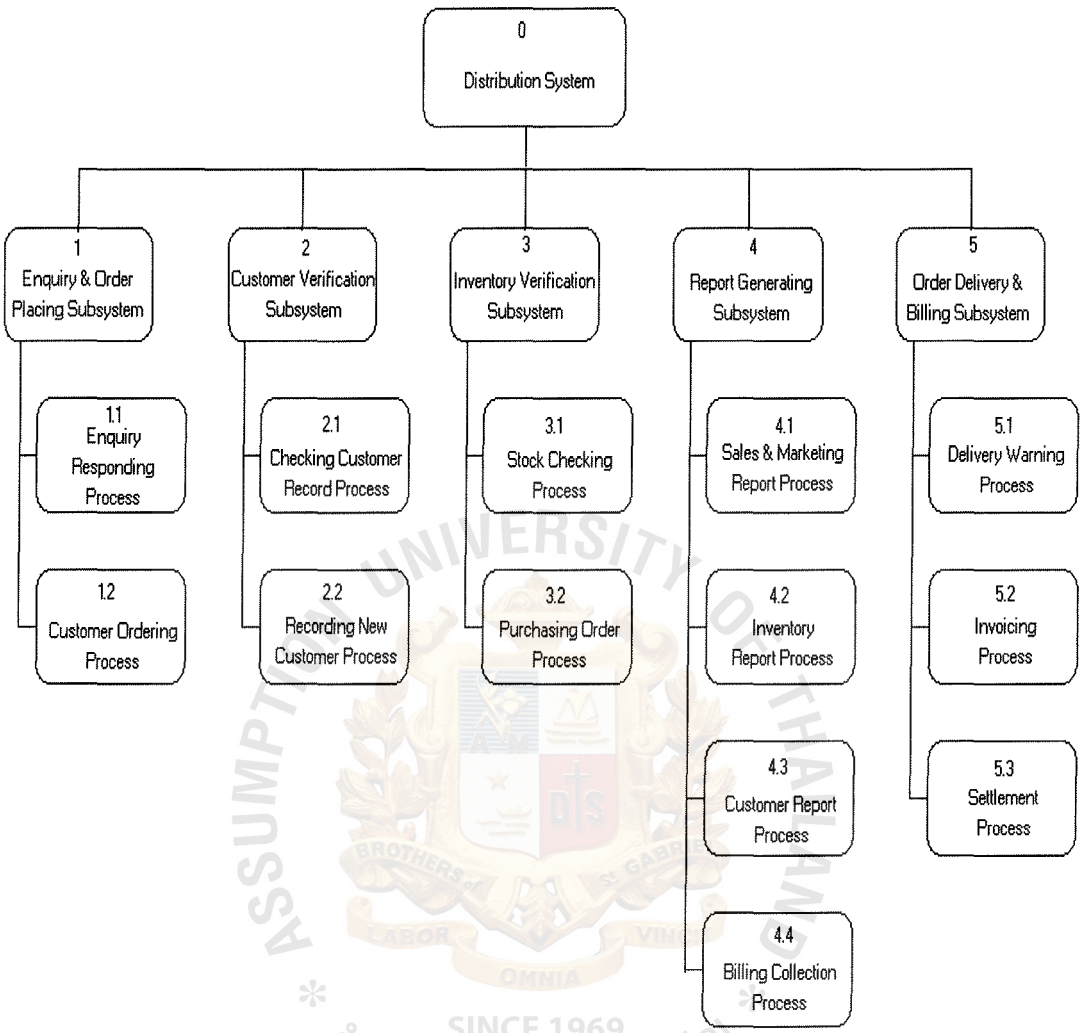

Figure B.1. Functional Decomposition Diagram.

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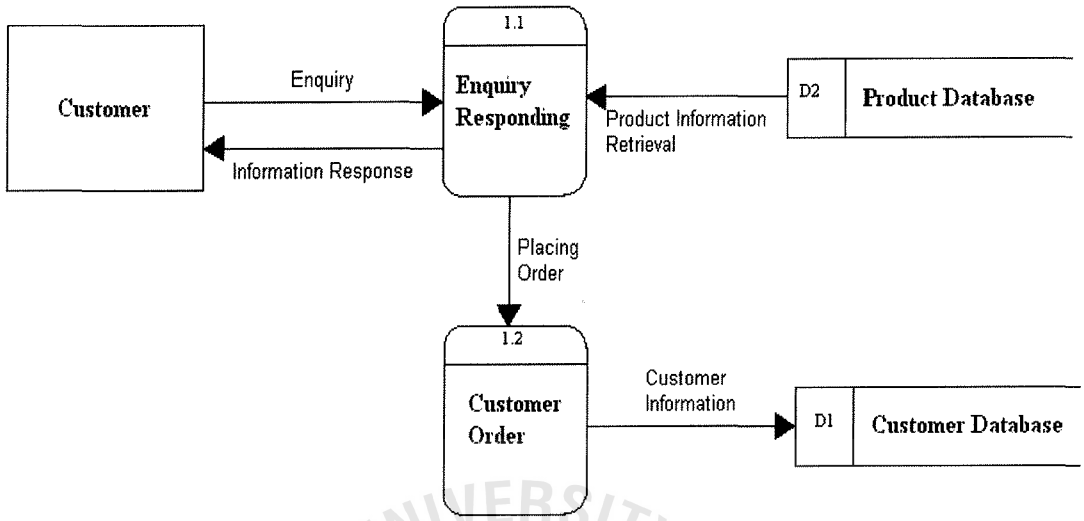

Figure B.2. Data Flow Diagram – Enquiry & Order Placing Subsystem.

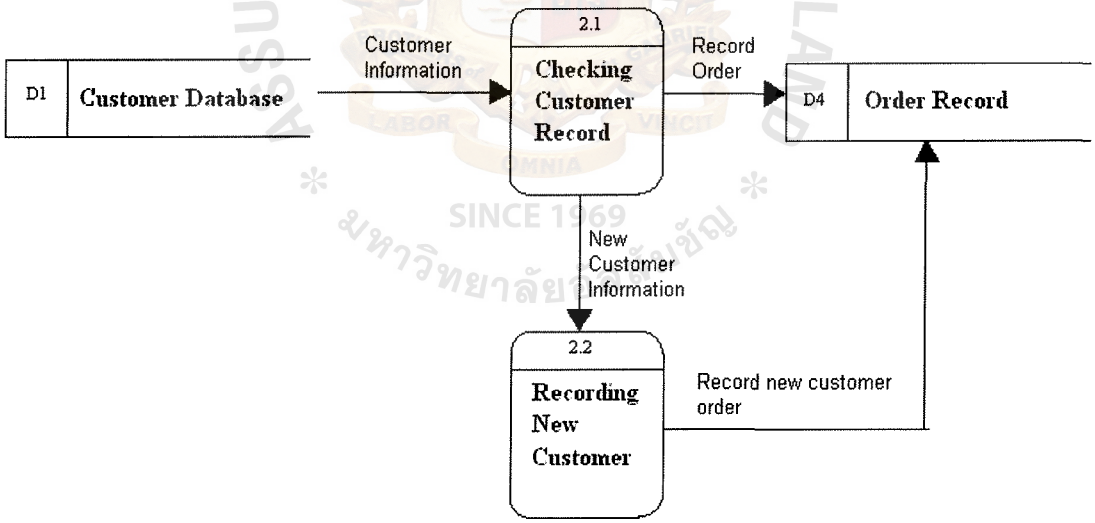

Figure B.3. Data Flow Diagram – Customer Verification Subsystem.

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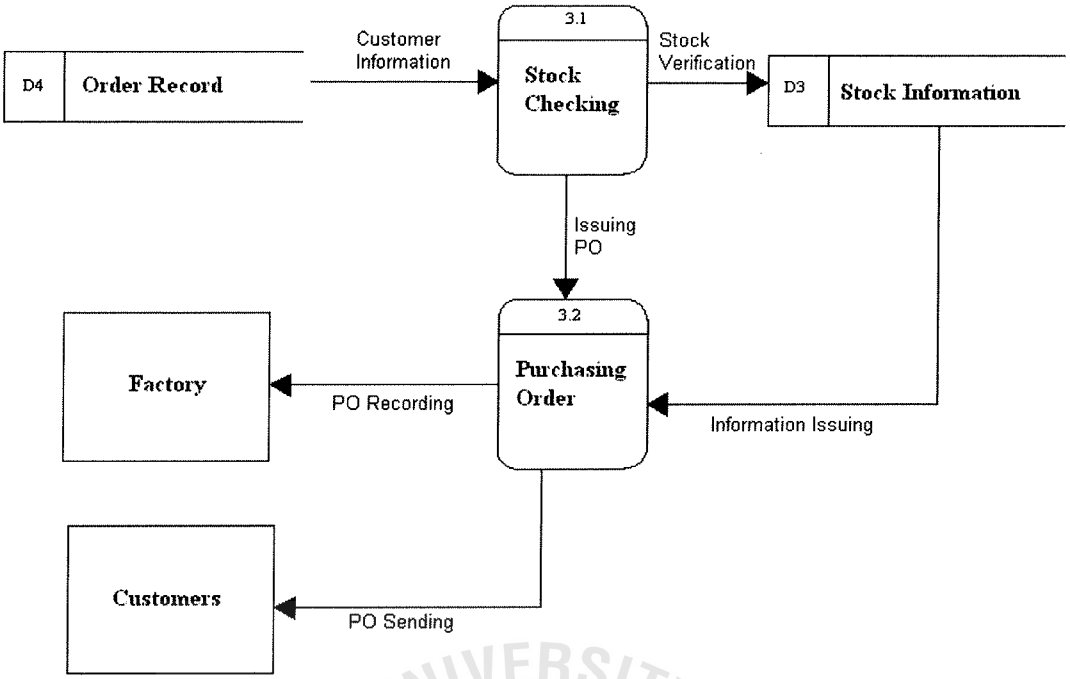

Figure B.4. Data Flow Diagram – Inventory Verification Subsystem.

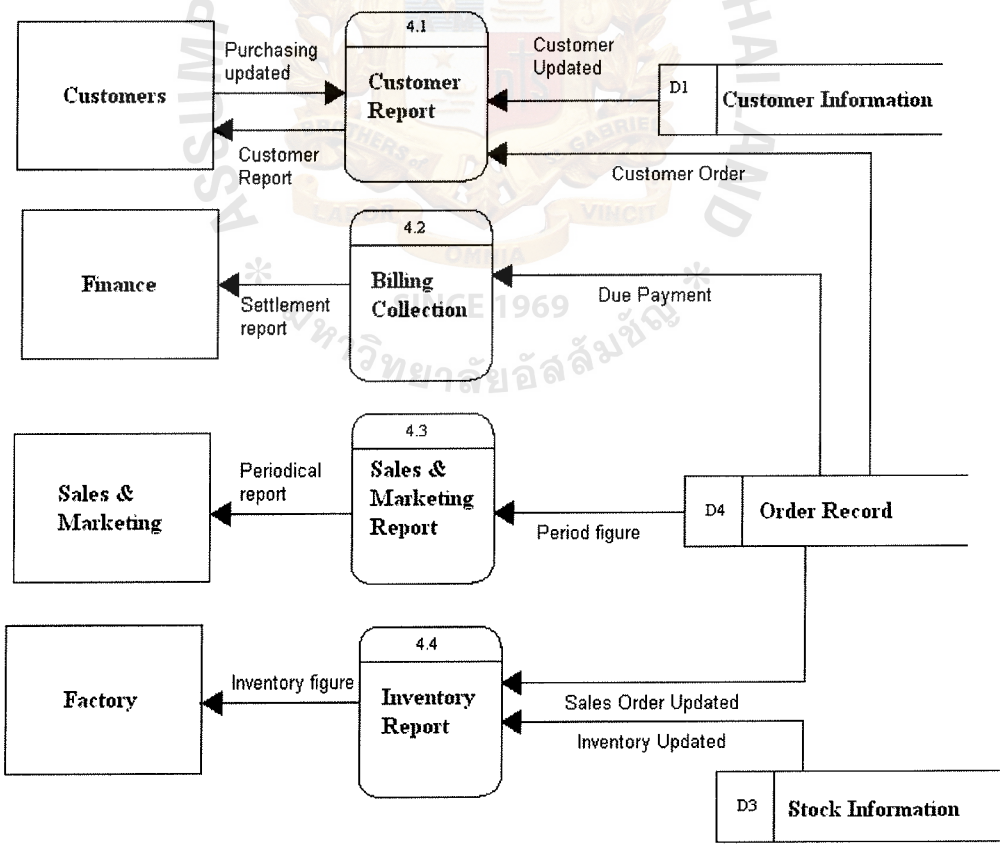

Figure B.5. Data Flow Diagram – Report Generating Subsystem.

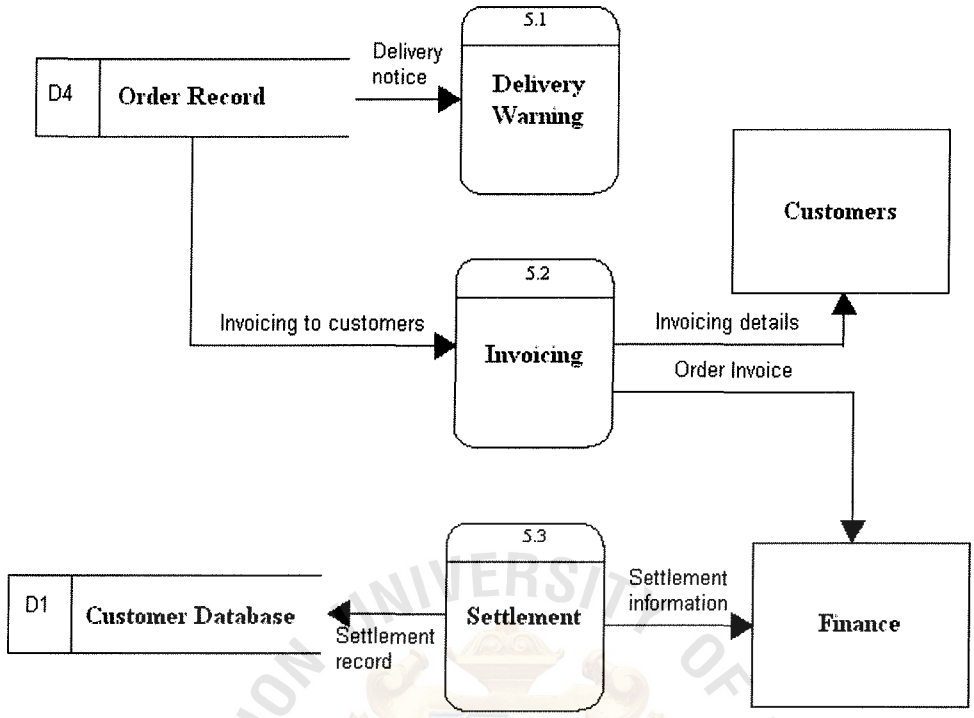

Figure B.6. Data Flow Diagram – Order Delivery & Billing Subsystem.

