Wooden Utensil Manufacturer Information System

by

Mr. Patana Dulyapiradit

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

March 2001

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Project Title	Wooden Utensil Manufacturer Information System
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Academic Year	March 2001

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

Light Star Wood Co., Ltd. is a wooden household item manufacturer, which has had a good business performance for over 10 years. The company is well accepted in many countries around the world such as Japan, Hong Kong, and America. In the late 1990s, the company was moved to the new location. The CEO has a vision to install a computer information system in order to increase the business competitiveness of the company. The new computerized system would help the company to maximize profits, minimize the operation cost, and improve internal management. The new system includes Transaction Processing Systems (TPS) for daily operations and Management Information Systems (MIS) to support decision-making for management.

At present, the existing system operates manually. All records of every department are kept in a paper file holder, which requires a number of staff to maintain. The time taken to find out a required record is lengthy and it causes a service quality problem. In addition, manual works frequently produce errors that affect system consistency.

A new computerized information system is developed to replace the current manual system. All data and information are kept in the Microsoft SQL database server 7 with Windows 2000 Professional Operating System and users can access the data through the Microsoft Access 2000 Clients. The proposed system is found to help reducing the response time of all business operations such as finding records, and processing reports, and eliminating human errors from input, process, and output procedures. The new computerized system helps to improve the efficiency of all areas of business operations within the company. Therefore, the number of staff can be reduced, which greatly helps the company in cost saving.

ACKNOWLEDGEMENTS

Several people have made contributions to this project. The writer would like to acknowledge their efforts and thank them for their contributions.

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I. INTRODUCTION

1.1 Background of the Project

Every business must compete to survive. Business people try to improve many things such as quality of products, marketing promotion, good will, and business management in order to maximize the profit. The accounting formula states that "a profit comes from a sale value subtracted by a cost." There are two ways to achieve maximum profit. The first way is to get highest sale value. This mission is accounted by marketing department and sale department. For many decades, all business sets this mission as a goal needed to be overcome. For the last few years, Thailand has been through an economic crisis, resulting in the collapse of many businesses. People have less purchasing power. The mission that gets highest sale value is very hard to defeat. Some business has a vision to maximize the profit by using the other way, which is to attempt to minimize the cost.

It is not easy to minimize the cost. The answer to this question lies in management policy and mechanism. The scope of management policy and mechanism is not only concerned with how to reduce the cost directly but also to concentrate on the efficiency of management.

To follow the globalization, computer information system is an important success key for the business. Only one computer system can keep a lot of data and process them into useful information provided to support many levels of business operations such as Operational level, Knowledge level, Management level, and Strategic level.

Light Star Wood Co., Ltd. has experienced over 10 years in manufacturing of wooden household items. The CEO of the company sets the goal to minimize cost by

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improving the management efficiency. By this goal, he expects two outputs, which are minimized cost and improved internal management.

Thus, the new management of the Light Star Wood Co., Ltd. wants computerized system as a solution to keep a lot of data and process them into useful information to support plan, decision, and operation in the organization.

1.2 Objectives of the Project

There are 6 main objectives for this project which are:

(1) To generate a computerized system to manage and control operating information which affects to total performance and efficiency of the company.

(2) To generate a Management Information System (MIS) to support manager planning, controlling and decision making by providing a summary and exception report, such as classifying a customer to make a promotion and discount rate plan, creating product season to predict the usage of raw materials. The Management Information System focuses on Marketing Department and Manufacturing Department.

(3) To monitor the status of each product and provide warning when the quantity of each item is too low. Therefore, managers are able to plan the inventory with much more efficiency.

(4) To implement a Transaction Processing System (TPS) that performs and records the daily routine transactions necessary to conduct the business. In addition, TPS allows users to quickly access and keep track of records required. The Transaction Processing System focuses on for Sales Department. This system serves the operational level of the organization.

(5) To eliminate human, increase reliability and consistency in every business operation.

(6) To create goodwill in customer images. The goodwill is an intangible benefit believed to be difficult or impossible to quantify. It influences the customers' purchasing decision and brand royalty.

1.3 Scope of the Project

To achieve the objectives of the project, the proposed system has to involve four major departments, which are Marketing Department, Sale Department, Manufacturing Department and Inventory Department.

This project does not include accounting department and raw material warehouse. In the cost benefit analysis, the project also calculates only tangible benefits, which can be easily quantified. Intangible benefits, such as goodwill, are not included.

Therefore, in terms of system development this project will consist of 4 modules, which are Customer Information Module, Product Information Module, Selling Information Module and Inventory Information Module. All modules and their relation are illustrated in Figure 1.1.

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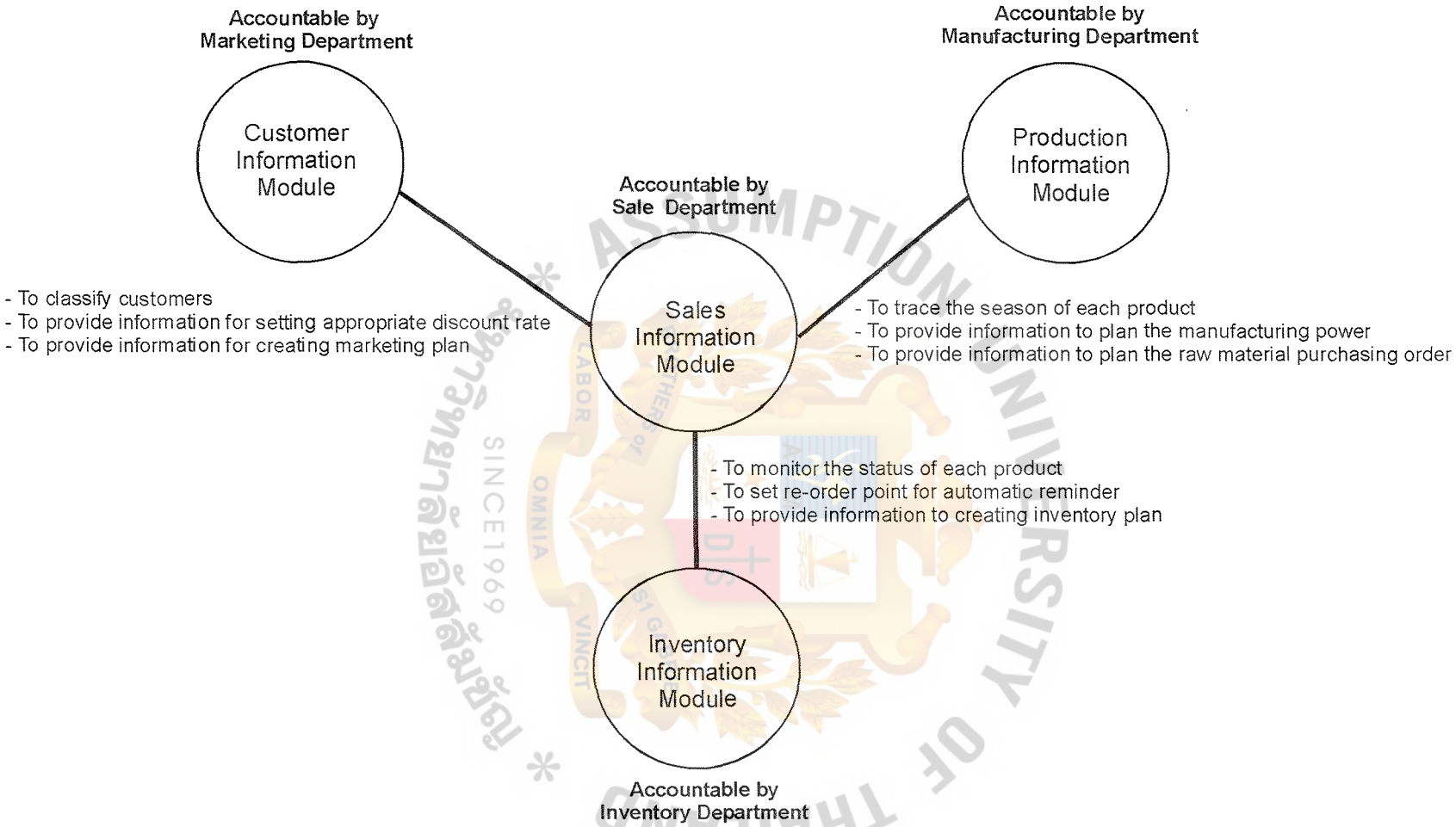

Figure 1.1. Related Departments in The Project Scope.

1.4 Deliverables

At the end of this project, deliverables can be divided into 2 sections. The first one focuses on systems analysis, which must indicate the business problems and the business requirement of the new system. In technical view, this project displays Entity Relationship Diagram (ERD) for database design, Functional Decomposition with Data Flow Diagram (DFD) for a process design.

The other one focuses on systems design, which delivers candidate solution with system specification, hardware and software requirement, feasibility analysis, and project implementation and delivery plan. In technical view, the project displays Network Topology Diagram, Structure Chart, File Layout and Process Specification.

Finally, all analyzed information and models are used to implement the real computerized system, which consists of both software and hardware for a solution.

1.5 Project Plan

This project started on Monday 2 October 2000. Follow the project schedule in Figure 1.2, are three phases, which are System analysis phase, system design phase, and system implementation phase.

System Analysis Phase has started since 2 October 2000. This phase has 7 activities, which are Define the objective and scope, Survey and plan the project, Study and analyze the existing system, Define and prioritize the business requirement, Develop Context Diagram, Develop Data Flow Diagram, and Cost & Benefit Analysis. The First phase needs 6 weeks to complete.

Next, System Design Phase takes another 6 weeks after the first phase has been finished. This phase started on the second week of November. There are four activities in this phase, which are Network design, Database design, Interface design, and Process design.

The last phase is System Implementation Phase that takes 7 weeks to complete. This phase has four activities, which are Program coding, Program testing, Hardware and Software installation, and System Conversion. Follow the project schedule, the project will be completed on the forth week of the January 2001.

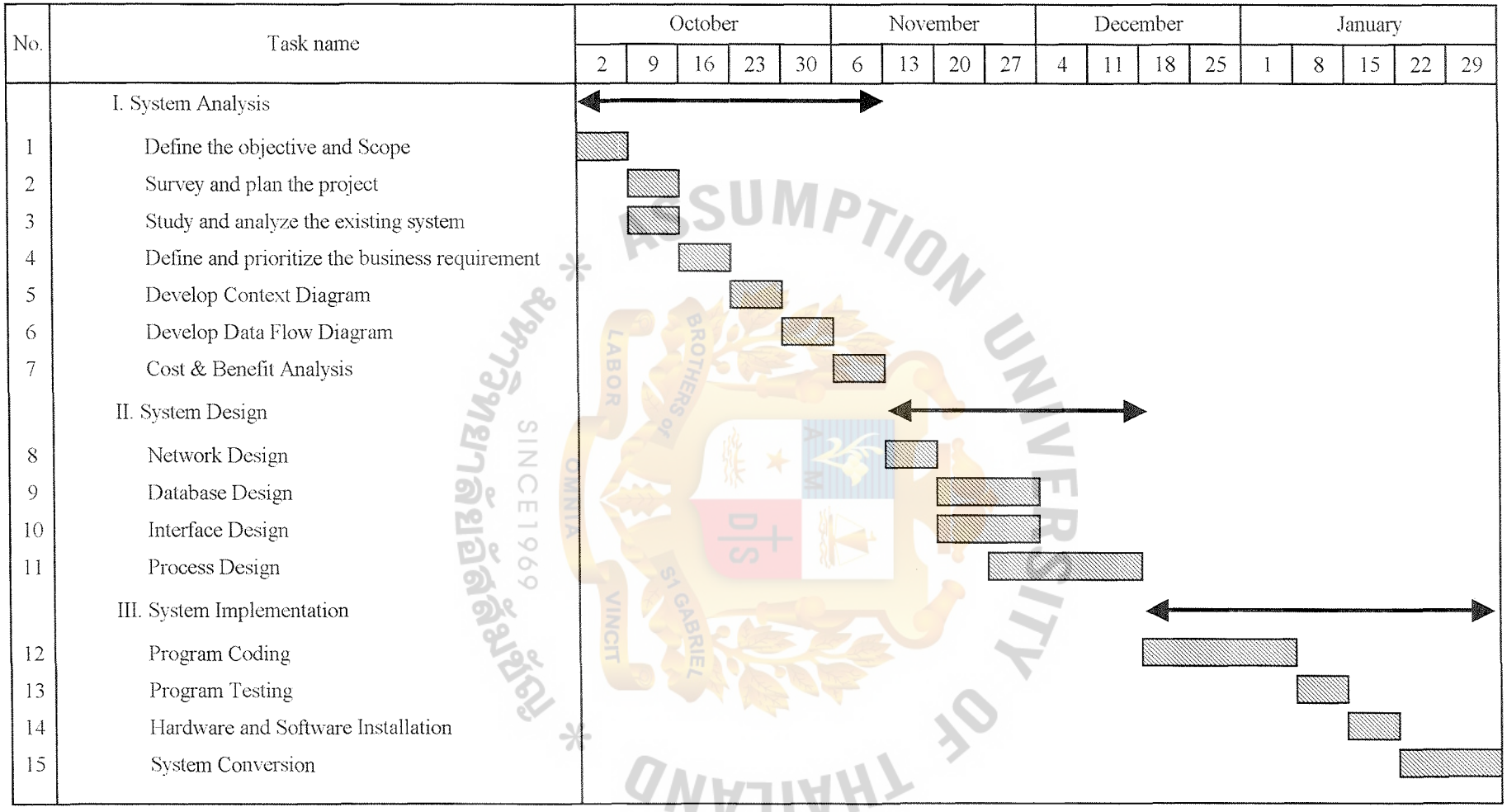

Figure 1.2. Gantt Chart of the Project.