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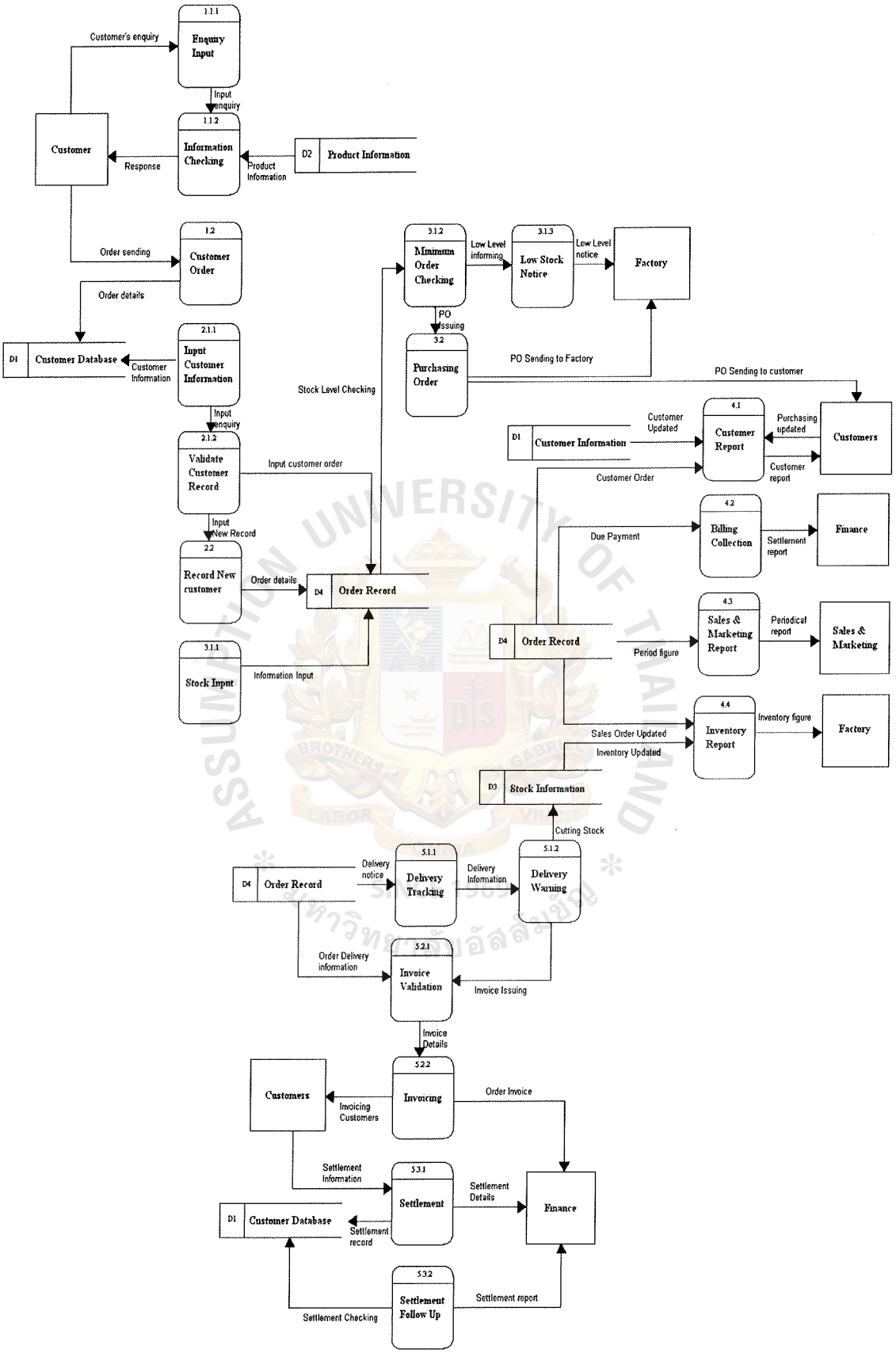

Figure B.7. System Diagram – Distribution System.

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APPENDIX C

FEASIBILITY ANALYSIS

Table C.1. Estimated Cost of 3 Candidates, Baht

Cost Items	Candidate 1	Candidate 2	Candidate 3
System Development Cost			
1. Hardware Cost			
- Server & Clients	546,750	587,250	405,000
- UPS	67,500	72,500	50,000
2. Software Cost			
- Server & Clients Software	337,500	362,500	250,000
3. People-Ware Cost			
- System Analyst	128,250	137,750	95,000
- Programmer & Database Specialist	195,750	210,250	145,000
- Network Specialist	121,500	130,500	90,000
4. Implementation Cost			
- Training Cost	305,775	328,425	226,500
- Installation Cost	186,300	200,100	138,000
Total System Development Cost	1,889,325	2,029,275	1,399,500
Operating Cost			
1. Maintenance Cost			
- Hardware Maintenance Cost	139,380	149,720	103,250
- Software Maintenance Cost	59,745	64,160	44,250
2. Personnel Cost			
User: Operation	307,125	329,870	227,500
System Support: Database & Network Administration	570,375	612,625	422,500
3. Office Supplies & Miscellaneous Cost	210,600	226,200	156,000
Total Annual Operating Cost	1,287,225	1,382,575	953,500
Total Computerized System Cost	3,176,550	3,411,850	2,353,000

Table C.2. Payback Period and Return on Investment for Candidate 1, Baht.

Cash Flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost	-1,889,325					
Operation & Maintenance Cost		-1,287,225	-1,347,435	-1,403,865	-1,487,160	-1,539,810
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present Value of annual costs	-1,889,325	-1,191,970	-1,154,752	-1,114,669	-1,093,063	-1,048,611
Total present value of lifetime costs	-1,889,325	-3,081,295	-4,236,047	-5,350,716	-6,443,779	-7,492,389
Benefits derived from operation of new systems	-	2,089,600	2,112,500	2,460,600	2,555,600	2,653,800
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present value of annual benefits	-	1,934,970	1,810,413	1,953,716	1,878,366	1,807,238
Total present value of lifetime benefits	-	1,934,970	3,745,382	5,699,099	7,577,465	9,384,702
Net Present Value of this Alternative	-1,889,325	-1,146,326	-490,665	348,383	1,133,686	1,892,313
ROI						20%

Table C.3. Payback Period and Return on Investment for Candidate 2, Baht.

Cash Flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost	-2,029,275					
Operation & Maintenance Cost		-1,382,575	-1,447,245	-1,507,855	-1,597,320	-1,653,870
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present Value of annual costs	-2,029,275	-1,280,264	-1,240,289	-1,197,237	-1,174,030	-1,126,285
Total present value of lifetime costs	-2,029,275	-3,309,539	-4,549,828	-5,747,065	-6,921,095	-8,047,381
Benefits derived from operation of new systems	-	2,089,600	2,112,500	2,460,600	2,555,600	2,653,800
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present value of annual benefits	-	1,934,970	1,810,413	1,953,716	1,878,366	1,807,238
Total present value of lifetime benefits	-	1,934,970	3,745,382	5,699,099	7,577,465	9,384,702
Net Present Value of This Alternative	-2,029,275	-1,374,570	-804,446	-47,967	656,369	1,337,321
ROI						14%

Table C.4. Payback Period and Return on Investment for Candidate 3, Baht.

Cash Flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost	-1,399,500					
Operation & Maintenance Cost		-953,500	-998,100	-1,039,900	-1,101,600	-1,140,600
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present Value of annual costs	-1,399,500	-882,941	-855,372	-825,681	-809,676	-776,749
Total present value of lifetime costs	-1,399,500	-2,282,441	-3,137,813	-3,963,493	-4,773,169	-5,549,918
Benefits derived from operation of new systems	-	2,089,600	2,112,500	2,460,600	2,555,600	2,653,800
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present value of annual benefits	-	1,934,970	1,810,413	1,953,716	1,878,366	1,807,238
Total present value of lifetime benefits	-	1,934,970	3,745,382	5,699,099	7,577,465	9,384,702
Net Present Value of This Alternative	-1,399,500	-347,471	607,569	1,735,605	2,804,295	3,834,784
ROI						41%

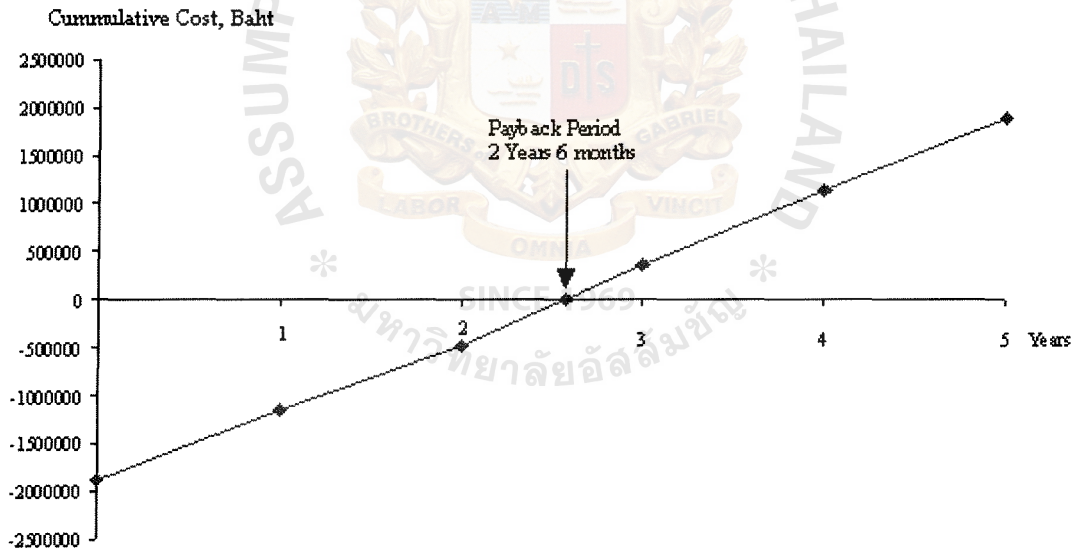

Figure C.1. Payback Period for Candidate 1.

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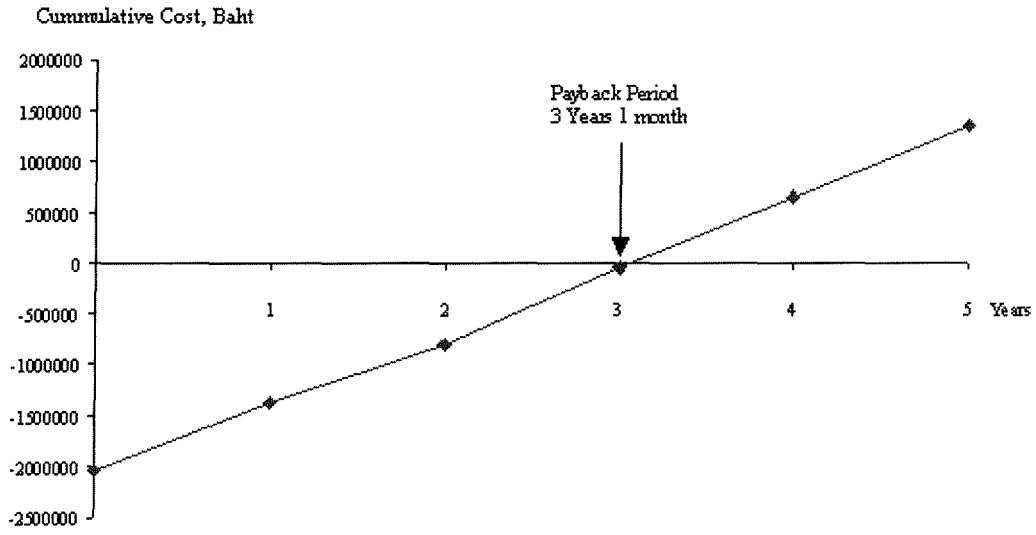

Figure C.2. Payback Period for Candidate 2.

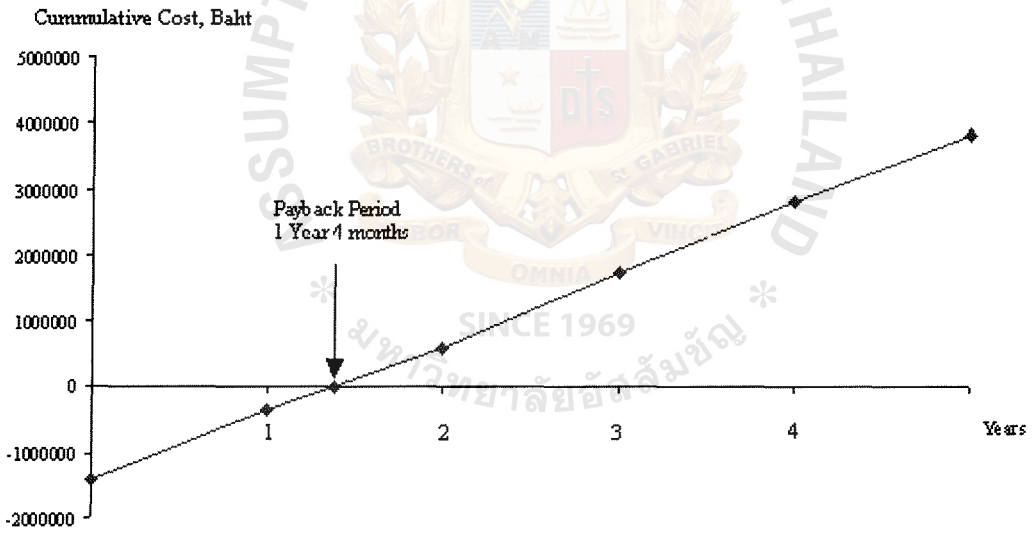

Figure C.3. Payback Period for Candidate 3.

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Table C.5. Net Present Value for Candidate 1, Baht.