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II. THE EXISTING SYSTEM

2.1 Background of the Organization

Light Star Wood Co., Ltd. has an experience of over 10 years in manufacturing of wooden household items. The headquarter is located at Solsakaengam, Praram2 road, Bangkhuntien. The company is well accepted among the customers in Japan, Hong Kong, Malaysia, Singapore, America and Europe. Later, the company moved form the 1,600 square-meters square to a new place with 16,000 square-meters square in the late of 1999.

The new place includes warehousing with large storage facilities to ensure raw materials for all year round. In addition, a new department, which is Research and Development, is established to develop innovation high-quality products.

Currently, Light Star Wood Co., Ltd. has two factories and one showroom. It has over 50 full-time employees in the factories and deals with over 700 customers around the world. The company can also manufacture any item as per the requirements of the customer according to the drawings or photos given. To support non-boundary trade, the company has an email address to receive orders and comment from the far-area customers. The core philosophy of the company is to develop and maintain the best products based on honesty, punctuality and competitive prices.

Light Star Wood Organization consists of five major departments, which are Accounting Department, Marketing Department, Manufacturing Department, Inventory Department, and Sales Department as shown in Figure 2.1.

Marketing Department is responsible for keeping customer information. In addition, the department has an accountability to create marketing and promotion plan.

Manufacturing Department responds for keeping product information. Moreover, The Department has a management duty, which plans a manufacturing power and raw material purchasing plan to reduce the cost.

Inventory Department is responsible for inventory information. The inventory information monitors the status of each product item in the warehouse.

Sales Department responds for sale information. The sale information keeps track of each selling. It can tell who the customers are, what and when the products were bought.

Accounting Department has a duty about the company's accounting and payroll. Furthermore, this department works as the company agent to contact with Government Revenue Department.

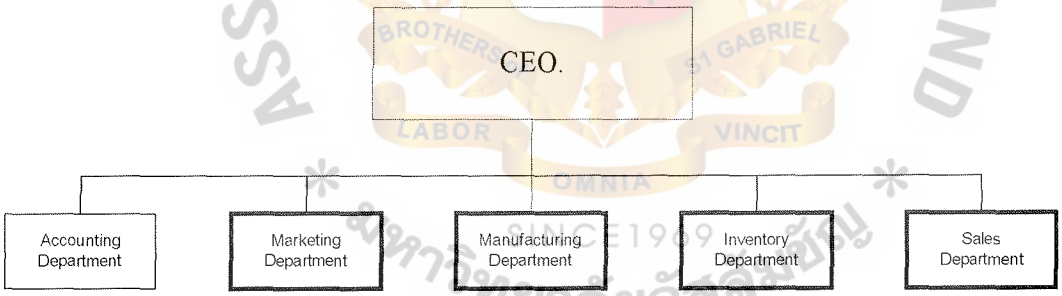

Figure 2.1. Organization Chart of Light Star Wood Co., Ltd.

2.2 Current Problems and Areas for Improvement

The problems and areas for improvement of Light Star Wood Co., Ltd. are as follows:

(1) To use manual and paper work in all operations. All of the functions of Sales Department, Marketing Department, Manufacturing Department, and Inventory department are still operated manually with paper work. Therefore, it causes low throughput and slow response time. The probability of mistake in input, process, and output stages is very high. Moreover, in the long run, a cost of salary will be higher than system maintenance.

(2) Officers must process data in the same way many times. This kind of problem occurs in all departments of the company. Human productivity is very low which effects efficiency of the whole organization.

(3) Lack of technology system to keep many kinds of records and to generate a useful information. With paper work, the company must set a big piece of budget to keep and generate them, while the company got a few benefits from that document. From this data, it is occasionally used to produce a significant information, which is used to support manager decision.

(4) It takes long to check number of remaining product in the warehouse. That means slow response time has an effect on business goodwill. Currently, the company needs to set a staff for checking the number of remaining product in the warehouse.

(5) It takes long to do a report for administrative level. A report is a kind of necessary information for the organization. Out of date and unreliable reports are useless information. It is a waste of time and resources to produce them.

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(6) Hard to find required records from paper file. The speed of searching required record from computer is normally much faster than human.

(7) Cannot calculate the accurate and consistent value of all operations. The chance to make a mistake of human work is very high when compared with a computer.

Problem Statements of Light Star Wood Co., Ltd. is shown in Table 2.1.

2.3 Existing System Analysis

Nowadays, Light Star Wood Co., Ltd. operates their business by pure manual and paper work. Follow scope of the project, there are 4 departments, which are Marketing Department, Manufacturing Department, Sale Department and Inventory Department need to be analyzed. The context diagram of the existing system is shown in Figure 2.2.

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Table 2.1. Problem Statements of Light Star Wood Co., Ltd.

PROJECT :	Computer Information System Development For Light Star Wood Co., Ltd.	PROJECT MANAGER :	Mr. Patana Dulyapiradit
CREATED BY :	Mr. Patana Dulyapiradit	LAST UPDATE BY :	Mr. Patana Dulyapiradit
DATE CREATED :	October 20, 2000	DATE LAST UPDATE :	October 30, 2000

Brief Statement of Problems	Urgency	Visibility	Priority of Rank	Proposed Solution
1. To use manual and paper work in all operations.	ASAP	High	1	Quick fix; then design a new system
2. Officers must process a data in the same way many times.	6 Months	Medium	7	Implemented by computerize system
3. No technology system keeps many kinds of record and generates a useful information.	4 Months	Low	5	Design a new system
4. To take long time to check number of remaining product in the warehouse.	ASAP	High	3	Quick fix; then design a new computerize system
5. To take long time to do a report for administrative level.	4 Months	Medium	4	Design a new system
6. Hard to find required records from paper file.	7 Months	Medium	6	Implemented by computerize system
7. Cannot calculate the accurate and consistent value of all operations.	3 Months	High	2	Quick fix; then design a new computerize system

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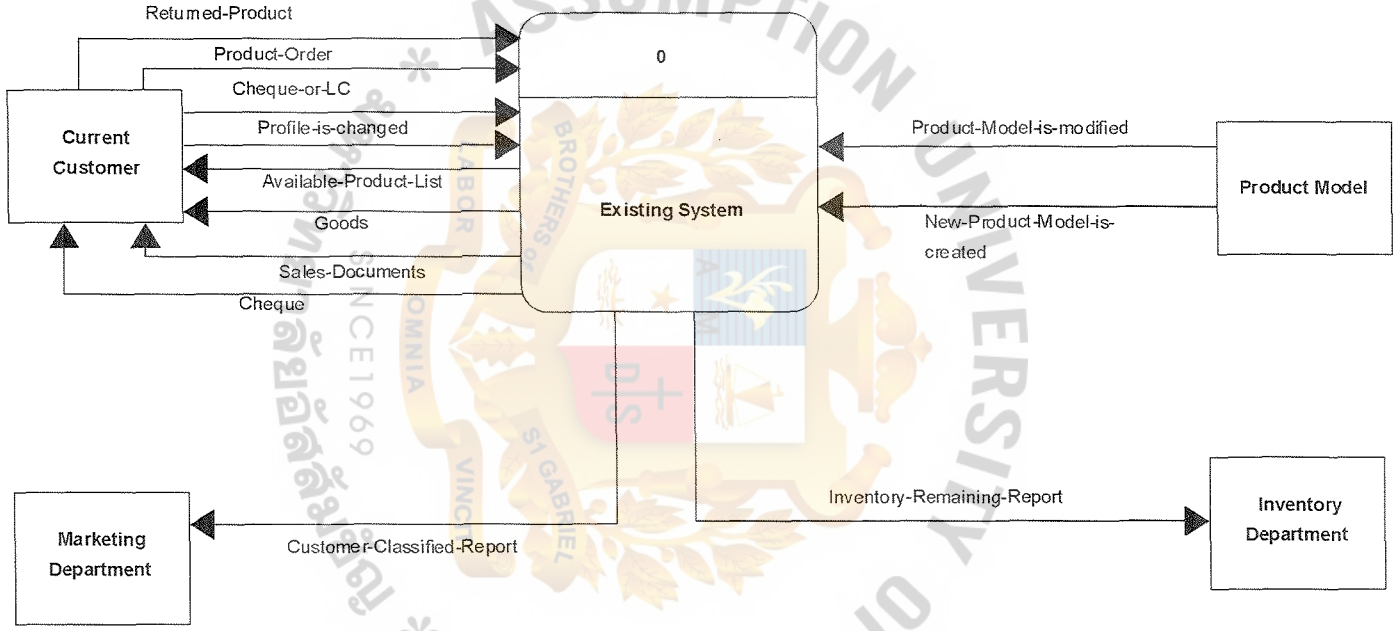

Figure 2.2. The Context Diagram of the Existing System.

2.3.1 Marketing Department

This department earns the income for the company. It tries to make more profit by increasing the sales volume. The other goal is to keep the old customer and explore new market group. Event and process of Marketing Department is shown in Figure 2.3.

Functions of the Department

(1) To keep and update customer records.

(2) To create marketing and promotion plan to activate sale volume.

(3) To set appropriate discount rate for every customer.

(4) To get customer requirements and complaints.

(5) To generate customer report for a manager and CEO.

Related to	Input	Process	Output
Customer →	New Customer →	Add new customer →	New customer data were Added
→	Current Customer →	Update customer data →	Customer data are updated
Sale Department →	Sale Database →	Find Sale record based on customer →	Customer status

Figure 2.3. Event and Process of Marketing Department.

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2.3.2 Manufacturing Department

This department works in expenditure side of the company. It tries to make much more profit by decreasing manufacturing cost. However, it must control the standardized quality of the product. The last goal of manufacturing department is concerned with time management. The delivered product must be available on time. Event and Process of Manufacturing Department is shown in Figure 2.4.

Functions of the Department

(1) To produce high quality product.

(2) To keep and update product information.

(3) To set an appropriate manufacturing plan.

(4) To plan raw material purchasing order with minimum cost.

Related to	Input	Process	Output
Product Information Module →	New product model →	Add new model →	New model data were added
→	Current product model →	Update product model →	Product data are updated
→	Current product model →	Delete product model →	Product data are deleted
Sale Department →	Sale Database →	Find Sale record based on product →	Product season
		→	Raw material Purchasing
		→	Manufacturing power plan

Figure 2.4. Event and Process of Manufacturing Department.

2.3.3 Sales Department

This department works closely with customers. Thus, the performance of this department is not only focusing on sales volume but also on service quality, which is a key to create brand royalty. One goal of the department concentrates on how to minimize the service response time. Event and Process of Sale Department is shown in Figure 2.5.

Functions of the Department

(1) To provide better service to a customer.

(2) To issue significant documents, which are invoice and receipt.

(3) To keep a sale record.

Related to	Input	Process	Output
Customer →	Customer order →	Sell →	Delivered product
	→	Generate sale documents →	Invoice
	→	Receive cheque →	Receipt
→	Returned Product →	Check Returned Product →	Issue Cheque for a Customer

Figure 2.5. Event and Process of Sales Department.

In case that a product is returned, the returned product will be sent to a child company. There is no need to update the inventory.

2.3.4 Inventory Department

This department has goals to minimize cost of inventory and tries to display required product status as soon as possible. Event and Process of Inventory Department is shown in Figure 2.6.

Functions of the Department

(1) To manage inventory with efficiency and control the level of products in warehouse.

(2) To re-order product to manufacturing, when a remaining product items are too low.

Related to	Input	Process	Output
Sale Department	→Customer order	→ Withdraw products	→ Product status is updated
		→ Deposit products	→ Product status is updated
	→Sale Database	→ Check all products remaining	→ Inventory Remaining Report
		→ Compare Product remaining with Re-order point	→ Reorder Report

Figure 2.6. Event and Process of Inventory Department.

III. THE PROPOSED SYSTEM

3.1 Business Requirements

The business requirements are the important keys for a system analyst and system designer to design a new computer information system that must satisfy mandatory requirements. The system analyst and the system designer act as an engineer, who draws a blueprint for a constructor. The requirements can come from both end-users and system owner of each department as follows.

3.1.1 The Requirements of the Marketing Department

(1) Marketing section can hold a large number of customer records and manipulate their records.

(2) Marketing offices are able to keep track of each customer by accessing and processing raw data from the sale database.

3.1.2 The Requirements of the Manufacturing Department

(1) Manufacturing section can keep and access all product designs and their specifications.

(2) Manufacturing officers can see the product sale season to set the optimum raw material purchasing and set efficient human resource plan.

3.1.3 The Requirements of the Sales Department

(1) Sales section can keep and retrieve an opened sale and returned records immediately.

(2) Sales section has accountable to generate sale documents, which are invoice and receipt, for a customer.

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3.1.4 The Requirements of the Inventory Department

(1) Sale officers and Inventory manager can view the accurate number of products in a stock immediately.

(2) The proposed should automate re-order form to manufacturing department, when the number of products in the stock is too low.

3.2 System Design

3.2.1 Overview of the Proposed System

The proposed system is designed to achieve the business requirements. Therefore, this system supports 4 business functions, which are Sale Department, Manufacturing Department, Marketing Department and Inventory Department, to make their daily operations have lower response time and more accurate by using transaction process system. Moreover, this proposed system is equipped with management information system to support a manager team.

The proposed system is implemented using Microsoft SQL Server version 7.0 as a back-end system and using Microsoft Access 2000 (in Microsoft office 2000 professional suite) as a front end system. Because this architecture is easy to maintain, clears responsibility between users and computer center operators, and provides friendly user interface.

3.2.2 Process Design

The new computerized information system can be designed follow the business requirements shown in topic 3.1. The Tool for design system is the Data Flow Diagram (DFD), which is shown in appendix A, is used as a tool for both structure analysis and system design.

Figure 3.1 shows the proposed system context diagram, which presents all related external entity. As shown in Functional Decomposition Diagram in Figure 3.2, The proposed system can be divided into 5 processes as follows:

(1) Process 1.0: Process Sale Operation

This process is responsible for keeping track of customer order and sale process status. It also generates sale document.

(a) To receive order from a customer and create sale record

(b) To check available needed product in a stock

(c) To calculate amount of money of the customer order

(d) To get customer payment and generate sale documents

(e) To update sale record status to be finished

(2) Process 2.0: Process Customer Information

This process is responsible for keeping and updating customer profile. In addition, it can create customer classification report.

(a) To create new customer record

(b) To update existing customer record

(c) To process customer classification based on total sale order of each customer in a period.

(3) Process 3.0: Process Product Information

This process is responsible for keeping and updating product information. Moreover, it can calculate total sale value of each product model.

(a) To create new product record

(b) To update existing product record

(c) To calculate total sale value of each product in a period.

(4) Process 4.0: Process Inventory Operation

This process is responsible of keeping track of inventory status and alerting user for acknowledgement when the current product amount is less than the minimum product point.

(a) To increase the number of product amount in inventory by manufacturing department.

(b) To decrease the number of product amount in inventory by sale department.

(c) Calculate current product amount and compare with minimum product point. If the current product amount is less than the minimum product point, then it will alert user for acknowledgement.

(5) Process 5.0: Process Product Return Operation

This process is accountable for handling returned product and keeping a returned product record.

(a) To check and verify sold order

(b) To create new returned record

(c) To issue cheque for payment

The process specification of the proposed is shown in Appendix B.

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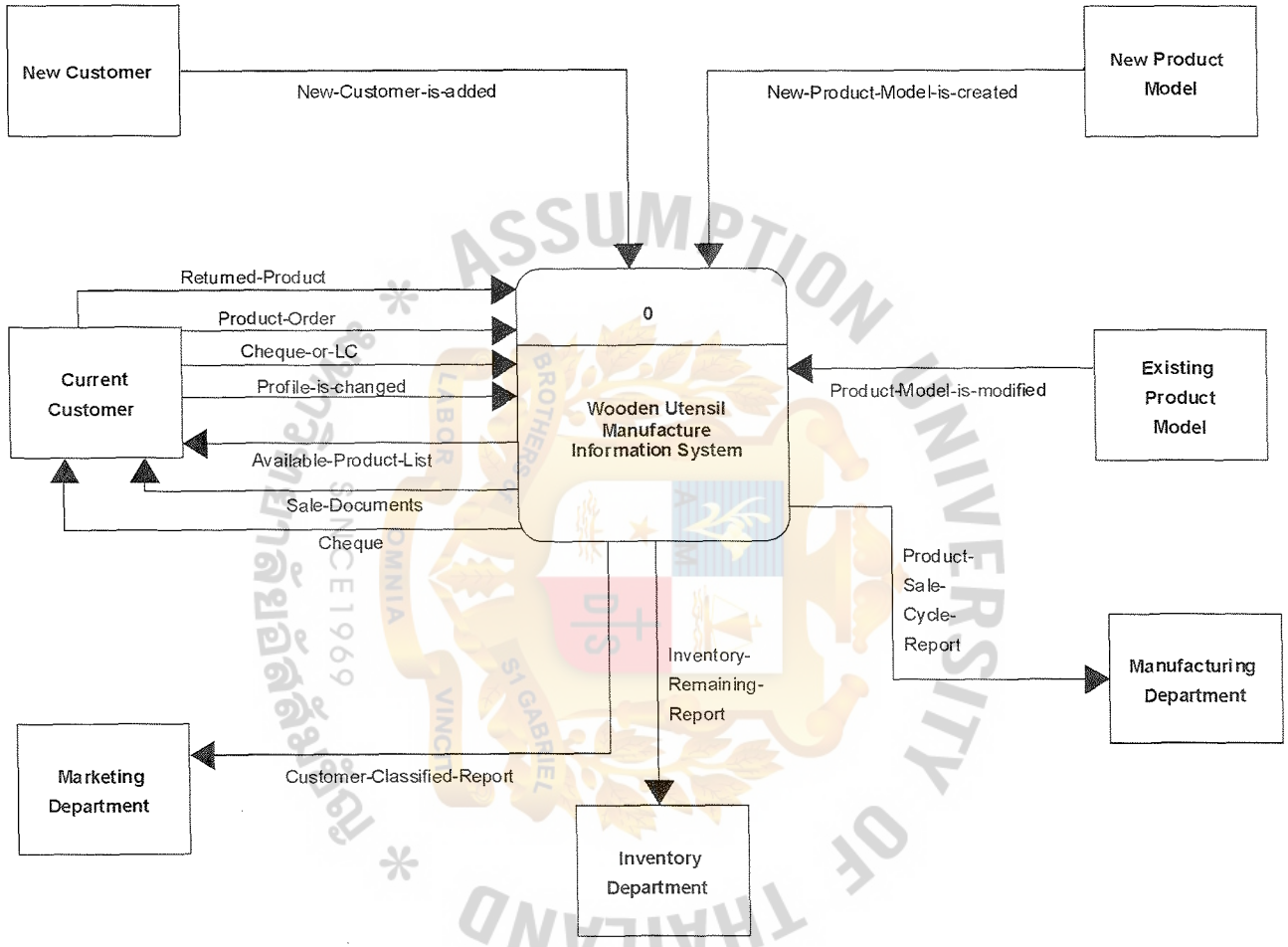

Figure 3.1. The Context Diagram of the Proposed System.

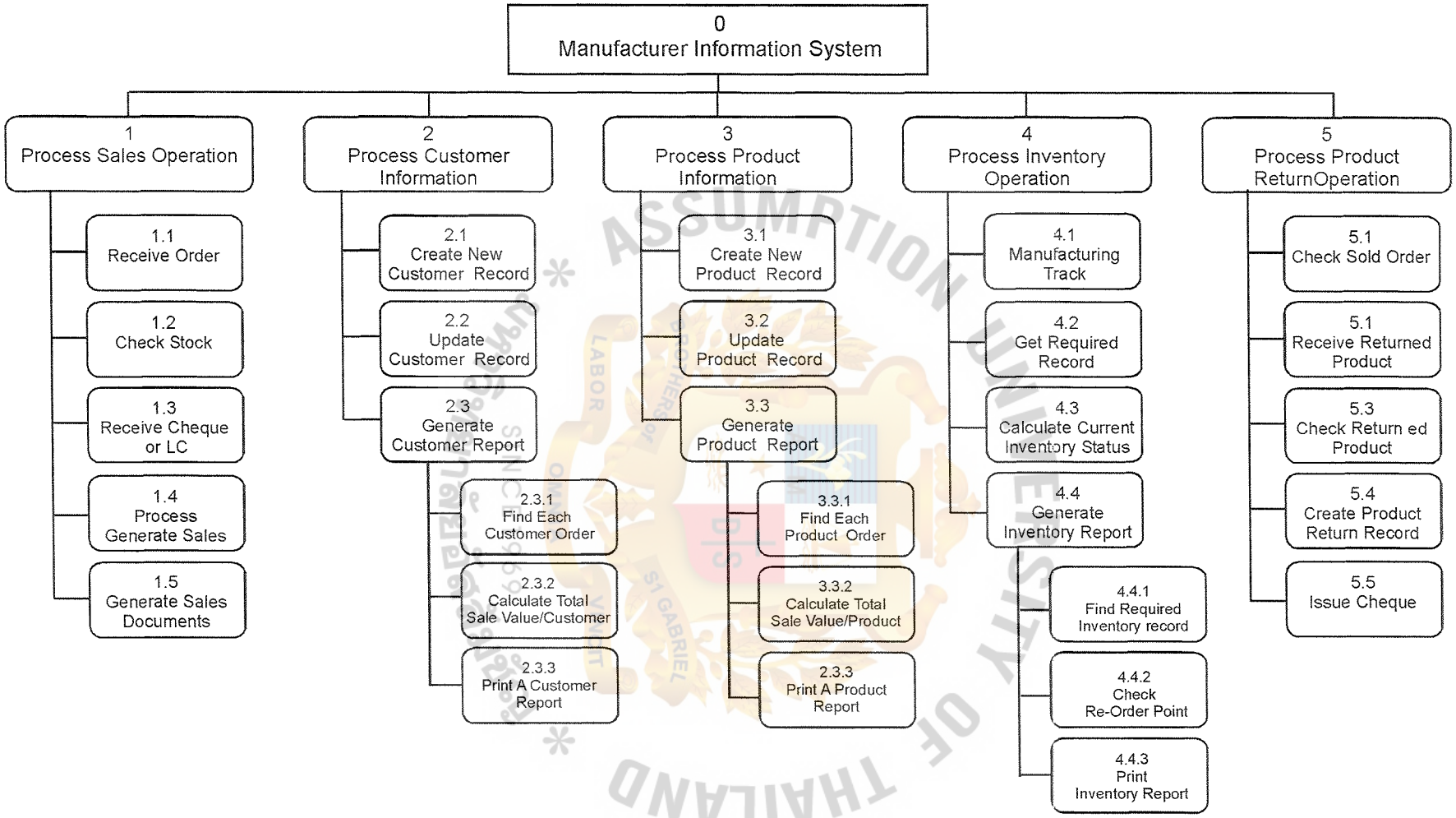

Figure 3.2. Functional Decomposition Diagram.

3.2.3 File Layout

Entity Relationship Diagrams were used as a tool to design database of the proposed system. The diagrams are shown in Appendix D.

The new computerized system has 2 master files with 6 transaction files. The master file contains the essential data, which is needed before opening new transaction record. The transaction files need to use a primary key (PK) of the master file as a foreign key (FK) in their record.