Cash Flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost	-1,889,325					
Operation & Maintenance Cost		-1,287,225	-1,347,435	-1,403,865	-1,487,160	-1,539,810
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present Value of annual costs	-1,889,325	-1,191,970	-1,154,752	-1,114,669	-1,093,063	-1,048,611
Total present value of lifetime costs						-7,492,389
Benefits derived from operation of new systems	-	2,089,600	2,112,500	2,460,600	2,555,600	2,653,800
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present value of annual benefits	-	1,934,970	1,810,413	1,953,716	1,878,366	1,807,238
Total present value of lifetime benefits	-	1,934,970	3,745,382	5,699,099	7,577,465	9,384,702
Net Present Value of This Alternative :						1,892,313

Table C.6. Net Present Value for Candidate 2, Baht.

Cash Flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost	-2,029,275					
Operation & Maintenance Cost		-1,382,575	-1,447,245	-1,507,855	-1,597,320	-1,653,870
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present Value of annual costs	-2,029,275	-1,280,264	-1,240,289	-1,197,237	-1,174,030	-1,126,285
Total present value of lifetime costs						-8,047,381
Benefits derived from operation of new systems	-	2,089,600	2,112,500	2,460,600	2,555,600	2,653,800
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present value of annual benefits	-	1,934,970	1,810,413	1,953,716	1,878,366	1,807,238
Total present value of lifetime benefits	-	1,934,970	3,745,382	5,699,099	7,577,465	9,384,702
Net Present Value of This Alternative						1,337,321

Table C. 7. Net Present Value for Candidate 3, Baht.

Cash Flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost	-1,399,500					
Operation & Maintenance Cost		-953,500	-998,100	-1,039,900	-1,101,600	-1,140,600
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present Value of annual costs	-1,399,500	-882,941	-855,372	-825,681	-809,676	-776,749
Total present value of lifetime costs						-5,549,918
Benefits derived from operation of new systems	-	2,089,600	2,112,500	2,460,600	2,555,600	2,653,800
Discount Factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Present value of annual benefits	-	1,934,970	1,810,413	1,953,716	1,878,366	1,807,238
Total present value of lifetime benefits	-	1,934,970	3,745,382	5,699,099	7,577,465	9,384,702
Net Present Value of This Alternative						3,834,784

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APPENDIX D

STRUCTURE DESIGN

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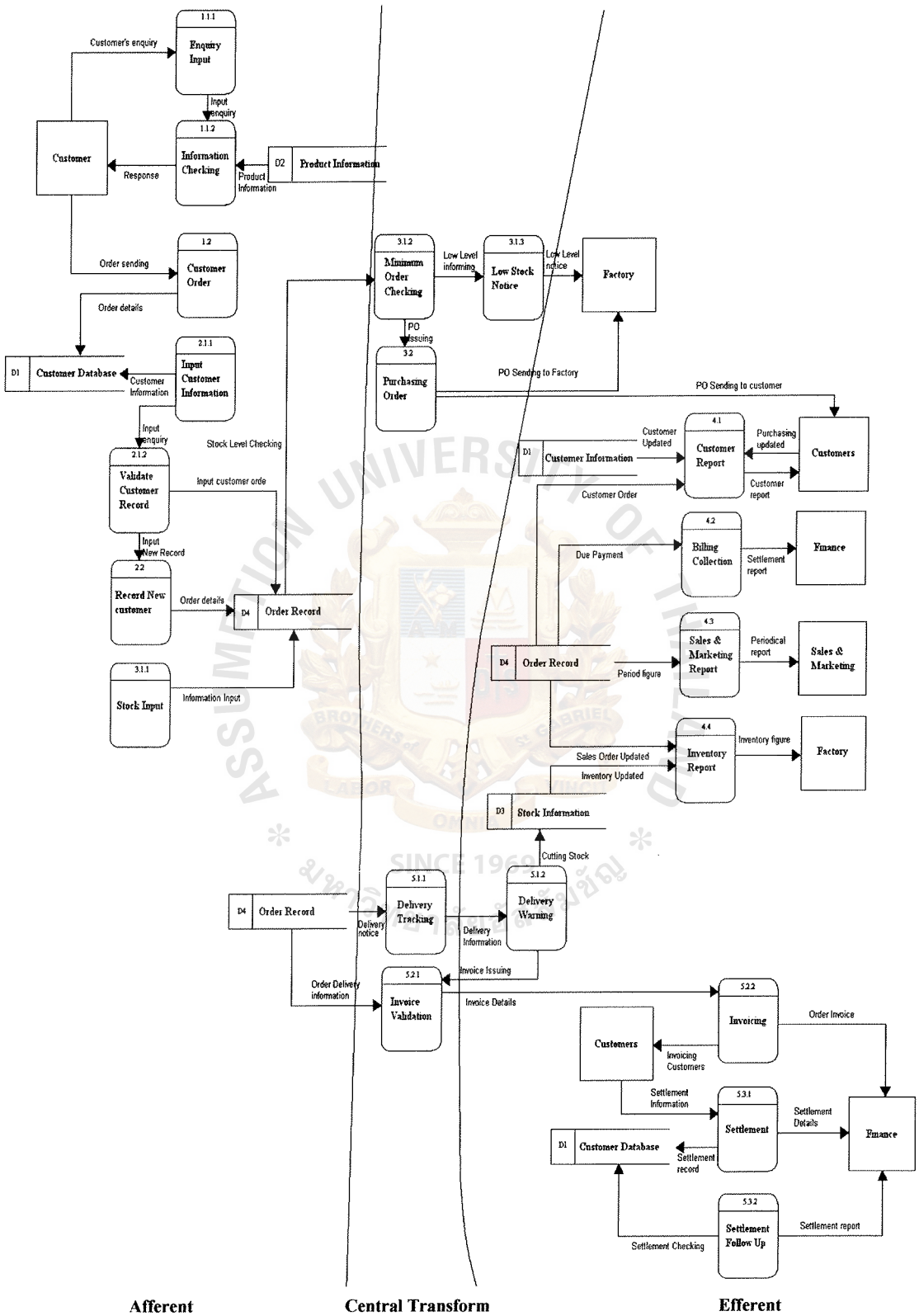

Figure D.1. Partitioned Data Flow Diagram of Distribution System.

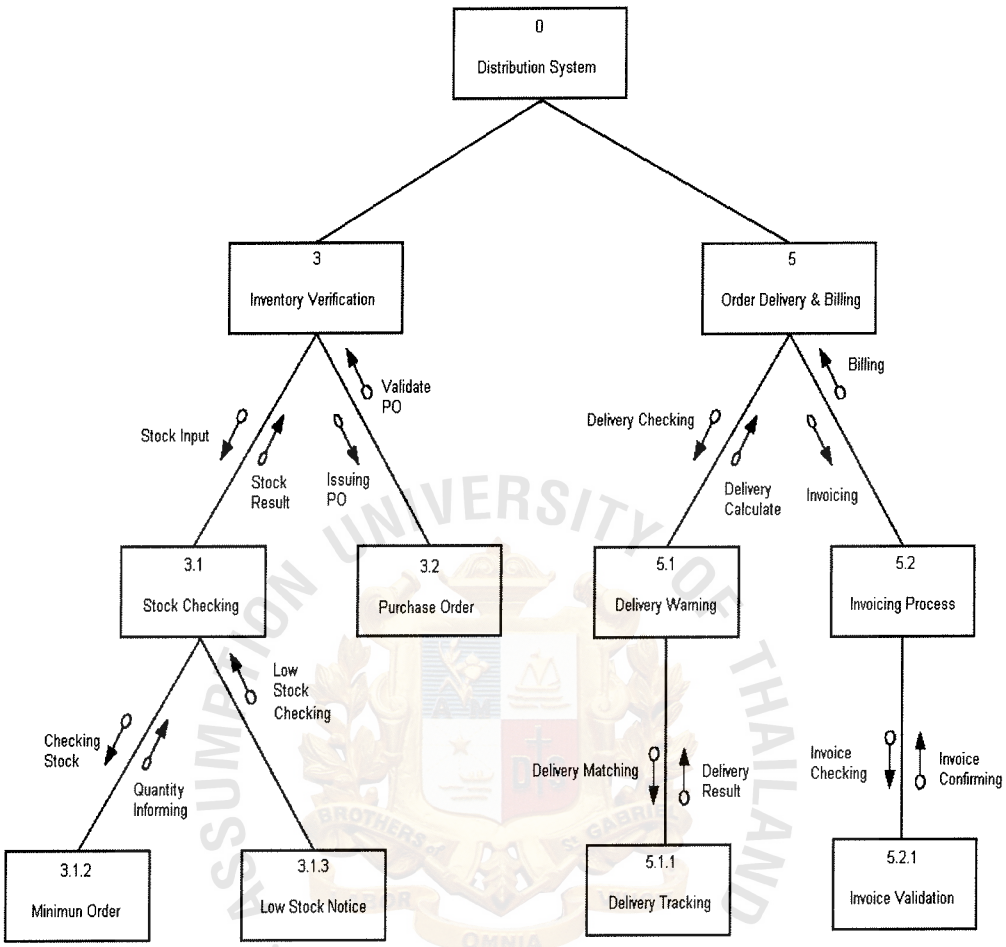

Figure D.2. Structure Chart of Distribution System - Afferent Process.

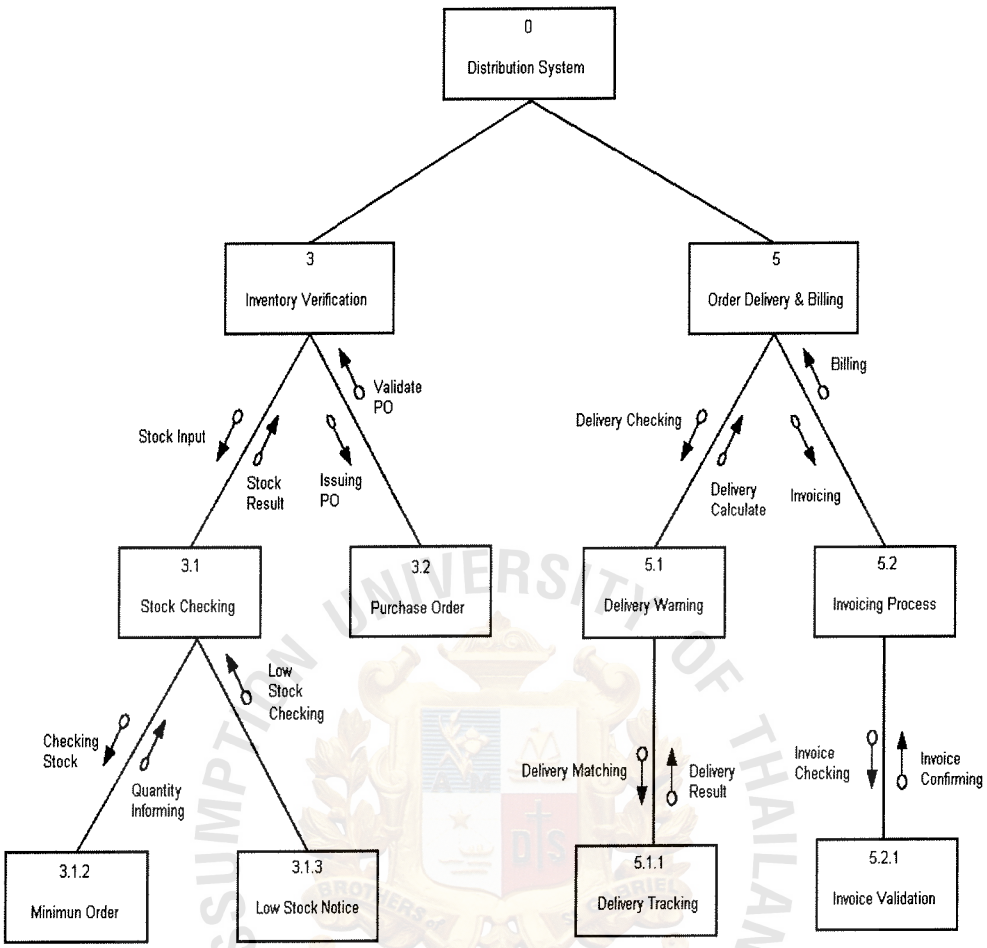

Figure D.3. Structure Chart of Distribution System Transform Process.

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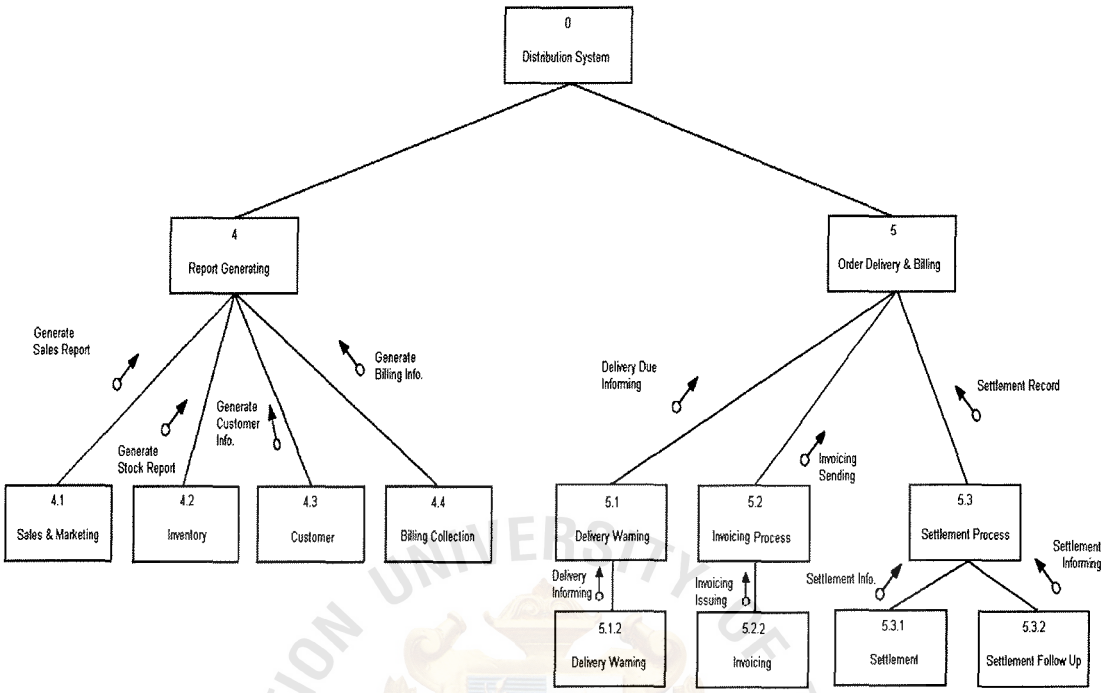

Figure D.4. Structure Chart of Distribution System Efferent Process.