There are 2 master files in the proposed system as follows:

(1) Customer File

This file holds a customer information such as company name, address and telephone number. An important field of this master file is Customer ID, which is the primary key. It is used in many transaction files.

(2) Product File

This file holds a product information. An important field of this master file is Product ID, which is the primary key. It is used in many transaction files.

The transaction file contains the daily data or transaction occurring in each day. There are 6 transaction files as following:

(1) Inventory File

This file contains re-order point, which is minimum volume of each product in inventory. This file needs Product ID from Product Master File.

(2) Manufacturing File

This file contains volume of product that is produced by manufacturing department everyday. This file also needs Product ID from Product Master File.

(3) Product Return File

This file contains product return information in case a customer found broken product or wrong specification product. This file needs Customer ID from Customer Master File to specify the customer. In addition, it also needs to specify a Sale ID of the returned product.

(4) Product_on_a_Return File

This file supports Product Return File by providing each returned product detail. This file needs Product ID from Product Master File and Product Return ID form Product Return File.

(5) Sales Order File

This file contains information of a sales order such as shipping place, and payment method. This file needs Customer ID from Customer Master File to identify the customer.

(6) Product_on_an_Order

This file supports Sales Order File by providing information of sales order in each product detail. Thus, this file needs Product ID from Product Master File to specify the product. In addition, it also needs to have a Sales ID for identification the sales.

The File Layout and Data dictionary are shown sequentially in Appendix E and F.

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3.3 Application Architecture

The technique for designing the overall information is application architecture, which defines the technologies to be used by all information systems in terms of its network, data, interface and process.

3.3.1 Network Architecture

There are 2 major network architecture types, which are centralized computing and distributed computing. The first one, centralized computing, will be replaced by distributed computing because the prices of computers go down everyday.

Thus, it is the distributed computing era. There are many types of distributed computing such as distributed presentation, distributed data (two-tiered), distributed data and logic (three-tiered) and the Intranet and Internet. For the proposed system, which will implement Wooden utensil Manufacturer, Distributed Data (or two-tiered) network architecture is the most suitable one for this case.

The first reason of this architecture is to separate information system stored data on a server side while the business logic and user interface are kept on client side. It is appropriate with our Pentium Celeron clients, which are not only a client but also perform other proposals such as word processor and spreadsheet.

The second reason, two-tiered is the best solution when budget and performance are recognized while Three-tiered need more budget to provide better performance and serve more clients that is not necessary, because the company needs the computerized information system to serve only 5 up to 8 clients at the same time.

Network configuration of the proposed system is shown in Figure 3.3. About system maintenance, a disadvantage of distributed data is that the application logic must be maintained on all the clients. In this case, it is not a big problem because we have only 5 clients in our system.

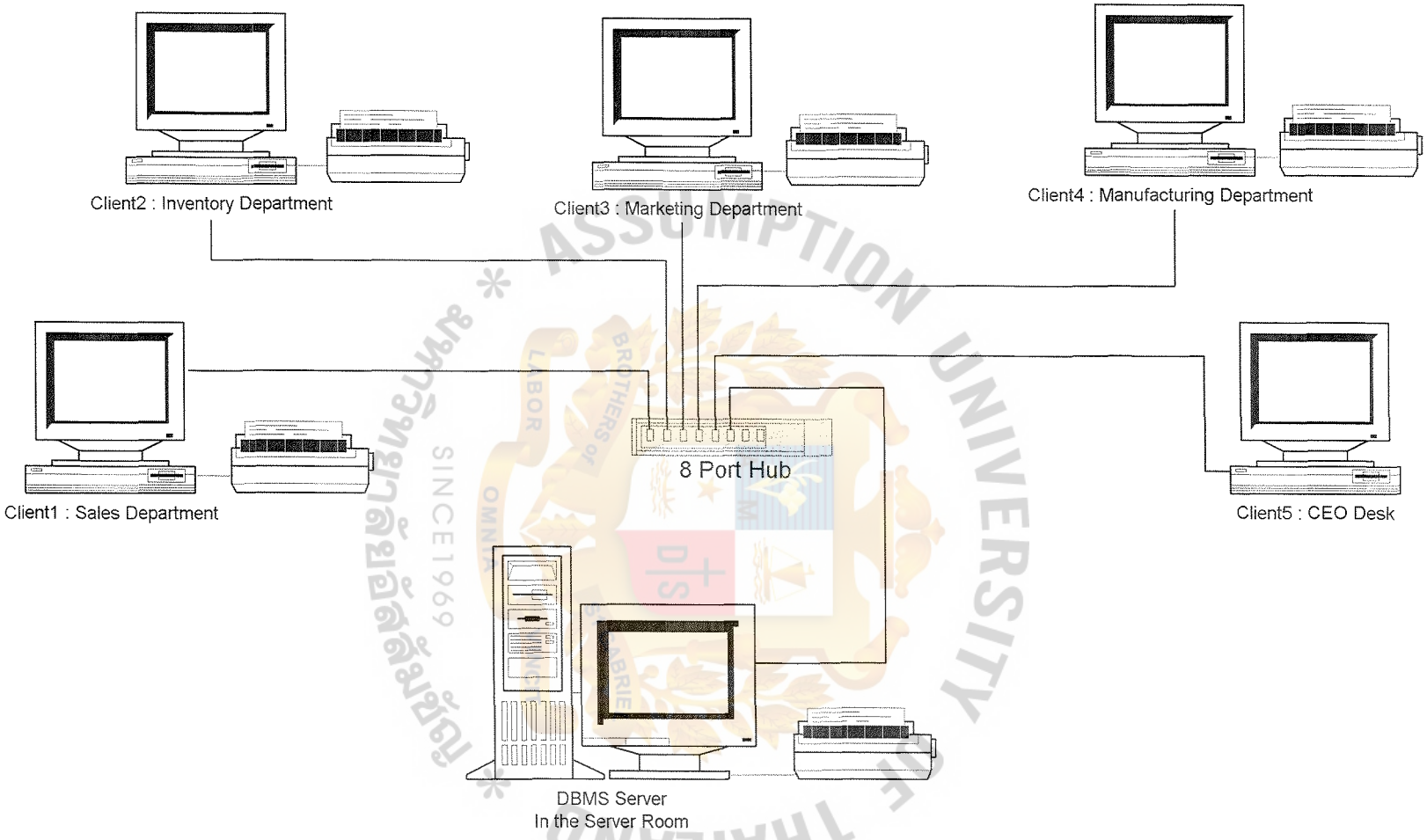

Figure 3.3. Network Configuration of the Proposed System.

3.3.2 Data Architecture

Controlling data centrally has been considered extremely. The only practical way to accomplish this goal is to store all data on a central computer. The technology of client / server computing has made it possible to distribute data without loss of centralized control. This control is being accomplished through distributed relational databases that are relational database, distributed relational database and distributed relational database management system(distributed RDBMs).

Distributed relational database management system is suitable for our system. We consider from software system, information database, system application, and client / server model. Distributed RDBMs is a software program to implement distributed relational database. Their advantages are:

(1) To be able to control access to and maintenance of the stored data.

(2) To be able to provide for backup, recovery, security, integrity and processing.

(3) To be able to reduce the data traffic on the network.

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3.3.3 Interface Architecture

The new computer information system of The company uses Remote Batch because it combines the best aspect of both Batch Input / Output and On-line Processing and it is very suitable for our data distributed network architecture. Distributed on-line computer handle data input and editing while edited transactions are collected into batch file for later transmission to host computer that process file as a batch. Finally results are transmitted as a batch back to the original computers.

Input / Output

Our new computer information system for Wooden Utensil Manufacturer Information System needs to have transferred data and information from a department as an input of the rest department via a LAN.

Graphic User Interfaces (GUIs) is one successful key. The interfaces design, which is very clear and easy to understand, will drive officers to adopt and adapt to new computer system. They should learn that computer is not hard to operate or understand. Then they will no longer stick to the old manual system.

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3.3.4 Process Architecture

The process architecture of an application is defined in terms of the software language and tools that will be used to develop the business logic and application programs.

We will use a Software Development Environment (SDEs) that is a language and tool kit for constructing information system application. SDE has four methods such as SDEs for Centralized Computing and Distributed Presentation, SDEs for Two-Tier Client/Server, SDEs for Multitier Client/Server and SDEs for Internet and Intranet Client/Server.

From Network Architecture, we use distributed data (Two-Tier Client/Server). Then in process architecture, SDEs for Two-Tier Client/Server is suitable for our system. The typical SDE for Two-Tier Client/Server application consists of a client-based programming language with built in SQL connectivity to one server database engines. SDE for Two-Tier Client/Server will have many advantage in our system. These will support authoring system, help us to write a report and programmer of computer department to develop, maintain and run data and programs and complied for replication and execution on the client PCs. Our system will have automatic generation of template code such as mouse-clicks and keystrokes. We can create, read, update, delete, sort record and send to the database engine for execution on the server.

3.4 Hardware and Software Requirement

The selected system requirements can divide in two parts, which are hardware part and software part.

3.4.1 Hardware Requirements

The hardware requirements of the Proposed System is shown in Tables 3.1, 3.2, and 3.3

Table 3.1. The Hardware Specification for the Server.

Item	Type	Name	Series	Specification
Server Computer 1 Unit	CPU.	Intel	Pentium III	800MHZ
	Mainboard	Compaq	N/A	Intel 815E, AGP 4X
	RAM	Kingston	512 MB	133 MHz
	VGA card	Asus	Savage 4	AGP, 16MB
	Hard Drive	Maxtor	20.4 GB	UDMA100 7200RPM
	Monitor	Compaq	L750	14 inches
	Case	Compaq	Server Case	500W, ATX
	Floppy drive	Sony	N/A	HD 1.44 MB
	Mouse	Intel	Intellimouse	PS/2
	Keyboard	Compaq	Standard	105 keys, PS/2
Printer 1 Unit	Dot Matrix	Epson	LQ-670	24 pins, 360x360 DPI.
UPS 1 Unit	UPS	Leonics	Acura1000bg	1,000 VA, For 1 Hr.

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Table 3.2. The Hardware Specification for the Client.

Item	Type	Name	Series	Specification
Client Computer 5 Units	CPU.	Intel	Celeron	550 MHz
	Mainboard	Asus	CUC2000	Intel i820, AGP 4X
	RAM	Hitachi	64MB	133 MHz
	VGA card	ColorMax	Savage 4	AGP, 16MB
	Hard Disk	Seagate	8.4 GB	UDMA 66, 5200RPM
	Floppy drive, keyboard, mouse are the same specification as Server			
Printer 4 Unit	Dot Matrix	Epson	LQ-670	24 pins, 360x360 DPI.

Table 3.3. The Hardware Specification for the Network.

Type	Amount	Name	Series	Specification
Hub	1 unit	D-link	DE809TX	8 ports, 100 Mbps
NIC.	6 units	D-Link	DE538TX	10/100 Mbps
UTP	50 meters	AMP	CAT 5	N/A
RJ-45	12 sockets	AMP	N/A	N/A

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3.4.2 Software Requirements

The software requirements of the proposed system can be summarized as follows:

(1) Computer Operating System

(a) Microsoft Windows 2000 (NT5) Professional Edition for Server

(b) Microsoft Windows 98 for Clients

(2) Database Management System (DBMS)

(a) Microsoft SQL Server version 7.0

(3) Application Software

(a) Microsoft Office 2000

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3.5 Security and Control

To minimize errors, disaster, computer crime, and breaches of security, special policy and procedures must be incorporate with design and implementation of information systems.

The combination of manual and automated measures that safeguards is termed controls. Computer systems are controlled by a combination of general control and application control.

3.5.1 General Controls

(1) Implementation Controls

Implementation Controls audit the systems development process at various points to ensure that it is properly controlled and managed.

(2) Software Controls

Software Controls monitor the use of system software and prevent unauthorized access of software programs, system software, and computer program. It concerns about program security control, designed to prevent unauthorized changes to program in systems.

(3) Hardware Controls

Hardware Controls ensure physical security and correct performance of computer hardware. Computer hardware should be physically secured so it can be accessed only by authorized individuals. To implement it, all computers must be locked by bios. They need a password to turn them on.

(4) Data Security Controls

Data Security Controls ensure that valuable business data and file that keep on the DBMS server are not subject to unauthorized access, change, or destruction. This control is implemented by a high quality DBMS, which is

Microsoft SQL Server version 7. This DBMS checks user login and classify the level of authority of each user.

(5) Administrative Controls

Administrative Controls are formalized standards, rules, procedures, and disciplines to ensure that the company's controls are properly executed and enforced.

3.5.2 Application Controls

Application controls objectives are completeness and accuracy of input and update, validity to authorized person, and correct and current data.

(1) Input Controls

They check data for accuracy and completeness such as using input-mask function that provide by Microsoft Access. In addition, Input Control must control input authorization of each user.

(2) Process Controls

Process Controls establish that data are complete and accurate during updating. Moreover, these controls must check processing algorithm in each process.

(3) Output Controls

Output Controls ensure that the results of computer processing are accurate. For security reasons, outputs must be available to authorized recipients.

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3.6 System Cost Evaluation and Benefit Analysis

This section consists of five parts, which are the cost of the Existing System, the cost of the Proposed system, Benefit analysis, Financial Analysis, and the Conclusion.

3.6.1 Cost of the Existing System

Cost of the existing system is mainly labor cost, which consists of salary and bonus (2 months). Manual system needs a lot of employees to operate their works when compared with a computerize system. The cost of manual system is shown in Table 3.4.

Table 3.4. Existing System Cost in Detail, Baht.

Cost items	Month	Year	With Bonus	Total
Employee Salary				
1 Sales Department				
- One manager	20,000	240,000	280,000	
- Three staffs (3*8,500)	25,500	306,000	357,000	
Sales department salary				637,000
2 Marketing Department				
- One manager	20,000	240,000	280,000	
- Two staffs (2*8,500)	17,000	204,000	238,000	
Marketing department salary				518,000
3 Manufacturing Department				
- One manager	20,000	240,000	280,000	
- Three staffs (3*8,500)	25,500	306,000	357,000	
Manufacturing department salary				637,000
4 Inventory Department				
- One manager	20,000	240,000	280,000	
- Three staffs (3*8,500)	25,500	306,000	357,000	
Inventory department salary				637,000
Total Employee Salary				2,429,000
Supplies & Miscellaneous Cost				
- A4 Paper, Bill and Form			6,000	
- Stationary			6,000	
- Utility			3,000	
Total Supplies & Miscellaneous Cost				15,000
Total Existing System Cost				2,444,000

3.6.2 Cost of the Proposed System

The proposed solutions is Client / Server Solution. The whole cost of the solution can be divided into 2 categories, which are Investment Cost, and Annual Operation Cost. The first category is fix costs that are paid only once while the last category is the costs that are paid annually. Cost of the proposed system is shown in Tables 3.5 and 3.6.

Table 3.5. Investment Cost of the Proposed System, Baht.

Cost items	Unit	Price	Sub Total	Total
Hardware Cost				
- COMPAQ - Pentium III Server	1	180,000	180,000	
- COMPAQ - Work Station	5	45,000	135,000	
- Epson - Printer LQ -670	5	15,000	75,000	
- D-LINK - Hub 8 ports / 100 Mbps	1	4,500	4,500	
- D-LINK - NIC 100 Mbps	6	1,500	9,000	
- AMP - UTP CAT 5	50	14	700	
- AMP - RJ45 Connector	12	25	300	
- LEONIC - UPS 1000VA	1	14,500	14,500	
Total Hardware Cost				419,000
Software Cost				
- Microsoft Windows 2000 Server	1	30,000	30,000	
- Microsoft Windows 98	5	5,000	25,000	
- Microsoft SQL Server version 7	1	20,000	20,000	
- Microsoft Office 2000 Professional	5	8,000	40,000	
Total Software Cost				115,000
System Implementation Cost				
- System analysis and program coding			600,000	
- User training			200,000	
Total System Implementation Cost				800,000
Total Investment Cost				1,334,000

Table 3.6. Annual Operating Cost of the Proposed System, Baht.

Cost items	Month	Year	With Bonus	Total
Employee Salary				
1 Sales Department				
- One manager	20,000	240,000	280,000	
- Two staffs (2*8,500)	17,000	204,000	238,000	
Sales department salary				518,000
2 Marketing Department				
- One manager	20,000	240,000	280,000	
- One staff (1*8,500)	8,500	102,000	119,000	
Marketing department salary				399,000
3 Manufacturing Department				
- One manager	20,000	240,000	280,000	
- Two staffs (2*8,500)	17,000	204,000	238,000	
Manufacturing department salary				518,000
4 Inventory Department				
- One manager	20,000	240,000	208,000	
- One staff (1*8,500)	8,500	102,000	119,000	
Inventory department salary				399,000
Total Employee Salary				1,834,000
Supplies & Maintenance Cost				
- System Maintenance Cost			25,000	
- A4 Paper, Bill and Form			3,000	
- Continuous Paper			2,000	
- Ribbon			1,500	
- 3.5 Inches Diskette			2,000	
- Stationary			2,000	
- Utility			10,000	
Total Supplies & Maintenance Cost				45,500
Total Operating Cost				1,879,500

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3.6.3 Benefit Analysis

There are many benefits of computerized system over the manual system. They can be classified into two categories, which are tangible benefits and intangible benefits.

(1) Tangible benefits

Tangible benefits are those that can be easily quantified. They are measured in term of annual saving when comparing computerize system with manual system. The tangible benefit analysis is shown in Table 3.7.

Table 3.7. Tangible Benefit Analysis, Baht.

Cost items	Existing System	Proposed System	Difference
Salary Cost			
1. Sales Department	637,000	518,000	
Reduce 1 Staff (8,500 * 14)			119,000
2. Marketing Department	518,000	399,000	
Reduce 1 Staff (8,500 * 14)			119,000
3. Manufacturing Department	637,000	518,000	
Reduce 1 Staff (8,500 * 14)			119,000
4. Inventory Department	637,000	399,000	
Reduce 2 Staff (8,500 * 28)			238,000
Total salary cost saving			595,000
Annual Operating Cost			
Annual Operating Cost	15,000	45,500	- 30,500
Total annual operating cost saving			- 30,500
Total Cost Saving			564,500

(2) Intangible benefits

Intangible benefits are those benefits believed to be difficult or impossible to quantify. Intangible benefits can be classified as follows:

(a) Provide more accurate and reliable management information.

(b) Provide better quality of service to customers.

(c) Improve business brand royalty and goodwill.

(d) Improve efficiency of transaction operation.

(e) Improve security and control.

3.6.4 Financial Analysis

To answer a question "Is the proposed system cost-effective?" There are three popular financial techniques to index that economic feasibility is also called cost-effectiveness: payback analysis, return-on-investment, and net present value.

To increase a degree of realism, the financial analysis must consist of the time value of money to adjust future money to be the current value actually called present value. The formula for present value is shown as follows:

$$PVn = 1 / (1 + I)^{n}$$

where PVn = Present value at year n

I = Discount rate (%)

N = Required year

The cost comparison between the Existing System and the Proposed System with present value is shown in Table 3.8. There are four methods to analyze business investment as follows:

(1) Breakeven Analysis

Break-even analysis is the method used to compare the cost of the proposed system and the cost of the existing system to determine the point that the costs of the both systems become equal. Normally cost of the proposed system will be highest at the first year because of the installation of new hardware and software. After that, the proposed system costs will dorp rapidly after the system has been already implemented. On the other hand, cost of the existing system grows every year. The major factor of the existing cost is employee salary.

In the calculation, an economic inflation was estimated at 10% per year. The existing system cost analysis and the proposed system cost analysis are shown in Tables 3.8 and 3.9.

From the table, the proposed system has development cost about 906,800 baht at the first year with operating cost about 1,879,500 baht, while the existing system has only operating cost at 2,444,000 baht. If only the operating cost is compared, the proposed system can save cost about 564,500 baht for a year because it reduces salary expense form 15 to 10 staffs.

The Figure 3.4 shows the break-even point, the proposed system can achieve that point at 10 months. It indicates that the proposed system has more economization than the existing system.

(2) Payback Analysis

This is a simple and popular technique for determining, when investment will pay for itself, because system development costs are incurred long before benefit begin accrue, it will take a period time for the

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benefits to overtake the cost. This period is called payback period. From Table 3.8, payback period can be calculated as follows:

$$P = \frac{I}{(1 - T)R}$$

P = Payback Period

I = Investment Cost

R = Average annual return on the investment

T = Corporate tax rate in percentage (30%)

$$P = \frac{1,334,000}{(1 - 0.3)\,(564,500)}$$

$$= 3.38 \text{ Years}$$

Payback period after tax for the proposed system is about 3.4 years.

(3) Return-on-Investment Analysis (ROI)

This technique shows a percentage rate that measures the relationship between the amount the business gets back form and investment and the amount invested. The ROI formula is shown as follows:

$$ROI = \frac{\text{(Estimated lifetime benefit - Estimated lifetime cost)}}{\text{Estimated lifetime cost}}$$

The calculation of Estimated lifetime benefit and Estimated lifetime cost are shown in Table 3.10. For this proposed system, at the end of the fifth year Return-on-Investment percentage will be equal:

$$ROI = (12,220,000 - 10,642,842)/10,642,842$$

$$= 0.1482 \times 100$$

$$= 14.82\%$$

(4) Net Present Value (NPV)

Net Present Value is the present value of the cash flows of the project discounted at the marginal cost of investment. Net Present Value can be calculated by sum of discounted costs form the discounted benefits. Net Present Value calculation is shown in Table 3.10.

For this proposed system, Net Present Value at the fifth year is 1,577,158 which is the positive value. Thus, it is a good project to be invested.

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Table 3.8. Existing System Cost Analysis, Baht.

Cost items		Years				
		1	2	3	4	5
Operating Cost (10% inflation)						
Salary Cost:						
Sales Department	1 Manager and 3 staffs	637,000.00	700,700.00	770,770.00	847,847.00	932,631.70
Marketing Department	1 Manager and 2 staffs	518,000.00	569,800.00	626,780.00	689,458.00	758,403.80
Manufacturing Department	1 Manager and 3 staffs	637,000.00	700,700.00	770,770.00	847,847.00	932,631.70
Inventory Department	1 Manager and 3 staffs	637,000.00	700,700.00	770,770.00	847,847.00	932,631.70
Total Annual Salary Cost		2,429,000.00	2,671,900.00	2,939,090.00	3,232,999.00	3,556,298.90
Office Supplies & Utility Cost:						
A4 Paper, Bill and Form	Per Annual	6,000.00	6,600.00	7,260.00	7,986.00	8,784.60
Stationary	Per Annual	6,000.00	6,600.00	7,260.00	7,986.00	8,784.60
Utility	Per Annual	3,000.00	3,300.00	3,630.00	3,,993.00	4,392.30
Total Annual Office Supplies & Miscellaneous Cost		15,000.00	16,500.00	18,150.00	19,965.00	21,961.50
Total Manual System Cost		2,444,000.00	2,688,400.00	2,957,240.00	3,252,964.00	3,578,260.40
Accumulated Manual System Cost		2,444,000.00	5,132,400.00	8,089,640.00	11,342,604.00	14,920,684.40

Table 3.9. Proposed System Cost Analysis, Baht.