APPENDIX E

PROCESS SPECIFICATION

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Table E.1. Process Specification of Process 1.

Items	Description
Process Name:	Enquiry & Order Placing
Data In:	Enquiry
Data Out:	Customer Information
Process:	(1) Get enquiry from Customer Entity.
	(2) Create Customer Information to Customer Database.
	(3) Create Information Response to Customer Entity.
Attachment:	(1) Product Database
	(2) Customer Database

Table E.2. Process Specification of Process 1.1.

Items	Description
Process Name:	Enquiry Responding Process
Data In:	Enquiry
Data Out:	Information Response
Process:	(1) Get enquiry from Customer Entity.
	(2) Get product information from product database.
	(3) Match the enquiry with the product information.
	(4) Send the result / response to Customer entity.
Attachment:	(1) Product Database

Table E.3. Process Specification of Process 1.2.

Items	Description
Process Name:	Customer Ordering Process
Data In:	Placing Order
Data Out:	Customer Information
Process:	(1) Get enquiry from Customer Entity.
	(2) Check in the enquiry response to check enquiry status.
	(3) Send the response for order to Customer Order.
	(4) Create the customer information to Database.
Attachment:	(1) Customer Database

Table E.4. Process Specification of Process 2.

Items	Description
Process Name:	Customer Verification
Data In:	Customer Information
Data Out:	(1) Record Order
	(2) Record new customer
Process:	(1) Retrive customer information from customer database.
	(2) Send customer information to checking customer record.
Attachment:	(1) Order Record

Table E.5. Process Specification of Process 2.1.

Items	Description
Process Name:	Checking Customer Record Process
Data In:	Customer Information
Data Out:	Record Order
Process:	(1) Get the customer information from customer database.
	(2) Check customer information in the customer record.
	(3) Send the customer order to Order Record.
Attachment:	(1) Order Record

Table E.6. Process Specification of Process 2.2.

Items	Description
Process Name:	Recording New Customer Process
Data In:	New Customer Information.
Data Out:	Recording New Customer
Process:	(1) Get new customer information from the checking customer record.
	(2) Create the new customer order record.
	(3) Put the new customer information order record to the Order record.
Attachment:	(1) Order Record

Table E.7. Process Specification of Process 3.

Items	Description
Process Name:	Inventory Verification
Data In:	Customer Information
Data Out:	(1) PO Recording
	(2) PO Sending
Process:	(1) Get the customer information
	(2) Check the order information with the stock information.
	(3) Issue PO if order information are matched with stock information.
	(4) Send PO to Factory and customer.
Attachment:	(1) Order Record
	(2) Stock Information.

Table E.8. Process Specification of Process 3.1.

Items	Description
Process Name:	Stock Checking Process
Data In:	Customer Information
Data Out:	(1) Stock Verification
	(2) PO Issuing
Process:	(1) Get the customer order / information. From order record.
	(2) Put the information in the stock checking.
	(3) Verify customer order with the stock information.
	(4) Send the confirmation to purchase order to issue PO.
Attachment:	(1) Purchasing Order

Table E.9. Process Specification of Process 3.2.

Items	Description
Process Name:	Purchasing Order Process
Data In:	Issuing PO
Data Out:	(1) PO Recording
	(2) PO Sending
Process:	(1) Retriving stocking details from stock information.
	(2) Get customer order from stock checking.
	(3) Issue PO.
	(4) Send the PO Information to factory.
	(5) Send the PO Information to customer.
Attachment:	(1) Factory
	(2) Customers

Table E.10. Process Specification of Process 4.

Items	Description
Process Name:	Report Generating
Data In:	(1) Purchasing updated
	(2) Periodical report
	(3) Inventory figure
Data Out:	(1) Settlement Report
Process:	(1) Get the customer order information.
	(2) Create the report from Customer Information.
	(3) Create the report from Order Record.
	(4) Create the report from Stock Information.
Attachment:	(1) Customer Information
	(2) Order Record
	(3) Stock Information

Table E.11. Process Specification of Process 4.1.

Items	Description
Process Name:	Sales & Marketing Report Process
Data In:	Period figure
Data Out:	Periodical report
Process:	(1) Retrieve the figure from order record.
	(2) Search for the specific sales & marketing information.
	(3) Send the target information to Sales & Marketing.
Attachment:	Sales & Marketing

Table E.12. Process Specification of Process 4.2.

Items	Description
Process Name:	Inventory Report Process
Data In:	(1) Inventory Updated
	(2) Sales order updated
Data Out:	Inventory Figure
Process:	(1) Retrieve the sales order information from order record.
	(2) Retrieve the inventory updated from stock information.
	(3) Match the sales order and inventory information.
	(4) Calculate the order and inventory.
	(5) Produce the stock in inventory.
	(6) Send the inventory figure to factory.
Attachment:	(1) Order Record
	(2) Stock Information
	(3) Factory

Table E.13. Process Specification of Process 4.3.

Items	Description
Process Name:	Customer Report
Data In:	Customer Updated
Data Out:	Customer data
Process:	(1) Retrieve the information from customer information.
	(2) Search for the specific customers.
	(3) Send the target information to customers.
Attachment:	Customer Information

Table E.14. Process Specification of Process 4.4.

Items	Description
Process Name:	Billing Collection Process
Data In:	Due Payment
Data Out:	Settlement report
Process:	(1) Get the order which is due from order record.
	(2) Create the bill in billing collection.
	(3) Produce the billing to finance for collecting money.
Attachment:	Order Record

Table E.15. Process Specification of Process 5.

Items	Description
Process Name:	Order Delivery & Billing
Data In:	(1) Delivery Notice
	(2) Invoicing to customers
Data Out:	(1) Invoicing details
	(2) Order Invoice
	(3) Settlement Information
Process:	(1) Get the deliver notice from order record.
	(2) Get the invoice information from order record.
	(3) Send invoice to customer
	(4) Inform finance for order invoice and settlement.
	(5) Keep settlement details in customer database.
Attachment:	(1) Order Record
	(2) Customer Database

Table E.16. Process Specification of Process 5.1.

Items	Description
Process Name:	Delivery Warning Process
Data In:	Delivery notice
Data Out:	Invoicing details
Process:	Retrieve delivery notice from Order Record.
Attachment:	Order Record

Table E.17. Process Specification of Process 5.2.

Items	Description
Process Name:	Invoicing Process
Data In:	Invoicing to customers
Data Out:	(1) Order invoice
	(2) Invoicing details
Process:	(1) Get the order record details from order record.
	(2) Issue the invoice in invoicing.
	(3) Send invoice to customer
	(4) Send Order invoice to Finance for settlement.
Attachment:	Order record

Table E.18. Process Specification of Process 5.3.

Items	Description
Process Name:	Settlement Process
Data In:	Order Invoice
Data Out:	(1) Settlement record
	(2) Settlement information
Process:	(1) Get the settlement details from invoicing.
	(2) Get the settlement information from Finance
	(3) Put the settlement record to customer database.
Attachment:	Customer Database

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APPENDIX F

DATABASE DESIGN

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Table F.1. Structure of Customer Table.

Name	Type	Length	Key Type	Foreign Key to	Check
Customer ID	Text	8	Primary Key	-	-
Customer Name	Text	18	Attribute	-	-
Customer Address	Text	22	Attribute	-	-
Contact Person	Text	17	Attribute	-	-
Telephone Number	Number	9	Attribute	-	-
Fax Number	Number	9	Attribute	-	-

Table F.2. Structure of Order Table.

Name	Type	Length	Key Type	Foreign Key to	Check
Order ID	Text	5	Primary Key	Customer Table	-
Order Date	Date/Time	8	Attribute	-	-
Term of payment	Text	3	Attribute	-	< 365 days
Payment Method	Text	5	Attribute	-	-
Discount	Number	12	Attribute	-	0 - 100%
Amount	Number	12	Attribute	-	
Payment Date	Date/Time	8	Attribute	-	
Customer ID	Text	8	Attribute	-	

Table F.3. Structure of Product Table.

Name	Type	Length	Key Type	Foreign Key to	Check
Product ID	Text	15	Primary Key	Order Table	-
Product Name	Text	15	Attribute	-	-
Product Specification	Text	22	Attribute	-	-
Unit Price	Number	9	Attribute	-	9 digits
Order ID	Number	9	Attribute	-	-

Table F.4. Structure of Stock Table.

Name	Type	Length	Key Type	Foreign Key to	Check
Stock ID	Text	6	Primary Key	Order Table	-
Order ID	Text	5	Attribute	-	-
Stock amount	Number	12	Attribute	-	12 digit
Stock date	Date/Time	8	Attribute	-	-
Delivery Date	Date/Time	8	Attribute	-	-

APPENDIX G

DATA DICTIONARY

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Table G.1. Data Dictionary forDistribution System Database.

Field Name	Meaning
Customer ID	Identification to identify each customer.
Customer Name	Name of customer to contact.
Customer Address	Address of customer.
Contact Person	Name of person to contact at that company.
Telephone Number	Telephone number of customer.
Fax Number	Fascimile number of customer.
Order ID	Order Identification to identify each order.
Order Date	The date that order is made.
Term of payment	When the payment will be made and discount to be given to customer.
Payment Method	How the payment is made ie cash, cheque, credit.
Discount	Discount on the price offered by customer.
Amount	The amount which is shown in the order.
Payment Date	When the payment is made.
Product ID	Identification to identify each product.
Product Name	Name of product to be sold.
Product Specification	Details of product.
Unit Price	Unit price of product to be sold.
Stock ID	Identification to identify each stock.
Stock amount	Number of stock in the inventory.
Stock date	The date of the stock
Delivery Date	The date that orders have been delivered to customers.

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Table G.2. Data Dictionary for Distribution System Data Flow Diagram.

Name	Type	Description
Customer's enquiry	Data Flow	Input enquiry from customers to the process.
Input enquiry	Data Flow	Sending the enquiry to the enquiry input.
Product Information	Data Flow	Information which is sent to customer.
Order sending	Data Flow	Order sending to the process.
Order details	Data Flow	Send the order details to the customer database.
Customer Information	Data Flow	Send customer information to the database.
Input customer order	Data Flow	Send customer order to the database.
Information input	Data Flow	Input stock information in database.
Stock level checking	Data Flow	Go to the stock to check the level of stock.
Low level informing	Data Flow	Inform the low stock.
Low level notice	Data Flow	Send the notice of low level stock.
PO Issuing	Data Flow	Send information for Purchase Order.
PO Sending to Factory	Data Flow	Send purchase order to the factory.
PO Sending to customer	Data Flow	Send purchase order to the customer.
Customers Report	Data Flow	Send information to customer.
Purchasing updated	Data Flow	Make new order.
Customer updated	Data Flow	Send the updated information.
Settlement report	Data Flow	Send settlement report
Due payment	Data Flow	send information for the payment which is due.
Periodical report	Data Flow	Send the report as requested.
Period figure	Data flow	Get the figure as requested.
Inventory figure	Data Flow	Send inventory report.
Sales order updated	Data Flow	Update the sales order.
Inventory updated	Data Flow	Update the stock in inventory.
Delivery notice	Data Flow	Send the information of the order which will be delivered.
Delivery information	Data Flow	Inform the delivery details.
Cutting stock	Data Flow	Cut the amount of stock due to the delivery.
Order delivery information	Data Flow	Send information for order delivery.
Invoice issuing	Data Flow	Request for invoice issued.
Order invoice	Data Flow	Send invoice of each order.

Table G.2. Data Dictionary for Distribution System Data Flow Diagram (Continued).

Name	Type	Description
Invoicing customer	Data Flow	Issue invoice to send out.
Settlement information	Data Flow	Send settlement information.
Settlement details	Data Flow	Send the settlement details.
Settlement checking	Data Flow	Check the settlement to record in the database.
Settlement report	Data Flow	Create a settlement report.
Product Information	Data Store	Product Information database.
Customer Database	Data Store	All information of customer.
Order record	Data Store	Record customer order in the database.
Stock information	Data Store	Stock information Database
Factory	External Entity	Get the notice of low level stock.
Finance	External Entity	Finance department
Sales & marketing	External Entity	Sales & Marketing Department
Factory	External Entity	Factory
Customers	External Entity	Customer who makes an enquiry or order.
Enquiry Input	Process	Take the enquiry from customer.
Information checking	Process	Check enquiry and response.
Customer Order	Process	Get the order from customer.
Input customer Information	Process	Create the customer information.
Record new customer	Process	Record information of new customer.
Stock input	Process	Process stock information.
Minimum order checking	Process	Check the stock to make sure the low level.
Local Stock Notice	Process	Create the low level stock notice.
Purchasing Order	Process	Create Purchase Order.
Customer report	Process	Create a report for customer.
Billing collection	Process	Create settlement report
Sales & marketing report	Process	Create the sales & marketing report.
Inventory report	Process	Create the stock report.
Delivery tracking	Process	Check the delivery details.
Delivery waring	Process	Create the warning notice.
Invoice validation	Process	Check the invoice and its information.
Invoicing	Process	Create Invoice.
Settlement	Process	Create the settlement details.