Cost items		Years				
		1	2	3	4	5
Fixed Cost						
Hardware Cost		83,800.00	83,800.00	83,800.00	83,800.00	83,800.00
Software Cost		23,000.00	23,000.00	23,000.00	23,000.00	23,000.00
System Implementation Cost		800,000.00	-	-	-	-
Total Fixed Cost		906,800.00	106,800.00	106,800.00	106,800.00	106,800.00
Operating Cost (10% inflation)						
Salary Cost:						
Sales Department	1 Manager and 2 staffs	518,000.00	569,800.00	626,780.00	689,458.00	758,403.80
Marketing Department	1 Manager and 1 staff	399,000.00	438,900.00	482,790.00	531,069.00	584,175.90
Manufacturing Department	1 Manager and 2 staffs	518,000.00	569,800.00	626,780.00	689,458.00	758,403.80
Inventory Department	1 Manager and 1 staff	399,000.00	438,900.00	482,790.00	531,069.00	584,175.90
Total Annual Salary Cost		1,834,000.00	2,017,400.00	2,219,140.00	2,441,054.00	2,685,159.40
Supplies, Maintenance & Utility Cost:						
System Maintenance Cost	Per Annual	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
A4 Paper, Bill and Form	Per Annual	3,000.00	3,300.00	3,630.00	3,993.00	4,392.30
Continuous Paper	Per Annual	2,000.00	2,200.00	2,420.00	2,662.00	2,928.20
Ribbon	Per Annual	1,500.00	1,650.00	1,815.00	1,996.50	2,196.15
3.5 Inches Diskette	Per Annual	2,000.00	2,200.00	2,420.00	2,662.00	2,928.20
Stationary	Per Annual	2,000.00	2,200.00	2,420.00	2,662.00	2,928.20
Utility	Per Annual	10,000.00	11,000.00	12,100.00	13,310.00	14,641.00
Total Annual Supplies, Maintenance & Utility Cost		45,500.00	50,050.00	55,055.00	60,560.50	66,616.55
Total Operating Cost		1,879,500.00	2,067,450.00	2,274,195.00	2,501,614.50	2,751,775.95
Total Computerized System Cost		2,786,300.00	2,174,250.00	2,380,995.00	2,608,414.50	2,858,575.95
Accumulated Proposed System Cost		2,786,300.00	4,960,550.00	7,341,545.00	9,949,959.50	12,808,535.45

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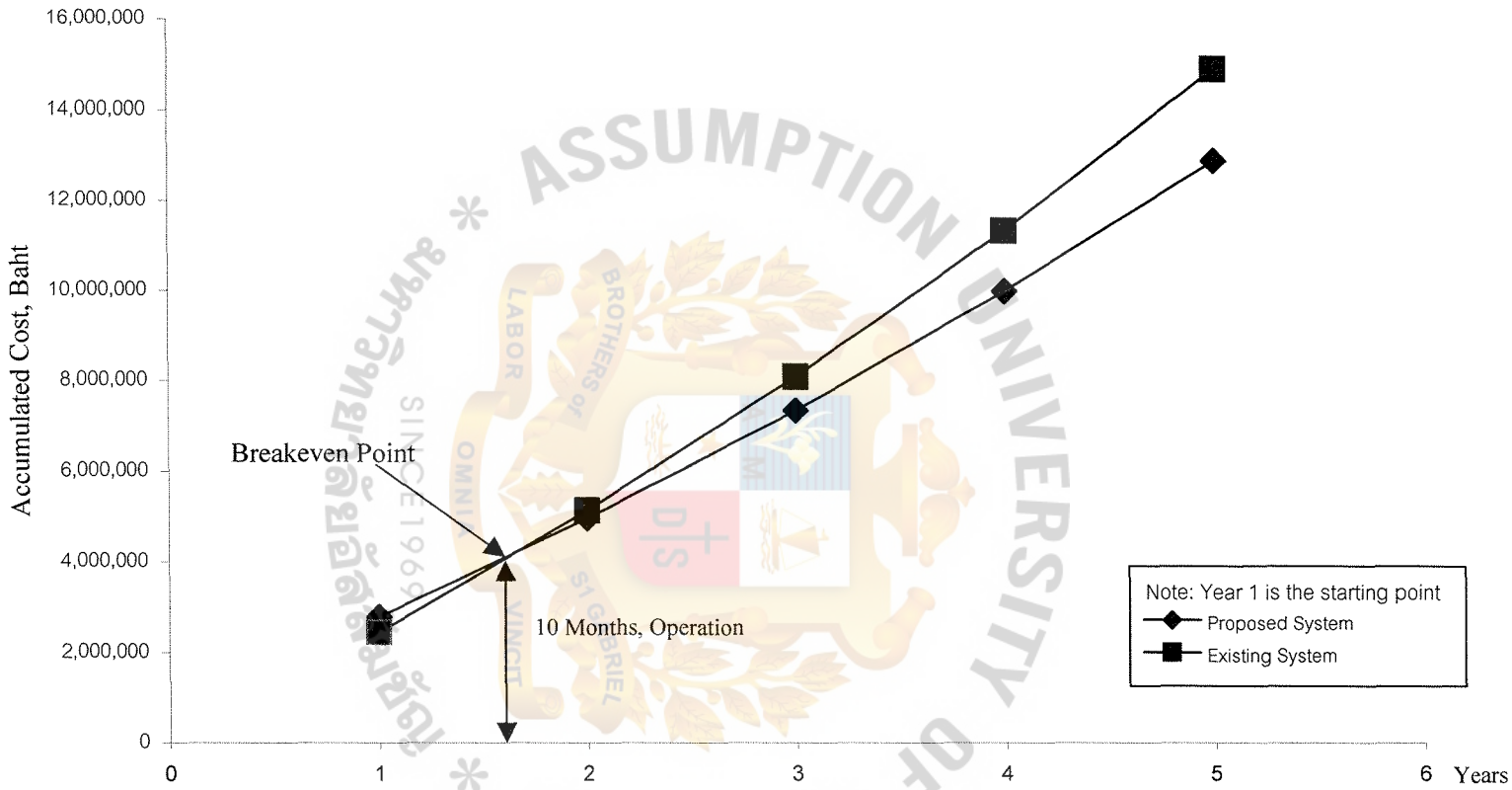

Figure 3.4. Breakeven Analysis between the Existing System and the Proposed System.

Table 3.10. Net Present Value and Return-on-Investment Calculation, Baht.

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Existing System						
Labor cost and Operating cost	2,444,000	2,688,400	2,957,240	3,252,964	3,578,260	
Discount Factors for 10%	1.000	0.909	0.826	0.751	0.683	
Time-adjusted costs (adjusted to present value):	2,444,000	2,444,000.00	2,444,000	2,444,000	2,444,000	
Total present value of life time of the existing system cost						12,220,000
Proposed System						
Development Cost:	906,800	106,800	106,800	106,800	106,800	
Operation & Mainteinance cost	1,879,500	2,067,450	2,274,195	2,501,615	2,751,776	
Discount Factors for 10%	1.000	0.909	0.826	0.751	0.683	
Time-adjusted costs (adjusted to present value):	2,786,300	1,976,591	1,967,764	1,959,740	1,952,446	
Total present value of life time of the proposed system cost						10,642,842
Net Present Value (NPV)				12,220,000 - 10,642,842 =		1,577,158
Return-on-Investment (ROI)				(12,220,000 - 10,642,842) / 10,642,842 =		14.82%

3.6.5 Conclusion of Financial Analysis

For system owner, who decides to approve a budget for the project, needs some information to make sure that the proposed system will be worth investing. The conclusion of four financial analysis methods are shown as follows:

(1) Breakeven Analysis

The cost of the proposed system and the cost of the existing system will be equal at 10 months. It is reasonable to invest because this project takes a short period to cover the changing cost form the existing system to a computerized system.

(2) Payback Analysis

The investment will pay for itself after deduct 30% government tax within 3.38 years period.

(3) Return-on-Investment Analysis (ROI)

Amount the business gets back from an investment is 14.82%. That rate is higher than bank loan interest rate, which is about 10-13% per year. Thus, the payback of this project is attractiveness.

(4) Net Present Value (NPV)

The cash flows of the project discounted at the marginal cost of investment at the fifth year is about 1.6 million baht in positive value. Thus, it is a good project to be invested

All financial analysis methods show positive sign to the proposed solution. For example, this project needs a short period to reach the breakeven point, and it gives high degree of return on investment. Thus, this project is worth investing.

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IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

The system implementation consists of two major activities, which are construction a new system and delivery the system into day-to-day operation. In the construction phase, programmers and auditors work together to build and test networks, database, software package and new written program. Problems caused by wrong written program or improper setting rarely occur.

In the delivery phase, this project is concerned with the installation of the computerized system to replace the manual system. A conversion plan of the project uses parallel conversion approach. Both of the old and new systems are operated for sometime period until all of conversion problems can be solved. This is done to ensure that all major problems in the new system have been solved before the old system is discarded.

4.2 Stages of Implementation

The project implementation has five stages, which are programming, program testing, system installation, documentation and users training. The first two stages can be categorized in construction phase and the rest can be categorized in delivery phase.

4.2.1 Programming

This stage concerns about package software, which are Microsoft SQL Server 7 and Microsoft Access 2000. At first, database design must be followed with normalization technique to ensure none of the data manipulation problems occur. The database implements on back-end computer, which is MS. SQL Server while queries, interactive forms, and reports are implemented on front-end computers, which is MS. Access 2000.

4.2.2 Program Testing

This stage is auditing the previous programs to ensure there is no errors before the system is actually used. There are three levels of testing to be performed, which are stub testing, unit testing, and systems testing.

(1) Stub testing is the test performed on individual module.

(2) Unit testing is a test whereby all the modules that have been stub tested are tested as an integrated unit.

(3) System testing is a test that ensures the application programs work properly when they are integrated into the total system.

4.2.3 System Installation

This stage concerns about installation new computer system for the real operation. The stage consists of both hardware and software installation. In the hardware side, an electrical specialist sets the electrical wiring, outlets, and instruments. After that, computer hardware specialist sets a server, clients, and install network equipment.

In software side, computer programmer installs all needed software and perform some testing on them.

4.2.4 Documentation

A good document is a key to success in the system implementation. System users, system owners and everyone, who are concerned with this system, must use the user manual as a guide to operate their works. A clear document helps users more understand and solve some problem by themselves. Thus, it can reduce degree of trouble from the users.

For this system, the user manual covers database schema and SQL server operation for database administration, how to work with operation interface and report builder for general users.

4.2.5 Users Training

This stage is the first time for users to evaluate the new system. Several questions in users' mind, such as "Is this system hard to understand and use?", will be answered. Good training can prepare users for a smooth transition to the new system. The trainer plays a hard role to make users understand and create good impression for the system. Teaching material is the document, which is user manual, in 4.2.4. The training guideline is overview of the system, lecture about procedure, discussion, and question-answer.

4.3 Results of the Implementation

The results of the implementation will focus on 2 subjects. The first one will focus on the new system itself. People ware is not included yet. After many testings, all software of the system will consist of error-free application software. Thus, users rely on computer based process that provides faster response time to any works.

The other one will focus on the system users. Most users have on experience in computer before. After training, the system users know how to operate the computer for their works. It will take some time for them to get familiar with the system. Finally, they will be the specialists who can operate and handle some complex problems. Thus, the system will work smoothly.

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V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Light Star Wood Co., Ltd. is a wooden household item manufacturer, which has a good business performance more than 10 years. The company is well accepted from many countries around the world such as Japan, Hong Kong, and America. In the late of 1999, the company was moved into the new larger location. Thus, CEO of the company set new goals, which are to minimize the business operation cost and to improve internal management.

To achieve those goals, it needs to eliminate some chronic business problems such as redundant work process, very slow response time of human working, and inconsistency caused by inaccurate information. The Company has to replace some manual work by a computer information system. The time spent between the existing system and the proposed system is shown in Table 5.1.

The new computerized system covers four departments, which are Marketing Department, Manufacturing Department, Inventory Department and Sale Department. An existing business workflow was analyzed to be a set of Data Flow Diagrams and Function Decomposition Diagram. These diagrams are used to design and improve sequence of new computerized system.

For financial analysis comparison between the Proposed System and the Existing System, the proposed system has break-even point at 10 months. The cash flows of the project that will have at the fifth year is about 1.6 million baht in positive value (Net Present Value – NPV. at the fifth year). The percentage value that business will get back from an investment is 14.82% (Return On Investment – ROI). Thus, it is a good project to be invested.

The proposed system was implemented by Microsoft SQL Sever with Windows 2000 NT as a back-end system and Microsoft Access as a front-end system. The reason is Microsoft SQL Server with Microsoft Windows 2000 can provide reliability, security and stability for a back-end system, while Microsoft Access provides beautiful and understandable graphic users interface for front-end computers.

Table 5.1. Degree of Achievement between the Existing System and the Proposed System.

Process	Existing System (Time Spent)	Proposed System (Time Spent)
Customer Order Process	30 mins.	15 mins.
Customer Information Process	20 mins.	10 mins.
Customer Report Process	3 hrs.	10 mins.
Product Information Process	15 mins	10 mins
Product Report Process	3 hrs.	10 mins.
Inventory Operation Process	25 mins	5 mins
Inventory Report Process	20 mins	5 mins
Product Return Process	30 mins	15 mins.
Total	8 hrs. 20 mins	1 hr. 20 mins.

All above processes concern with a large number of data. The existing system is manual process. So each process need a lot of time to complete its procedure. Especially the process about report such as the Customer Report Process, an officer must find a specific group of records and calculate them repeatedly. Thus, the Proposed system can reduce total processing time up to 7 hours from the existing system.

5.2 Recommendations

Light Stars Co., Ltd. is operated by manual system. Thus, the employees have no knowledge and experience in computer. The company encourages the staff to realize the need of the computerized system. All concerned staff should be trained of how to operate the new system and basic problem solving.

One improvement point focuses on a chance of human error. The best solution is trial to minimize human operation. In this case, the company can reduce human error and improve performance by using bar codes system. The bar codes sticker will be attached on product container at manufacturing department. At inventory department uses bar code reader for checking in new product items and deducting sold products.

The computerized system will be an important key to operate the business, the company should set security policy for the system such as hardware and software access priority, and system recovery plan. For example, IT manager is the one who has a key for server room. These security policies will build up more integrity for the proposed system and it takes less time to recover the system, in case it goes down.

For further enhancement of the system, The Company should integrate this proposed system with accounting system. The integrated system can reduce redundant works such as key-in of sale staff and accounting staff from the same customer order. In addition, the company should form a Wide Area Network (WAN) to connect headquarters with a show room and two factories for online information. Thus, a transaction from the branch will update data in the headquarters immediately. Although it is hard to integrate them, the integrated system will be the perfect system that does not only provide management information support and transaction process support but also provides accounting management to serve both CEO and managers.

APPENDIX A

DATA FLOW DIAGRAM

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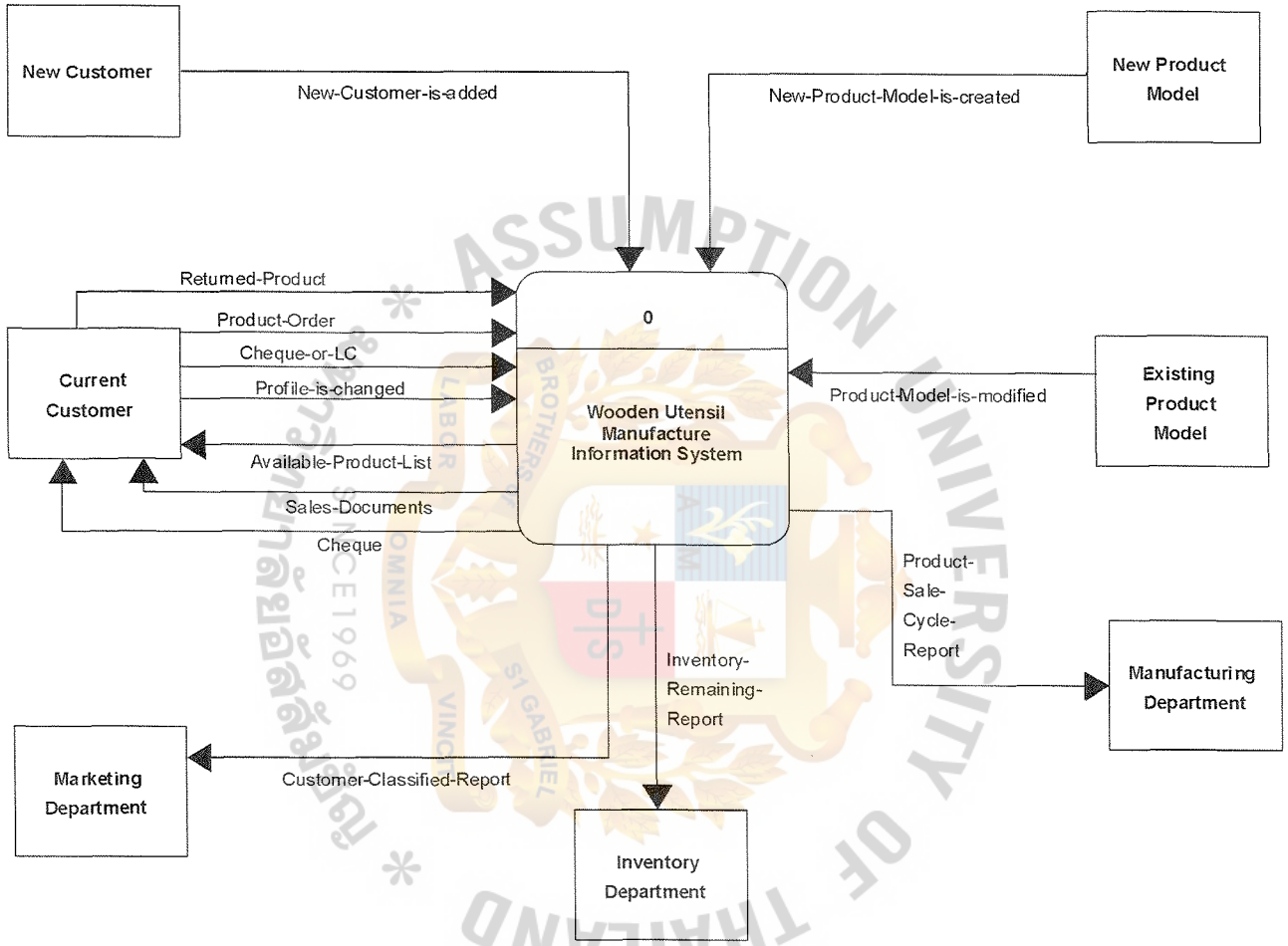

Figure A.1. The Context Diagram of the Proposed System.

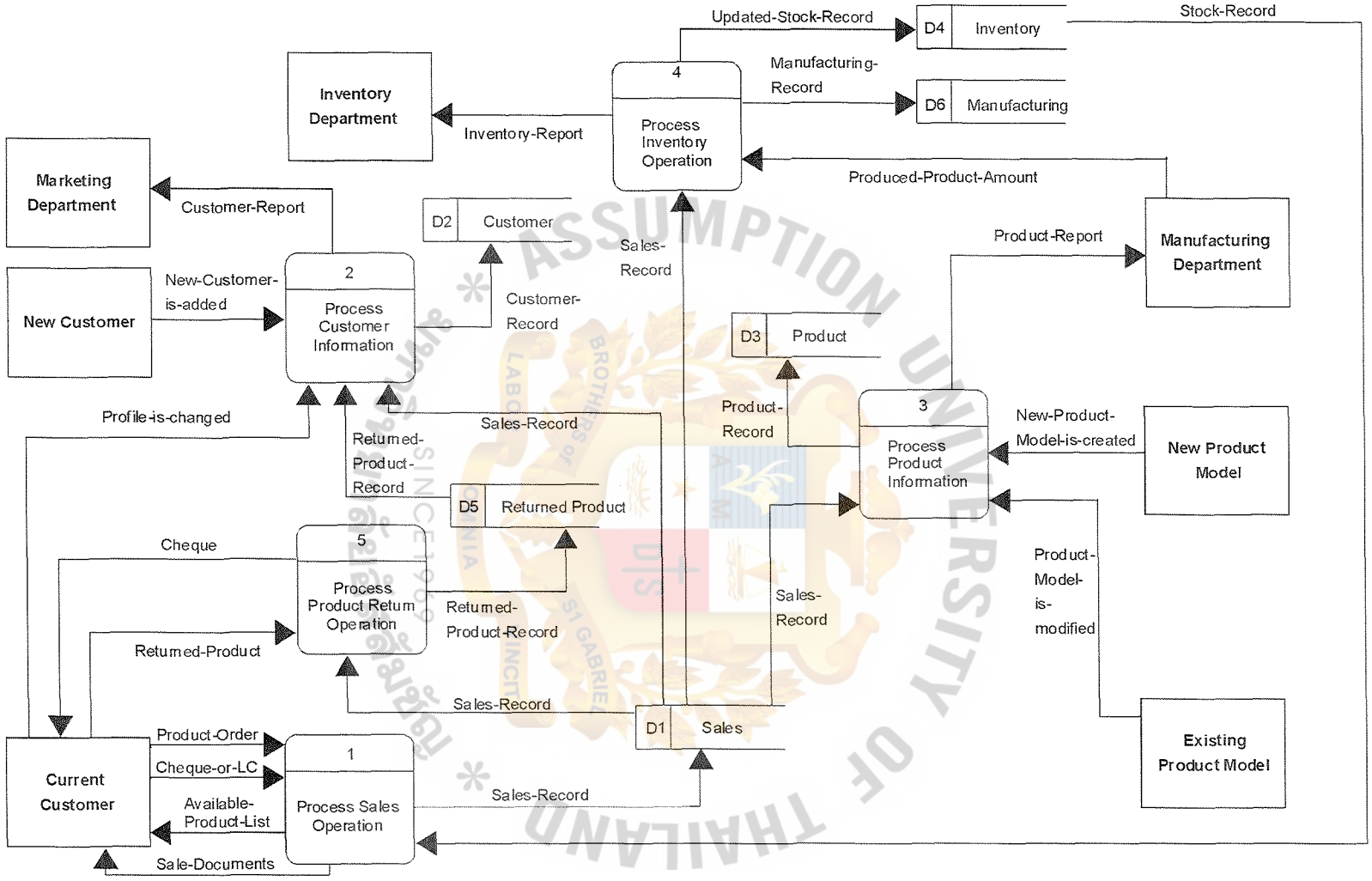

Figure A.2. Level 0 Data Flow Diagram of Manufacturer Information System.

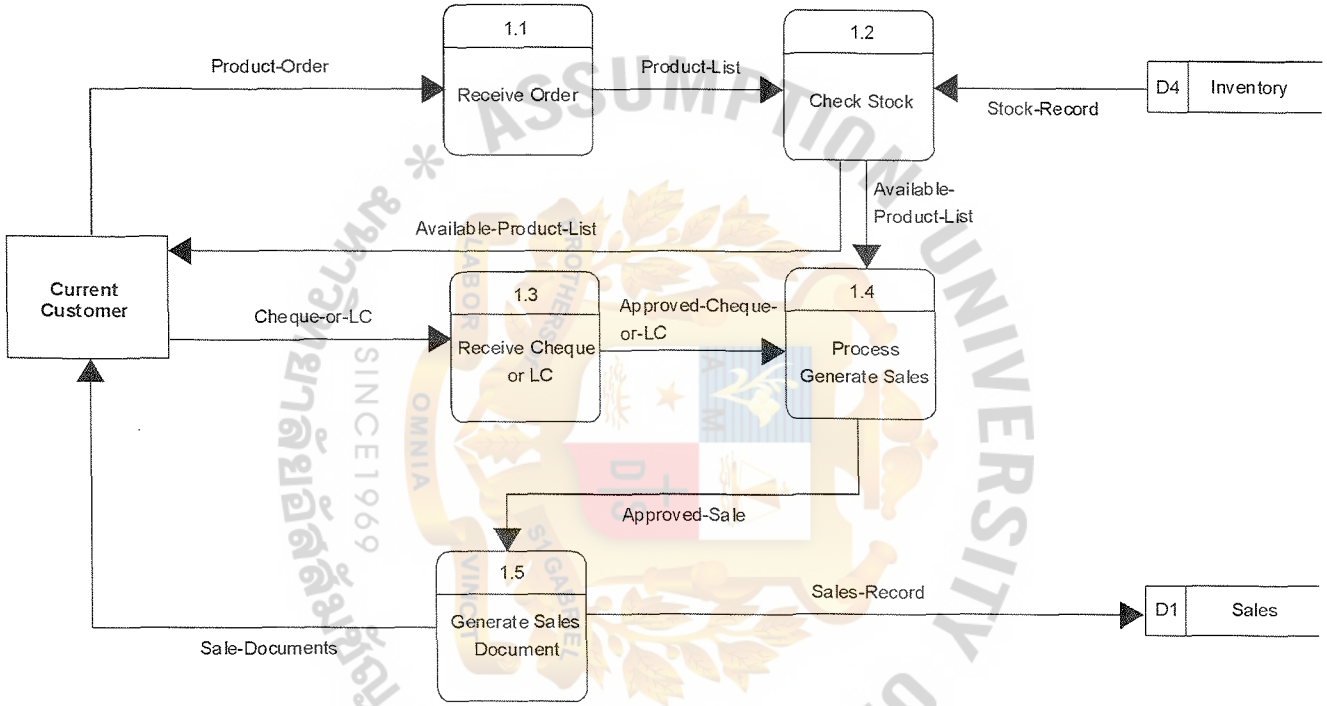

Figure A.3. Level 1 Data Flow Diagram of Process Sales Operation.