APPENDIX H

WEB INTERFACE DESIGN

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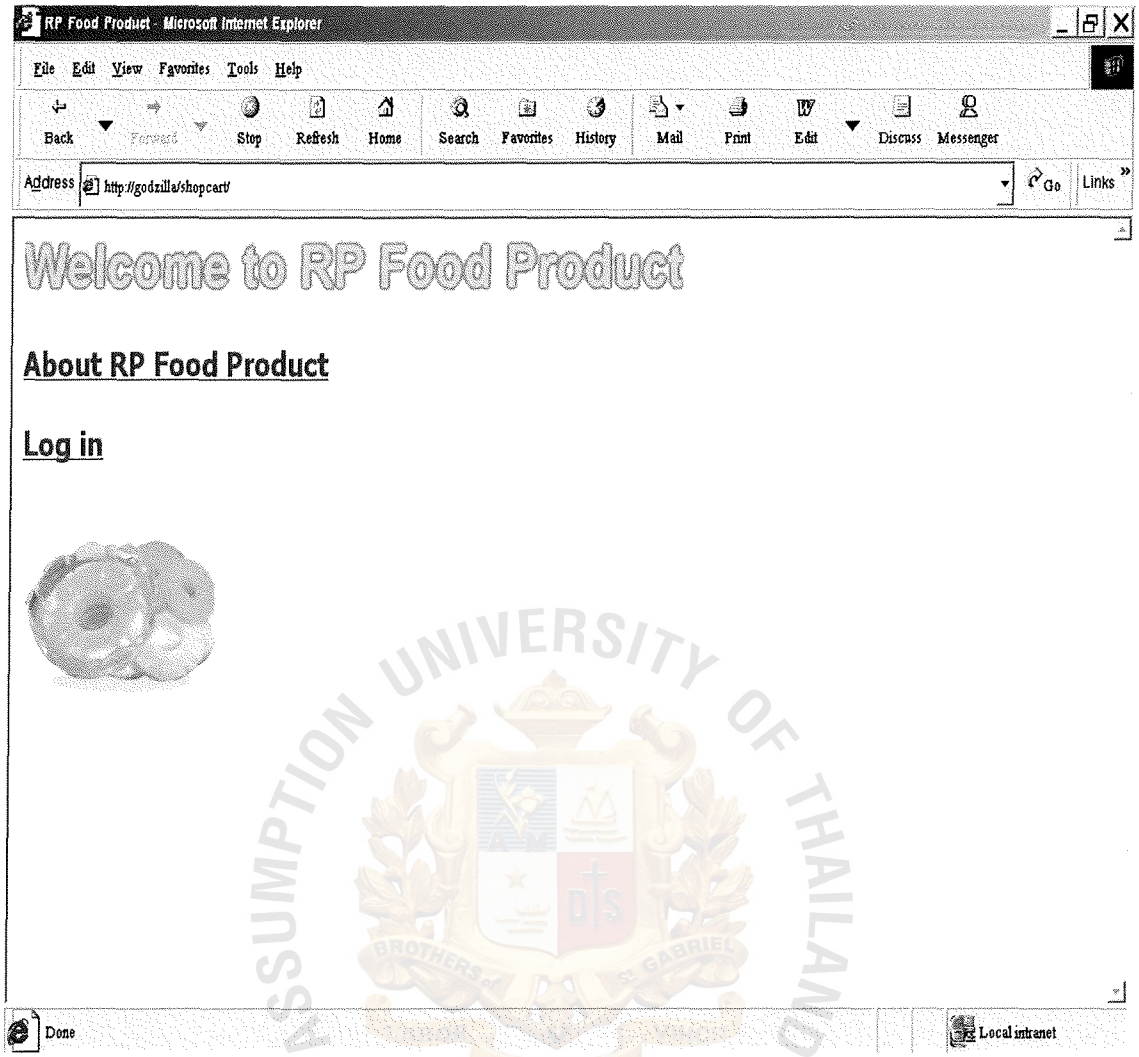

Figure H.1. Web Interface Screen: First Page.

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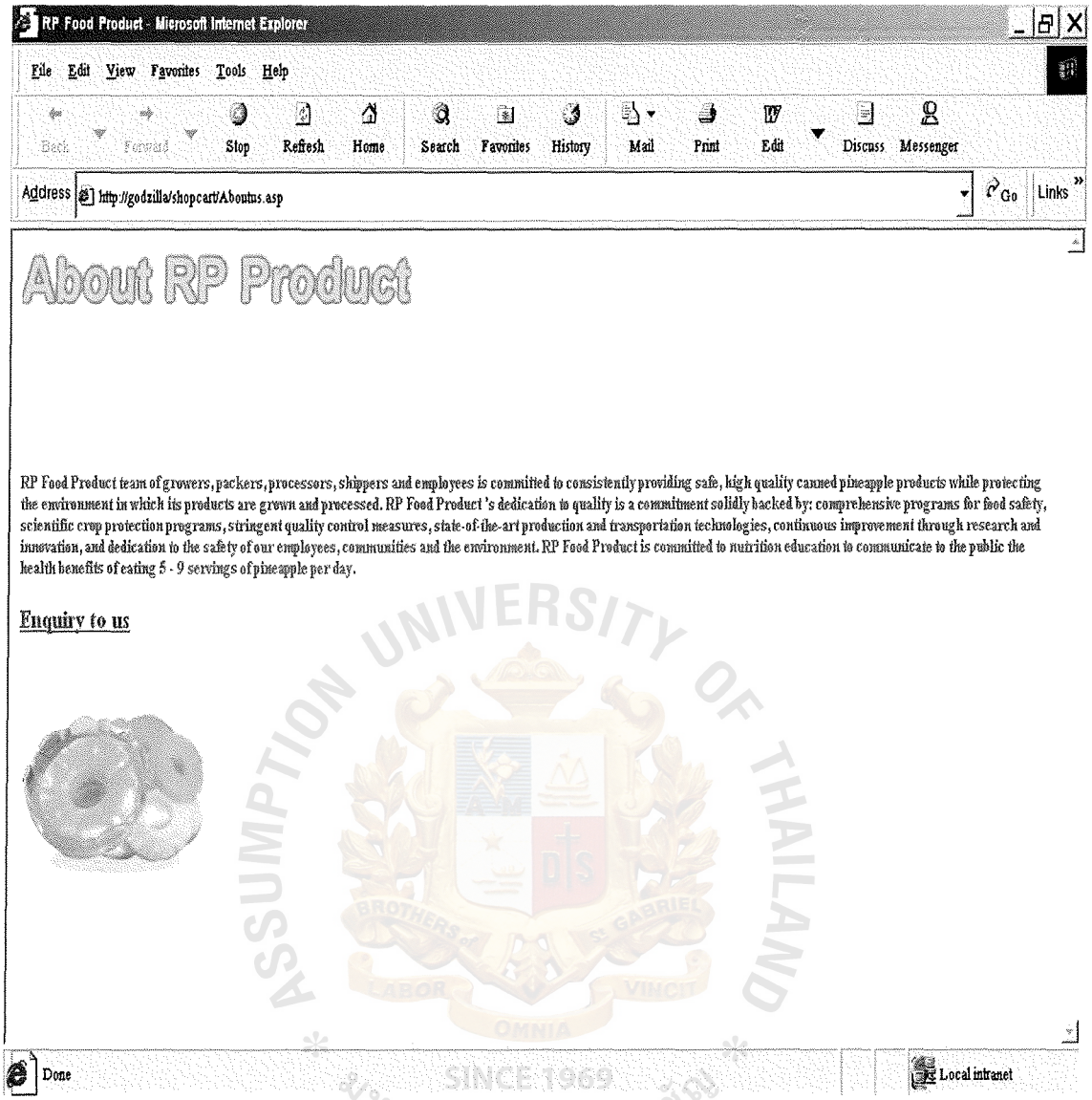

Figure H.2. Web Interface Screen: About Company and Enquiry Page.

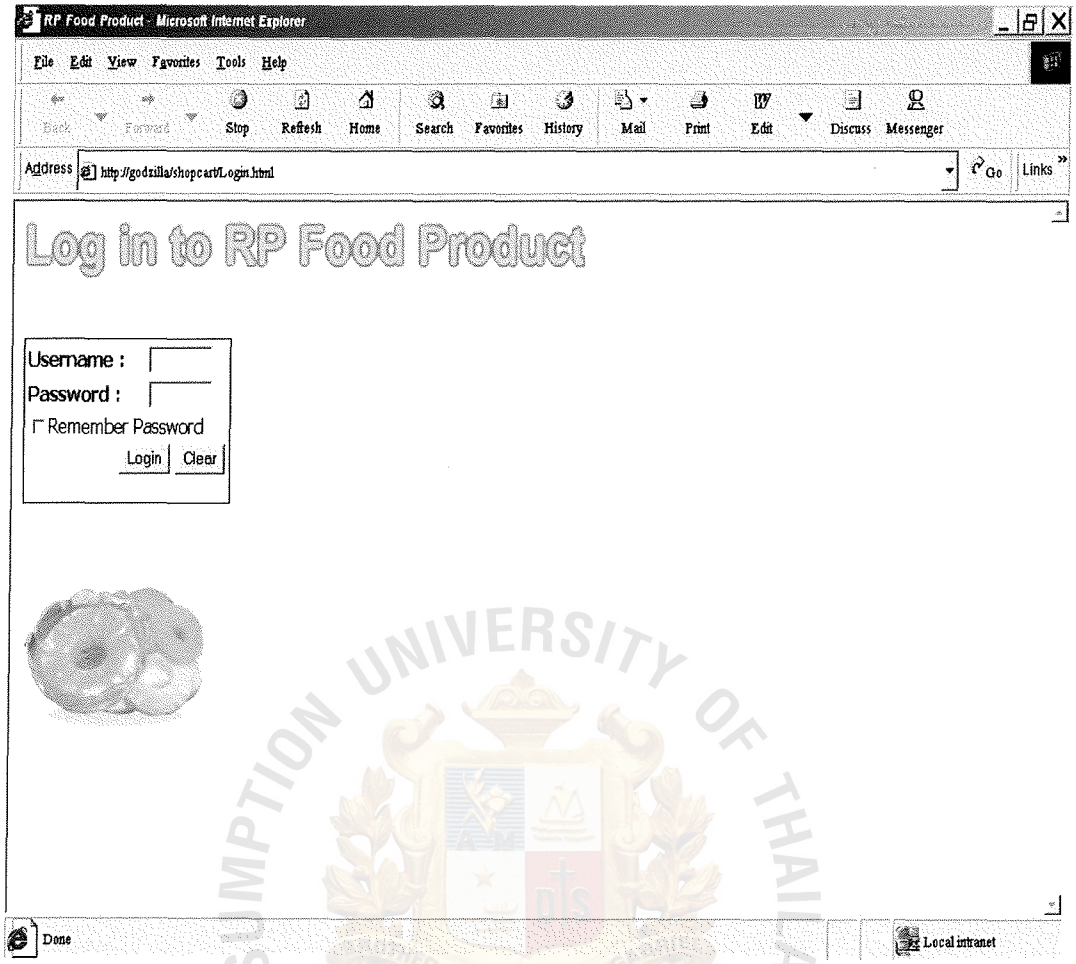

Figure H.3. Web Interface Screen: Login Page.

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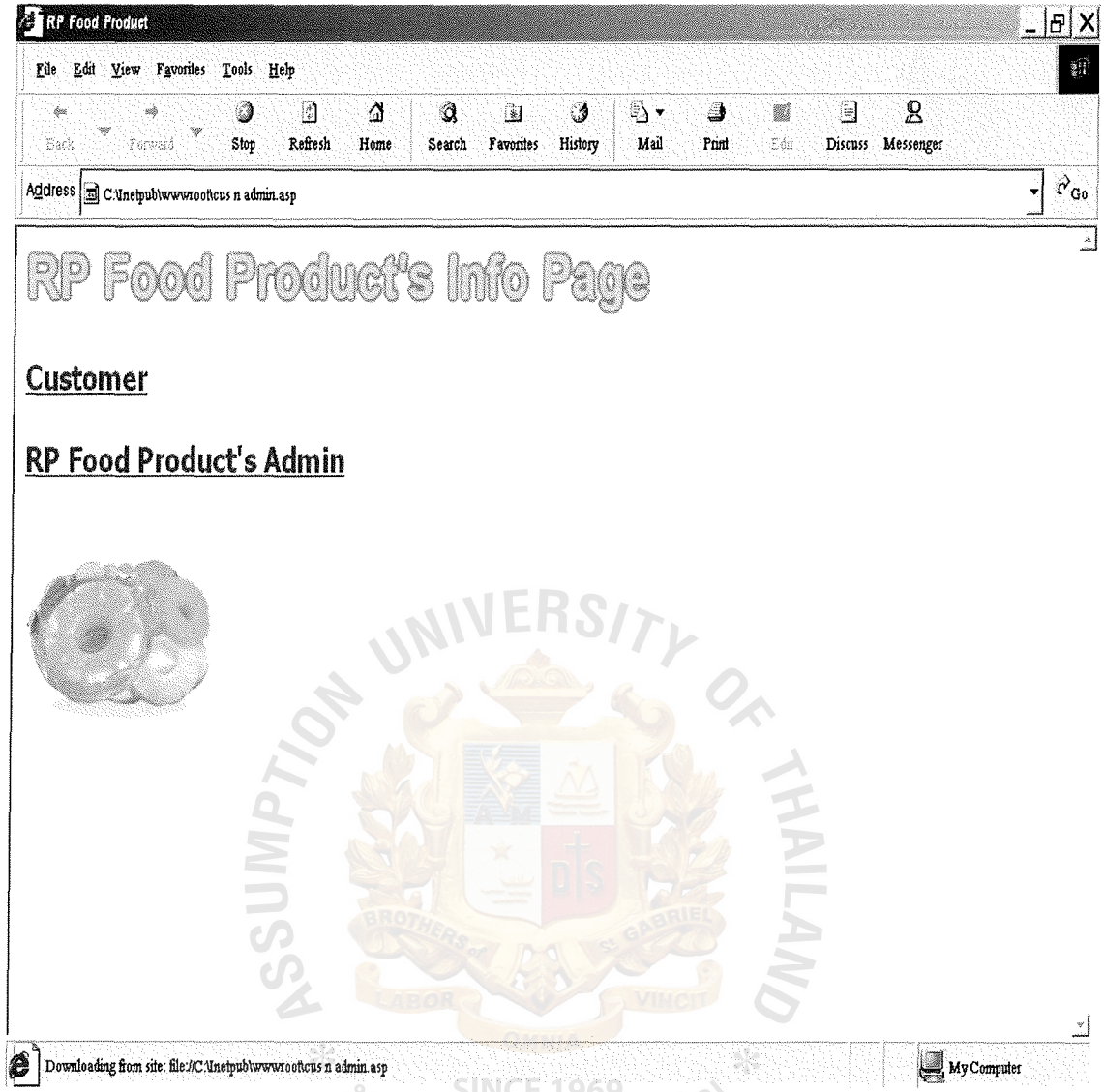

Figure H.4. Web Interface Screen: Customer & Admin Page.

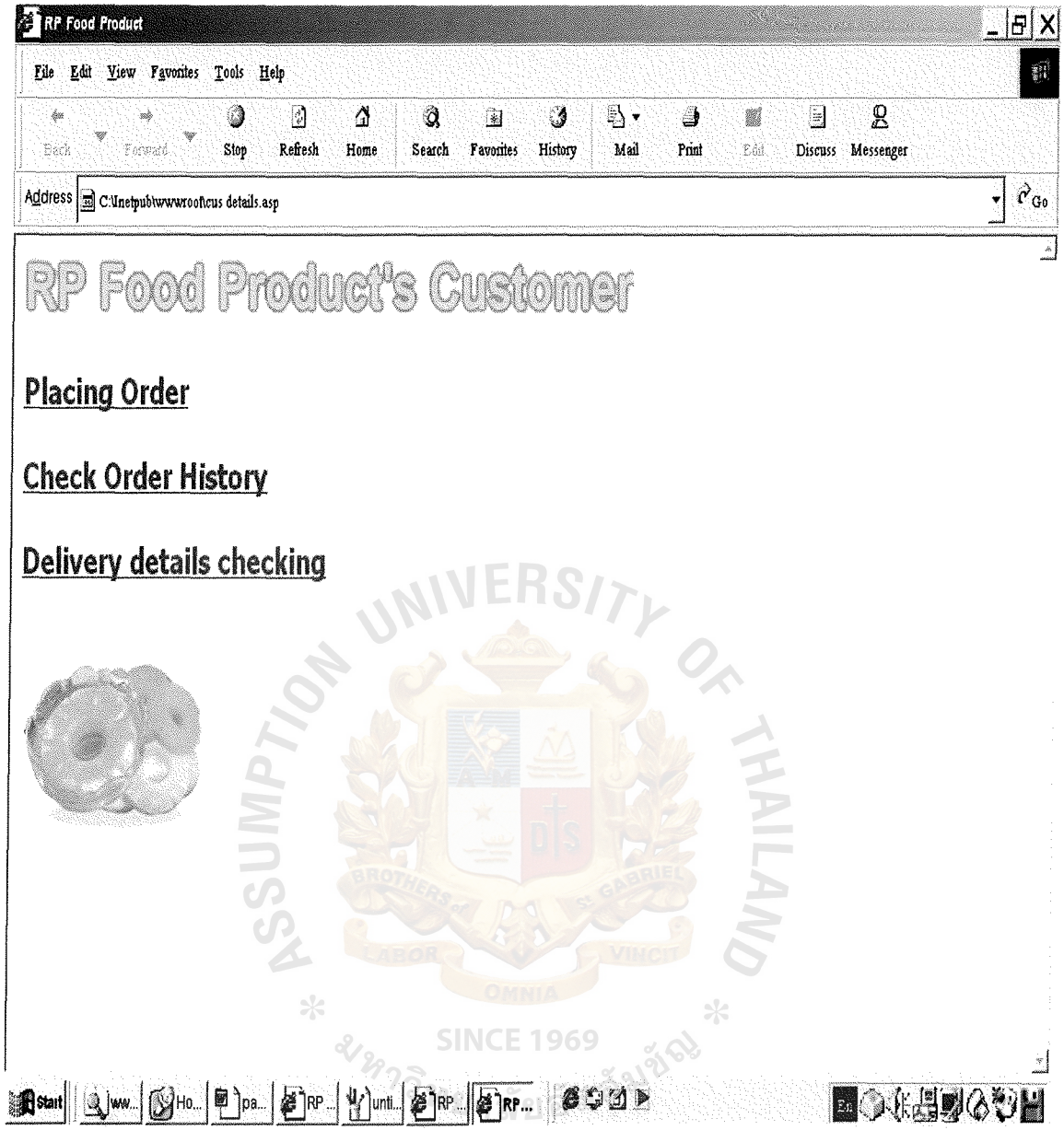

Figure H.5. Web Interface Screen: Customer Information Process.

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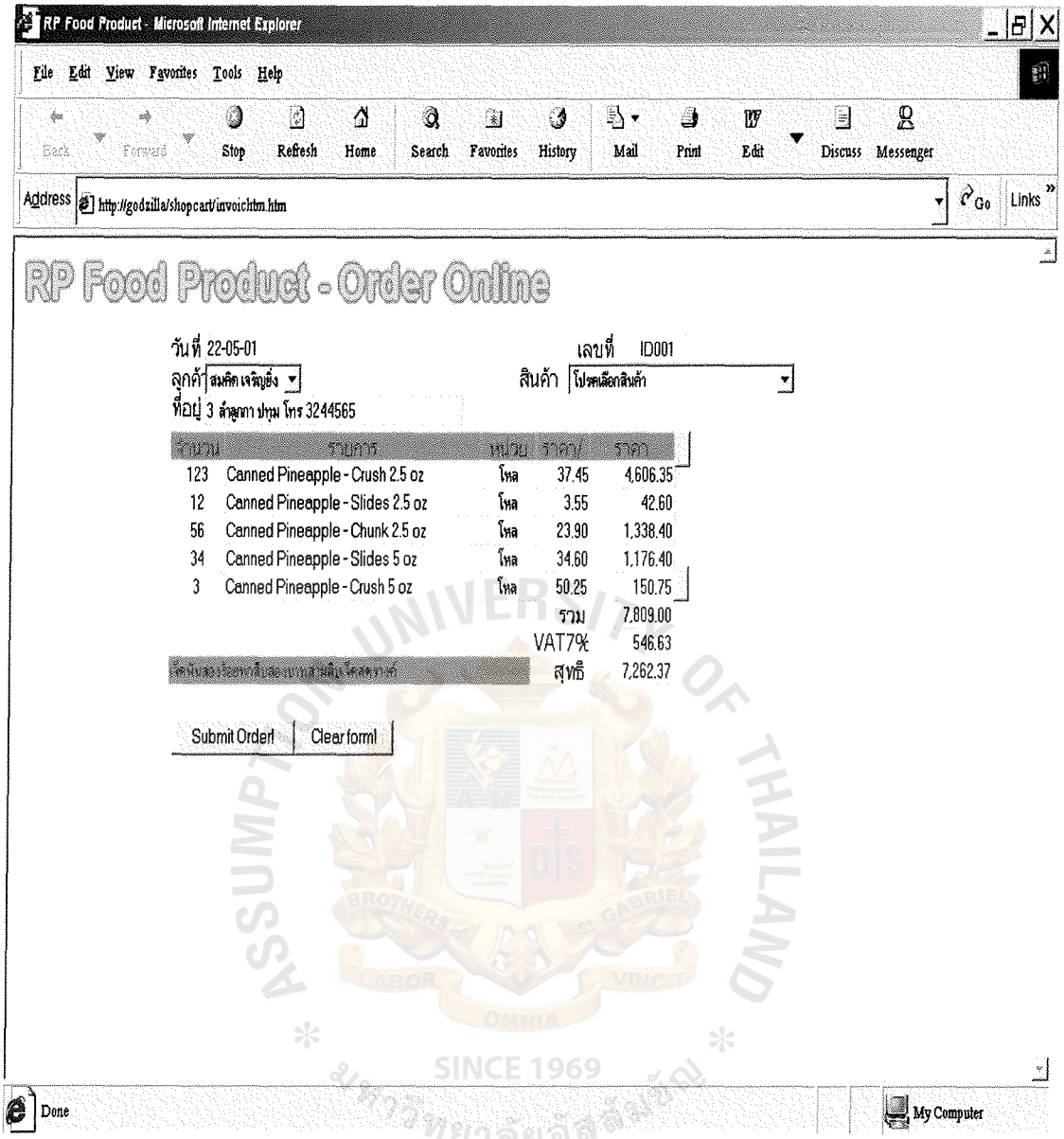

Figure H.6. Web Interface Screen: Customer Placing Order.

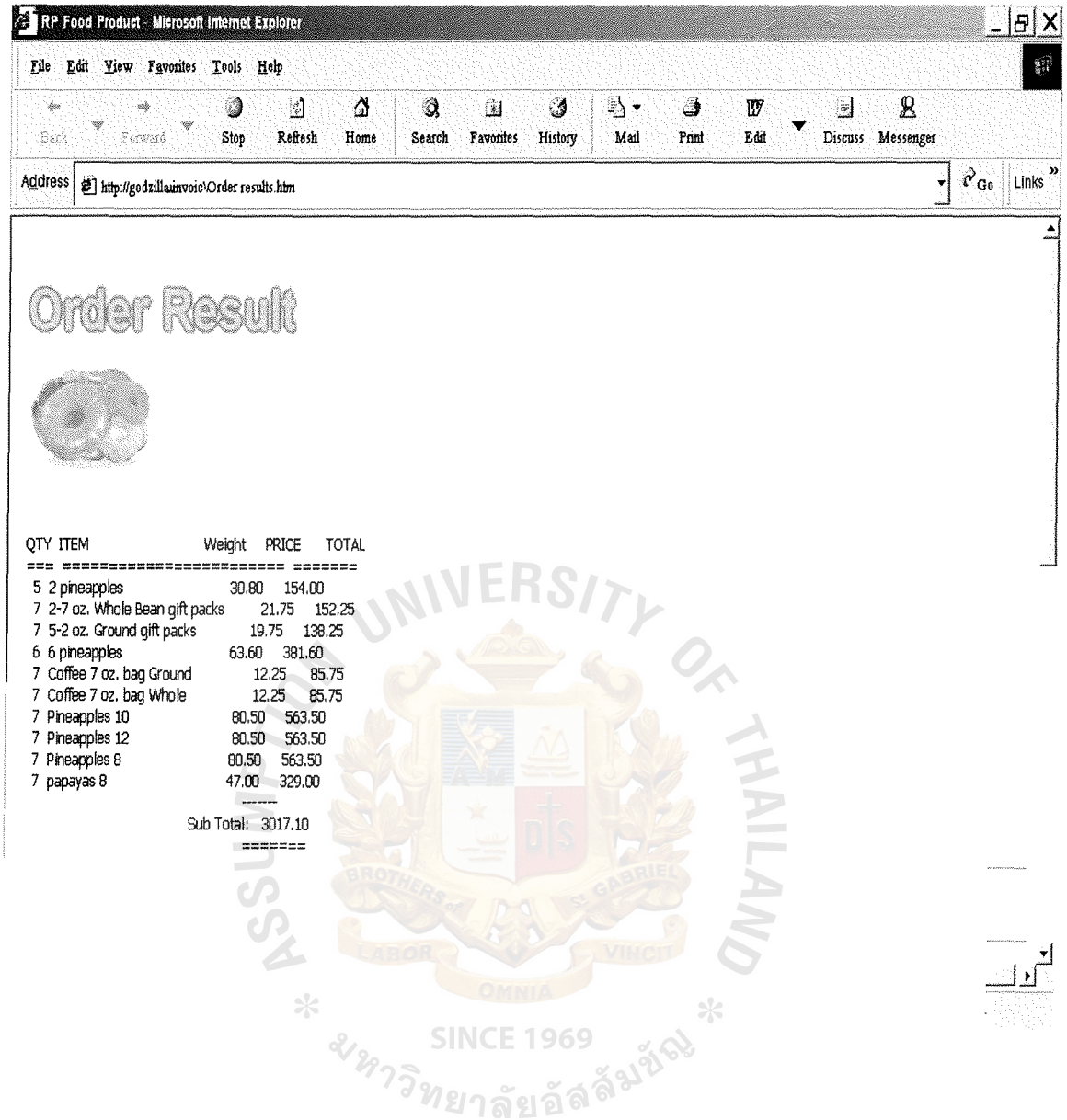

Figure H.7. Web Interface Screen: Customer 's Order Details.

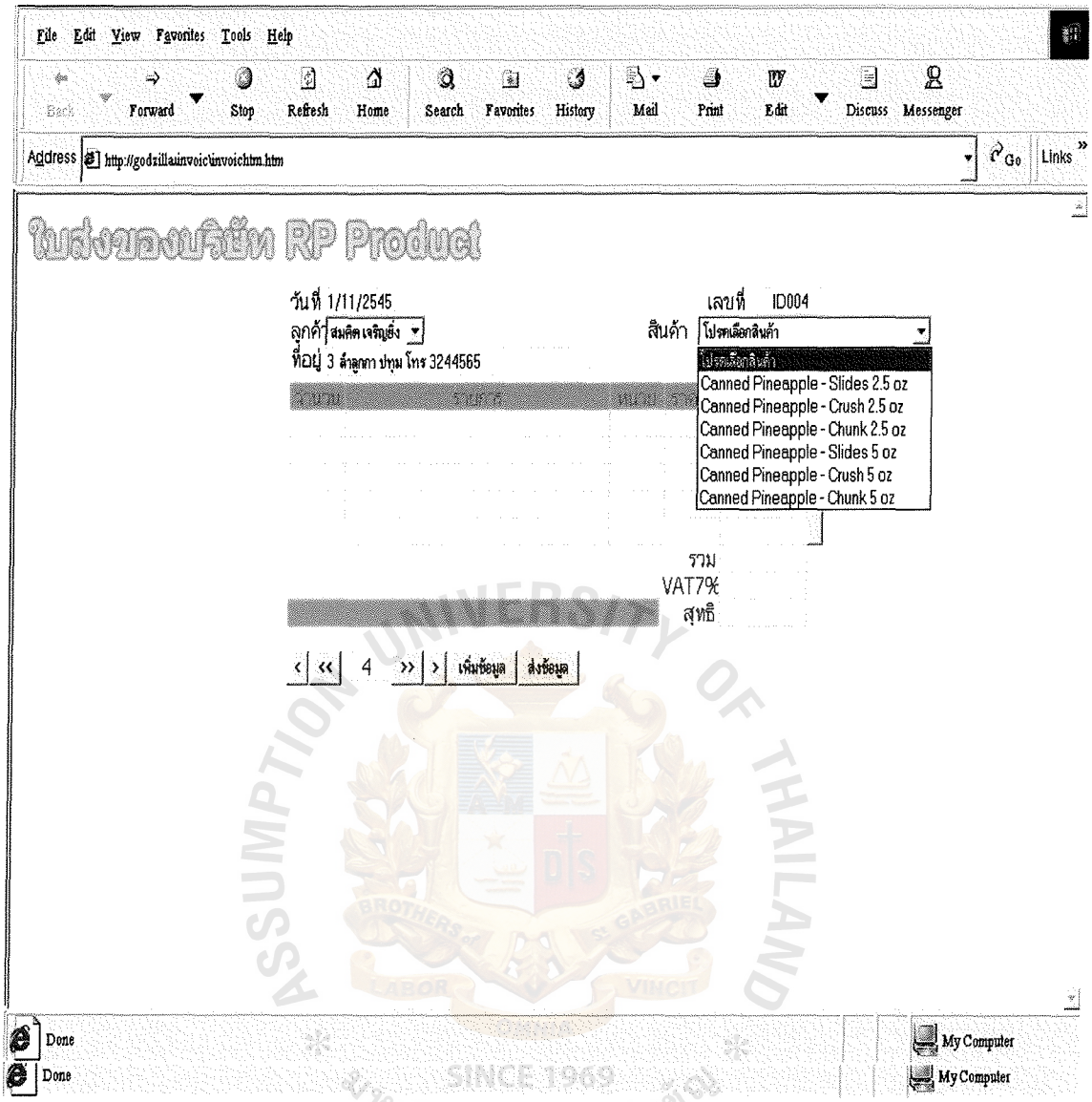

Figure H.8. Web Interface Screen: Invoice.

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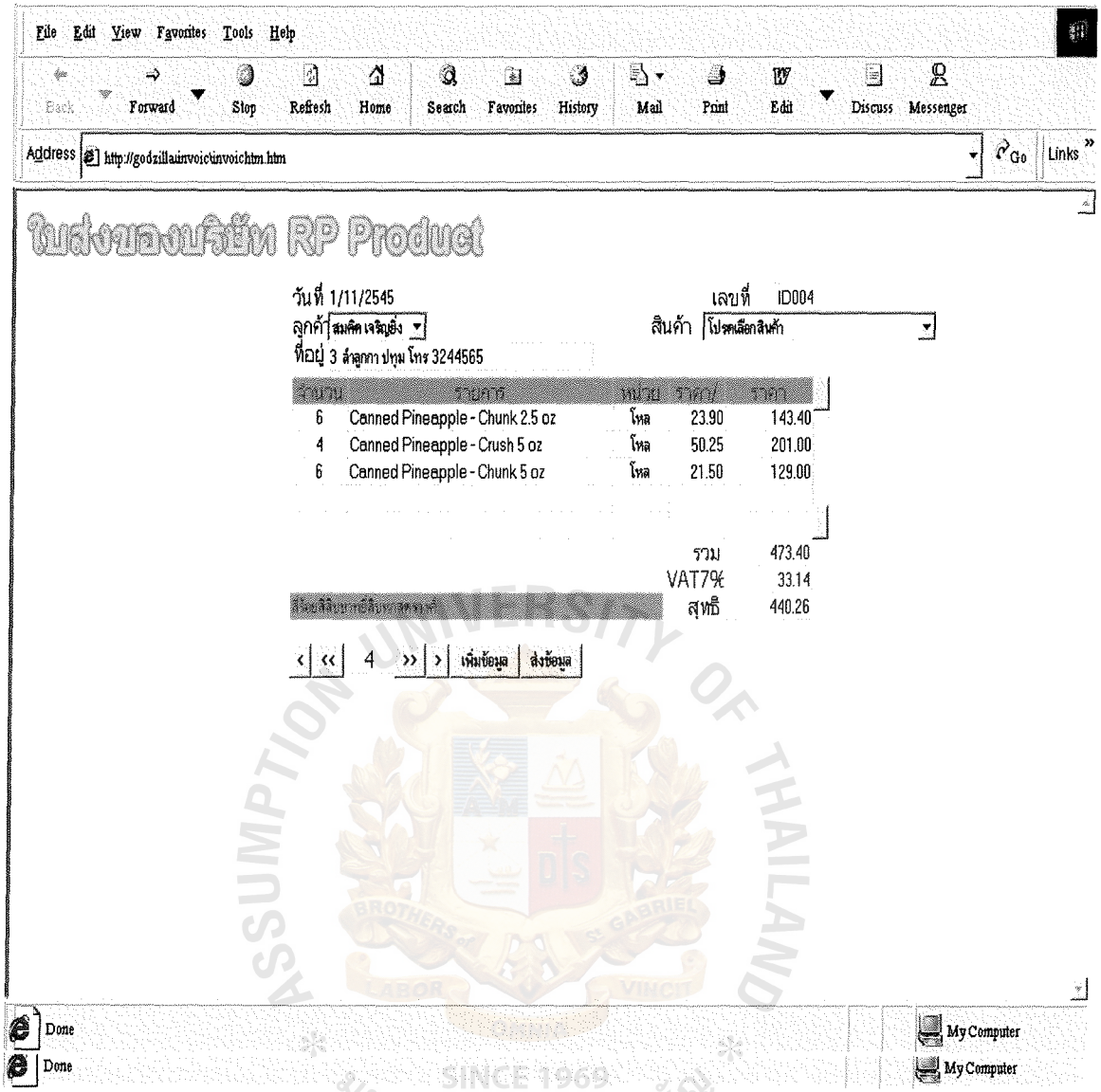

Figure H.9. Web Interface Screen: Invoice.

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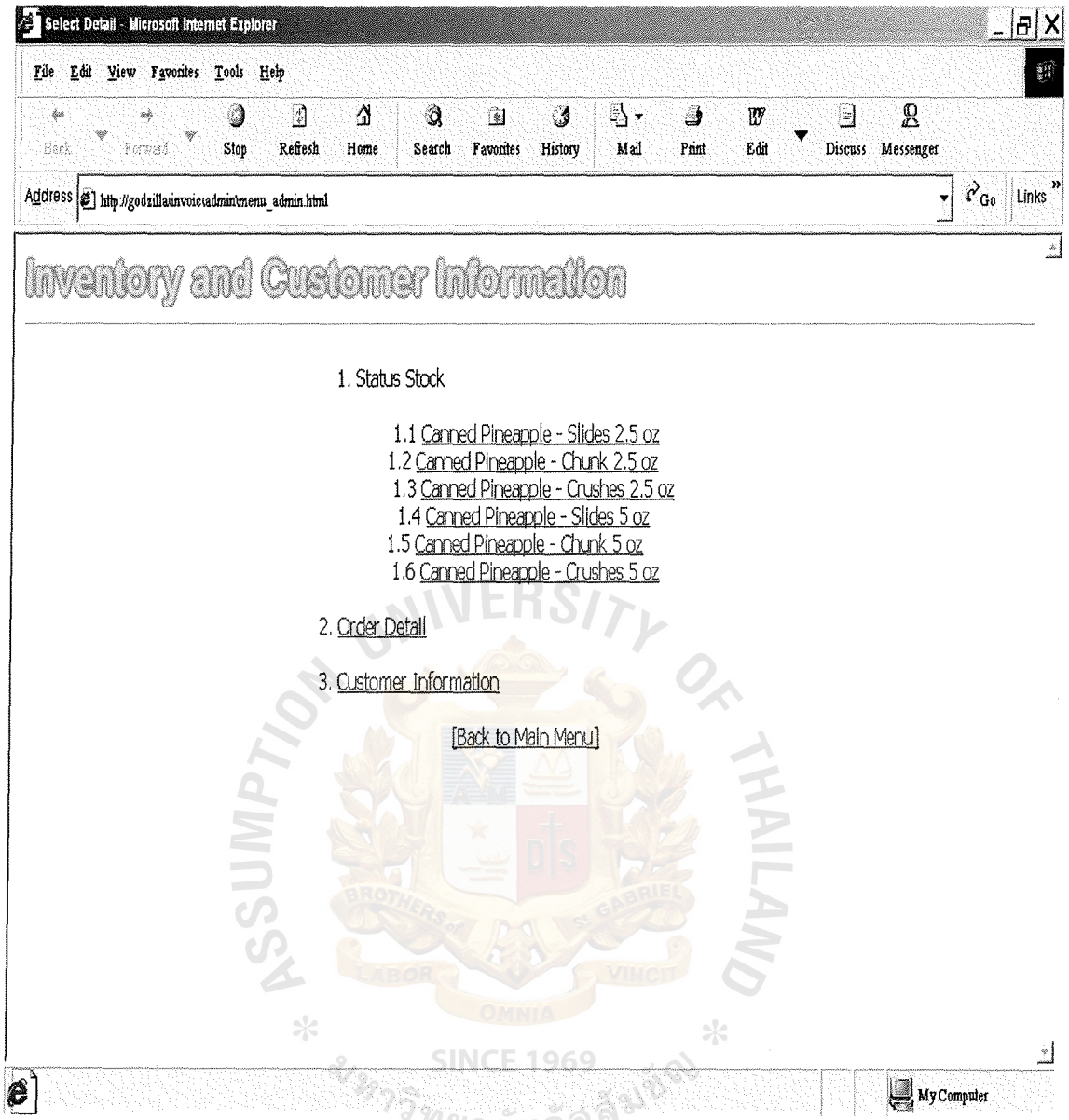

Figure H.10. Web Interface Screen: Inventory, Order and Customer Information.

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APPENDIX I

REPORT DESIGN

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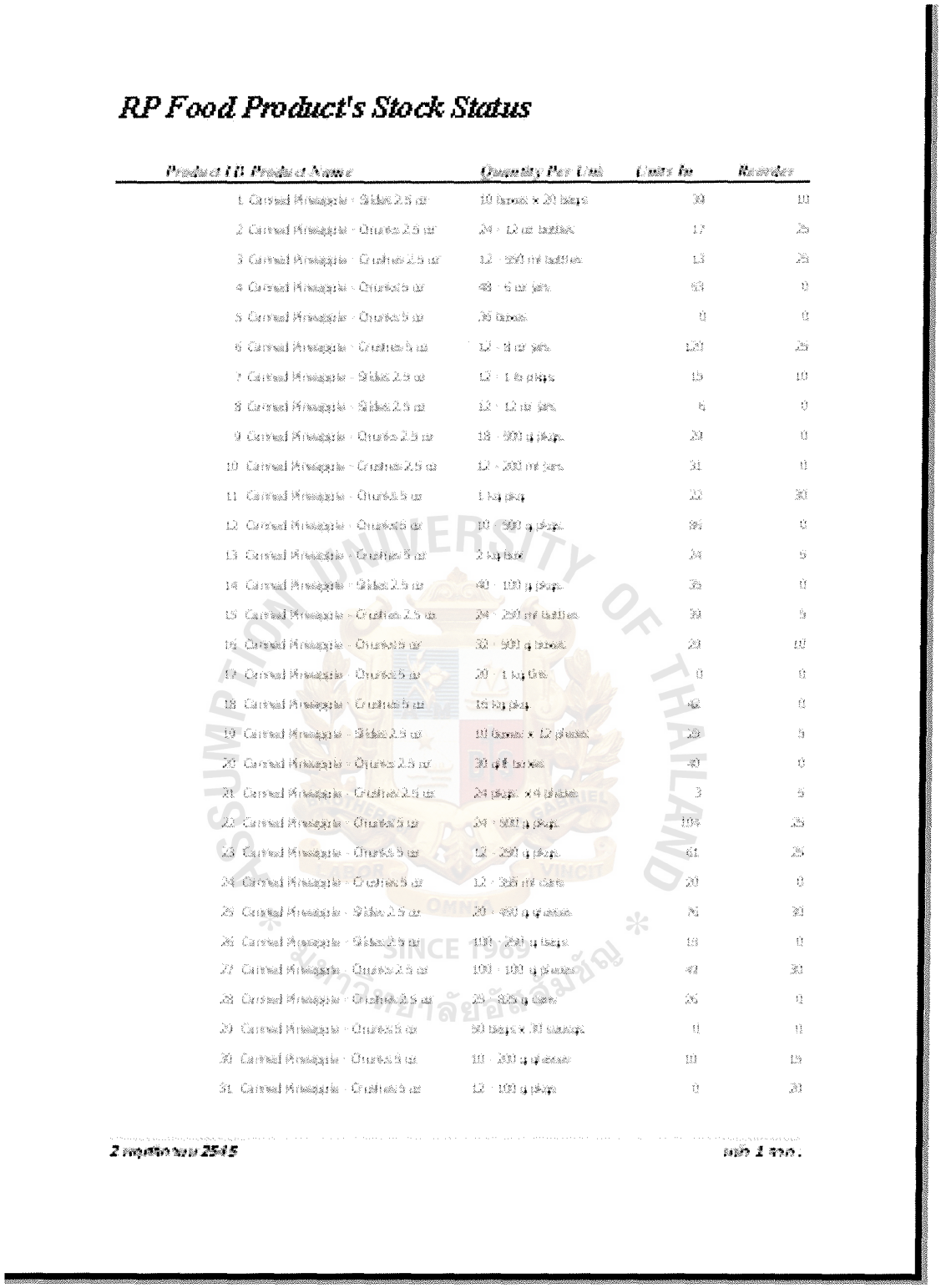

RP Food Product's Stock Status

Product ID	Product Name	Quantity Per Unit	Units In	Reorder
1	Canned Pineapple - Slices 2.5 oz	10 boxes x 20 bags	30	10
2	Canned Pineapple - Chunks 2.5 oz	24 - 12 oz bottles	17	25
3	Canned Pineapple - Crushed 2.5 oz	12 - 550 ml bottles	13	25
4	Canned Pineapple - Chunks 5 oz	48 - 6 oz jars	63	0
5	Canned Pineapple - Chunks 5 oz	36 boxes	0	0
6	Canned Pineapple - Crushed 5 oz	12 - 8 oz jars	120	25
7	Canned Pineapple - Slices 2.5 oz	12 - 1 lb pkgs.	15	10
8	Canned Pineapple - Slices 2.5 oz	12 - 12 oz jars	6	0
9	Canned Pineapple - Chunks 2.5 oz	18 - 300 g pkgs.	20	0
10	Canned Pineapple - Crushed 2.5 oz	12 - 200 ml jars	31	0
11	Canned Pineapple - Chunks 5 oz	1 kg pkg.	22	30
12	Canned Pineapple - Chunks 5 oz	10 - 500 g pkgs.	86	0
13	Canned Pineapple - Crushed 5 oz	2 kg tins	24	5
14	Canned Pineapple - Slices 2.5 oz	40 - 100 g pkgs.	35	0
15	Canned Pineapple - Crushed 2.5 oz	24 - 250 ml bottles	30	5
16	Canned Pineapple - Chunks 5 oz	30 - 500 g boxes	20	10
17	Canned Pineapple - Chunks 5 oz	20 - 1 kg tins	0	0
18	Canned Pineapple - Crushed 5 oz	15 kg pkg.	40	0
19	Canned Pineapple - Slices 2.5 oz	10 boxes x 12 packs	10	5
20	Canned Pineapple - Chunks 2.5 oz	30 g/f boxes	40	0
21	Canned Pineapple - Crushed 2.5 oz	24 pkgs. x 4 packs	3	5
22	Canned Pineapple - Chunks 5 oz	24 - 500 g pkgs.	105	25
23	Canned Pineapple - Chunks 5 oz	12 - 250 g pkgs.	61	25
24	Canned Pineapple - Crushed 5 oz	12 - 355 ml cans	20	0
25	Canned Pineapple - Slices 2.5 oz	20 - 450 g glasses	76	30
26	Canned Pineapple - Slices 2.5 oz	100 - 250 g bags	15	0
27	Canned Pineapple - Chunks 2.5 oz	100 - 100 g glasses	42	30
28	Canned Pineapple - Crushed 2.5 oz	25 - 825 g cans	26	0
29	Canned Pineapple - Chunks 5 oz	50 bags x 30 sacks	0	0
30	Canned Pineapple - Chunks 5 oz	10 - 300 g glasses	10	15
31	Canned Pineapple - Crushed 5 oz	12 - 100 g bags	0	20

2 กุมภาพันธ์ 2545 หน้า 1 จาก 1

Figure I.1. Report Design: Stock Status.

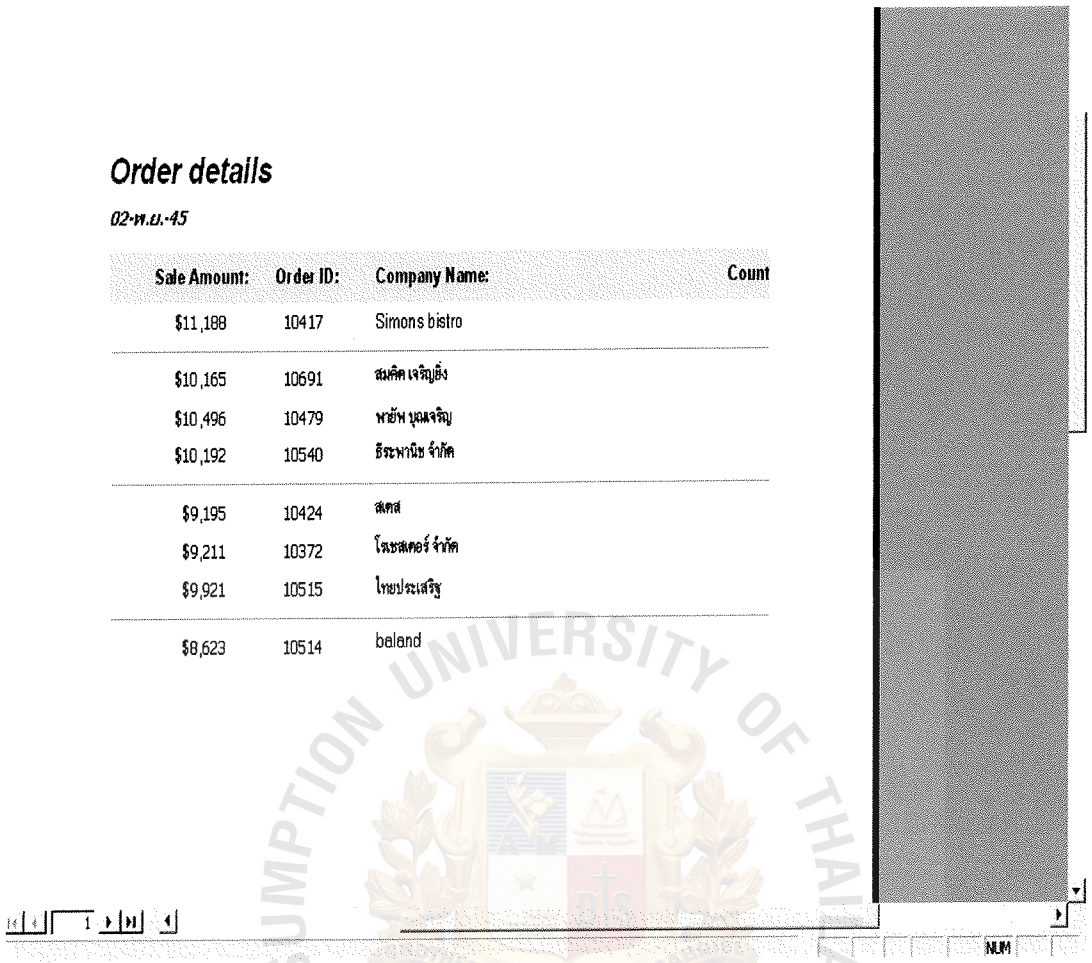

Figure I.2. Report Design: Order.

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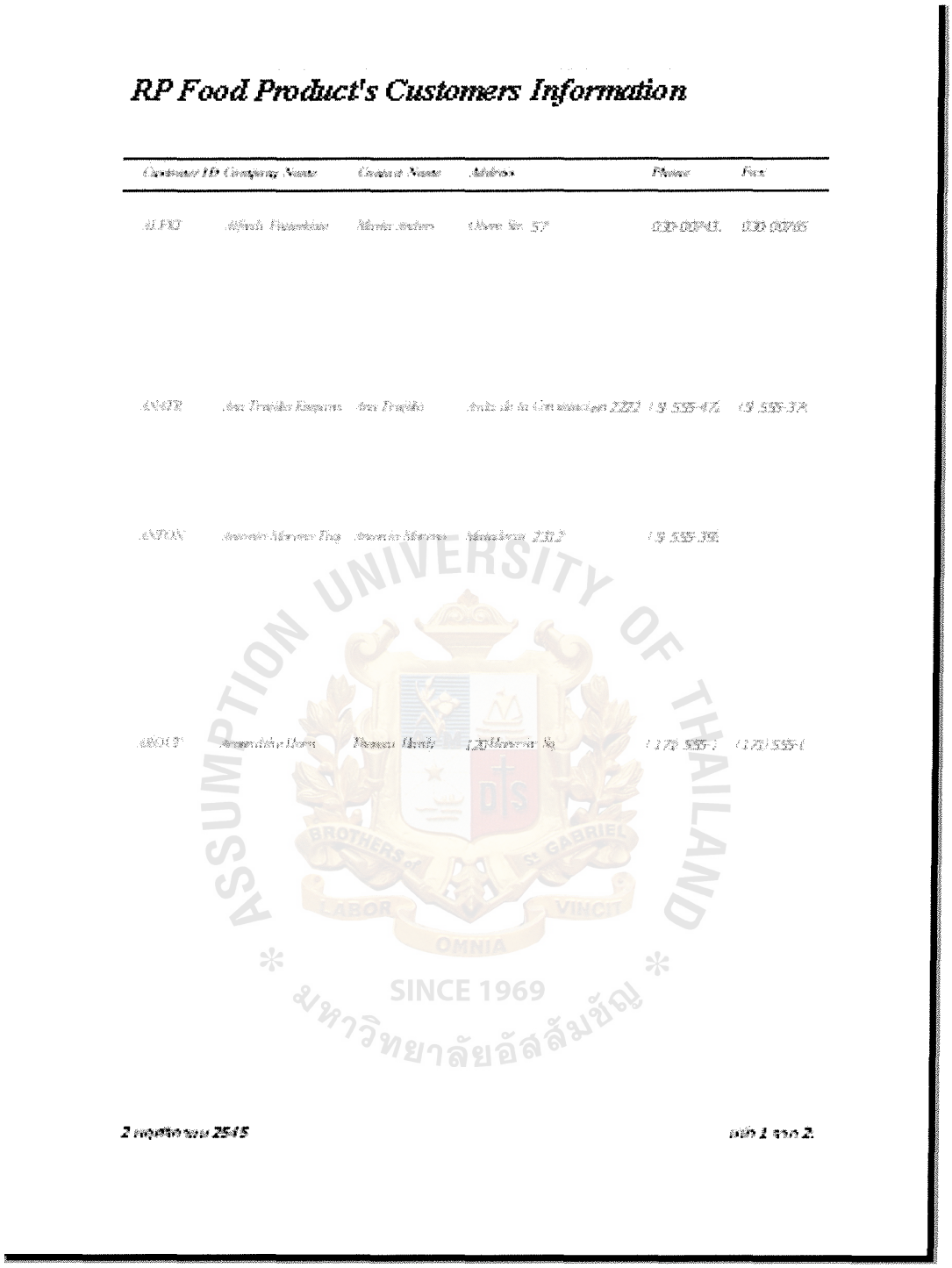

RP Food Product's Customers Information

Customer ID	Company Name	Contact Name	Address	Phone	Fax
ALFKI	Alfreds Futterkiste	Maria Anders	Obere Str. 57	030-0074321	030-0076545
ANATR	Ana Trujillo Emparedados	Ana Trujillo	Avda. de la Constitución 2222	(5) 555-4729	(5) 555-3745
ANTON	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	(5) 555-3932	
AROUT	Around the Horn	Thomas Hardy	120 Hanover Sq.	(171) 555-7788	(171) 555-6750

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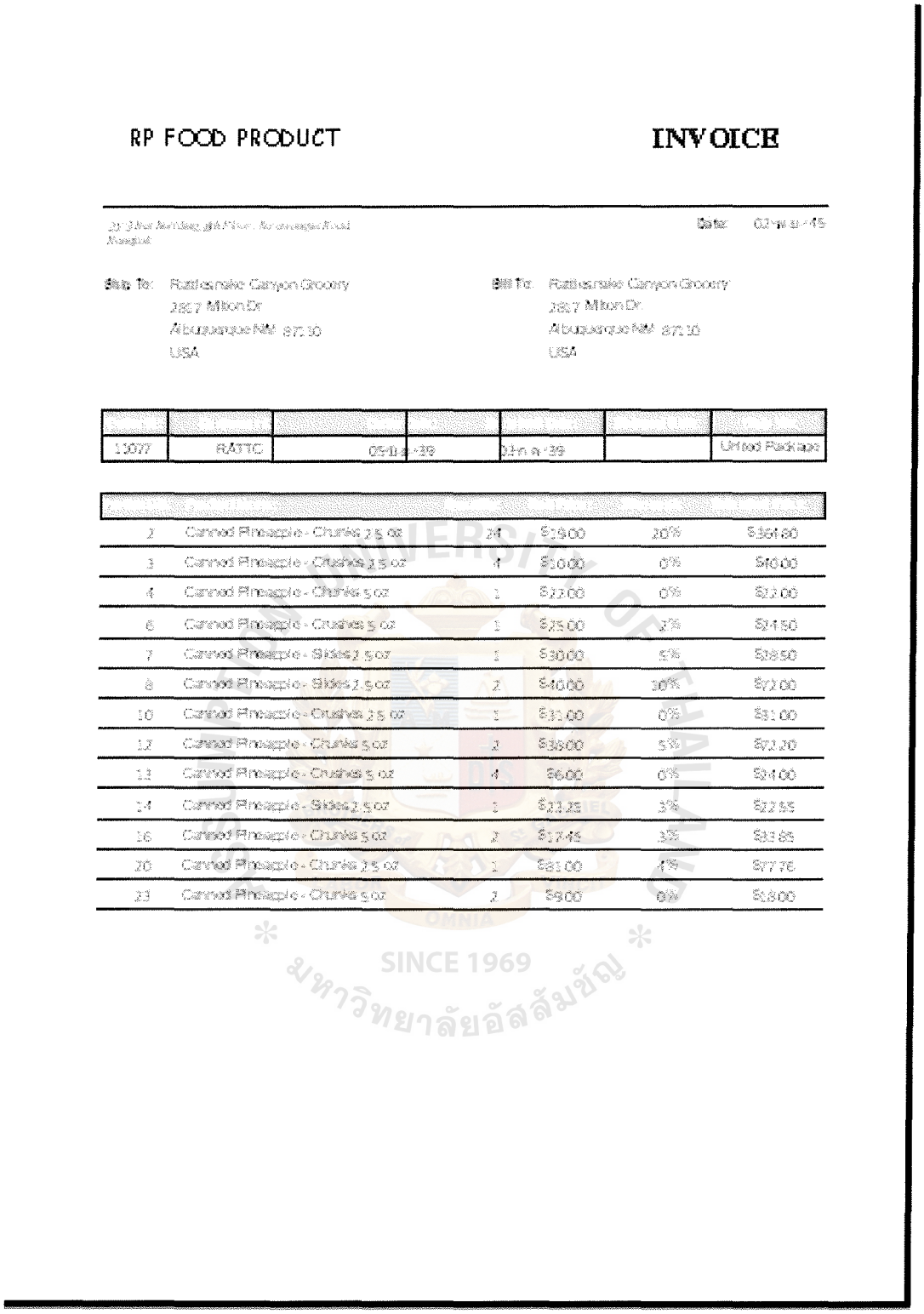
Figure I.3. Report Design: Customer Information.



RP FOOD PRODUCT

INVOICE

[illegible]

Date: 02-พ.ย.-45

Ship To: Rattlesnake Canyon Grocery
2817 Milton Dr
Albuquerque NM 87110
USA

Bill To: Rattlesnake Canyon Grocery
2817 Milton Dr
Albuquerque NM 87110
USA

11077	RATTC	05-ธ.ค.-39		03-ก.ค.-39		United Package

2	Canned Pineapple - Chunks 2.5 oz	24	$19.00	20%	$364.80
3	Canned Pineapple - Crushes 2.5 oz	4	$10.00	0%	$40.00
4	Canned Pineapple - Chunks 5 oz	1	$22.00	0%	$22.00
6	Canned Pineapple - Crushes 5 oz	1	$25.00	2%	$24.50
7	Canned Pineapple - Slides 2.5 oz	1	$30.00	5%	$28.50
8	Canned Pineapple - Slides 2.5 oz	2	$40.00	10%	$72.00
10	Canned Pineapple - Crushes 2.5 oz	1	$31.00	0%	$31.00
12	Canned Pineapple - Chunks 5 oz	2	$38.00	5%	$72.20
13	Canned Pineapple - Crushes 5 oz	4	$6.00	0%	$24.00
14	Canned Pineapple - Slides 2.5 oz	1	$23.25	3%	$22.55
16	Canned Pineapple - Chunks 5 oz	2	$17.45	3%	$33.85
20	Canned Pineapple - Chunks 2.5 oz	1	$81.00	4%	$77.76
23	Canned Pineapple - Chunks 5 oz	2	$9.00	0%	$18.00

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Figure H.4. Report Design: Official Invoice to Customer.

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