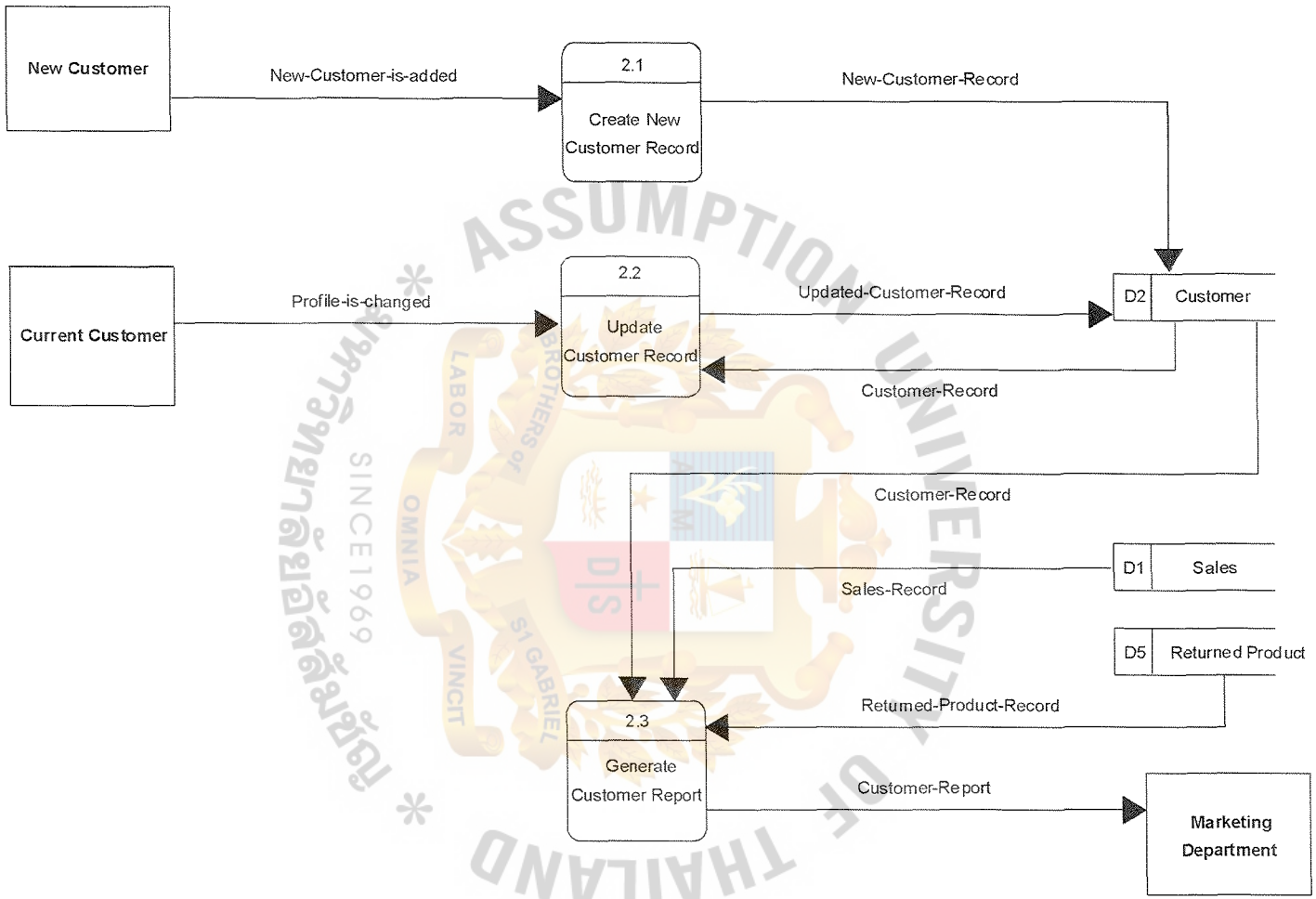

Figure A.4. Level 1 Data Flow Diagram of Process Customer Information.

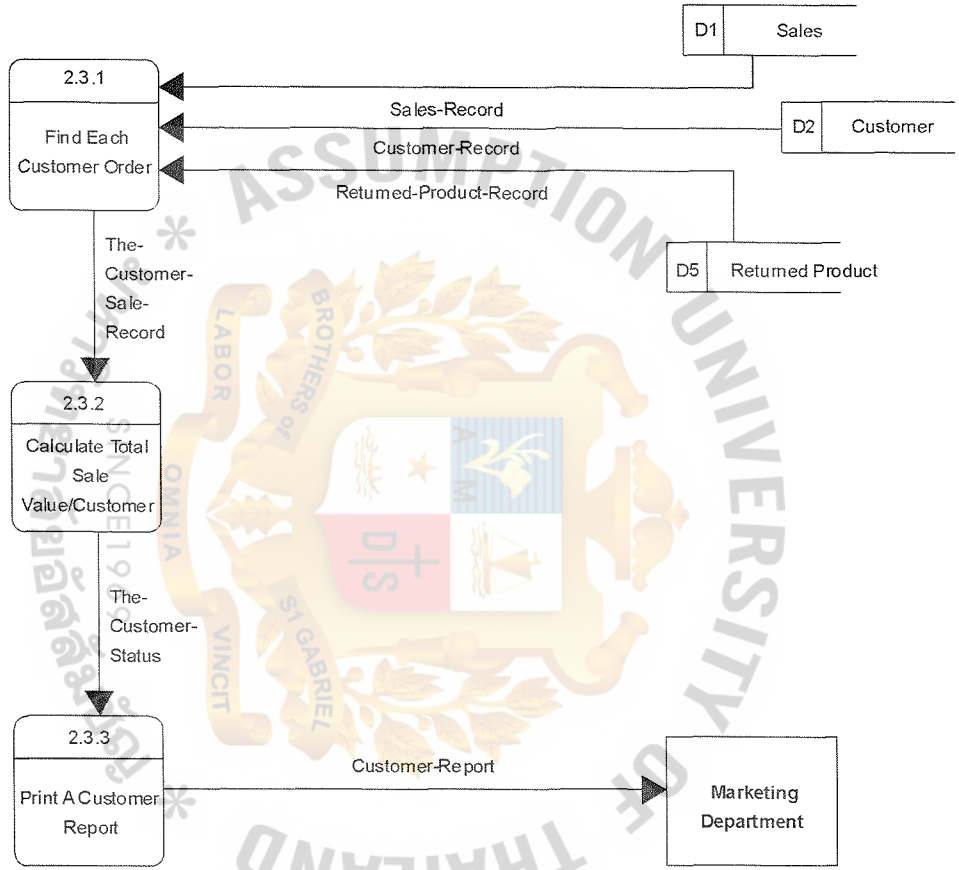

Figure A.5. Level 2 Data Flow Diagram of Generate Customer Report.

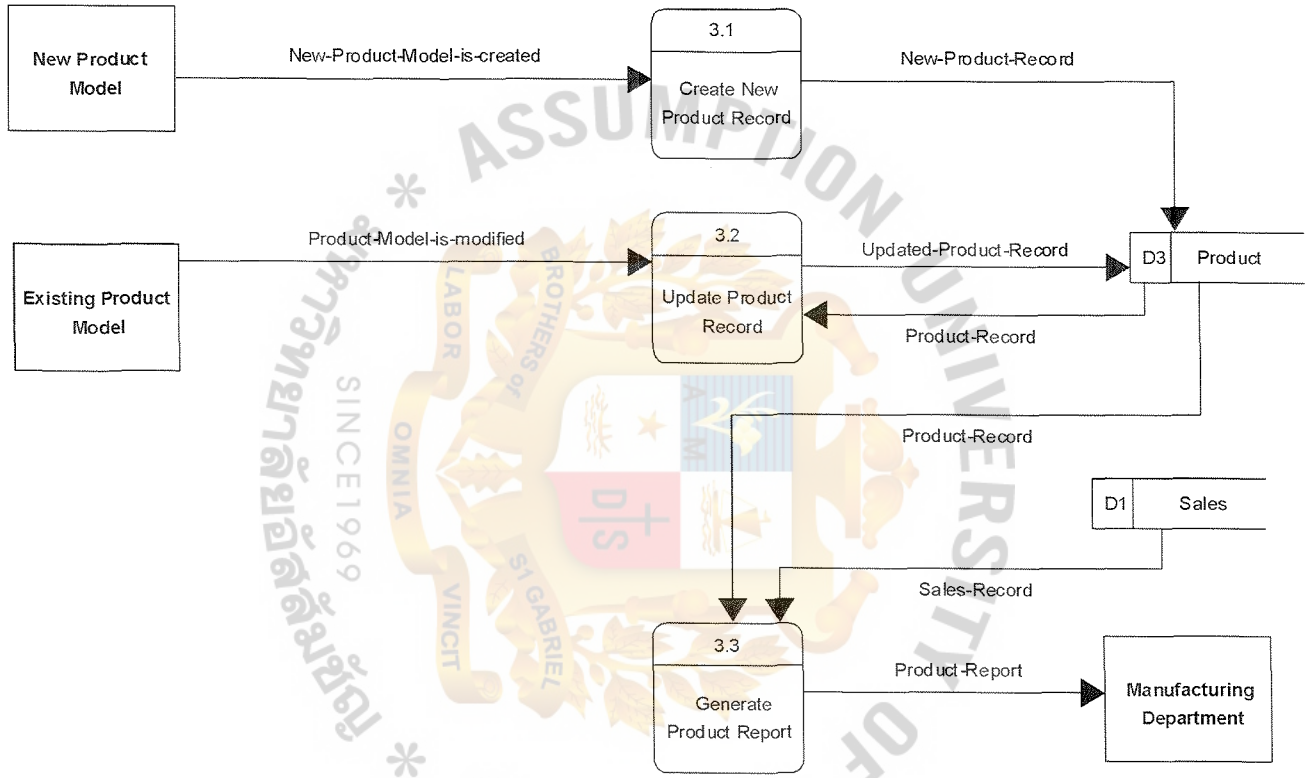

Figure A.6. Level 1 Data Flow Diagram of Process Product Information.

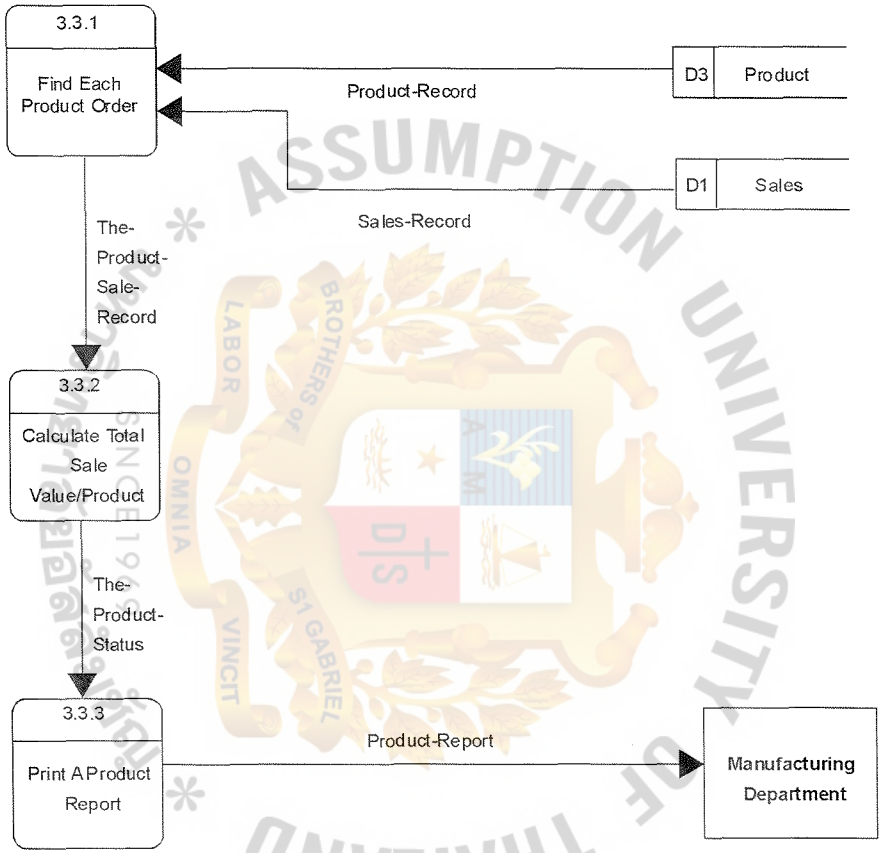

Figure A.7. Level 2 Data Flow Diagram of Generate Product Report.

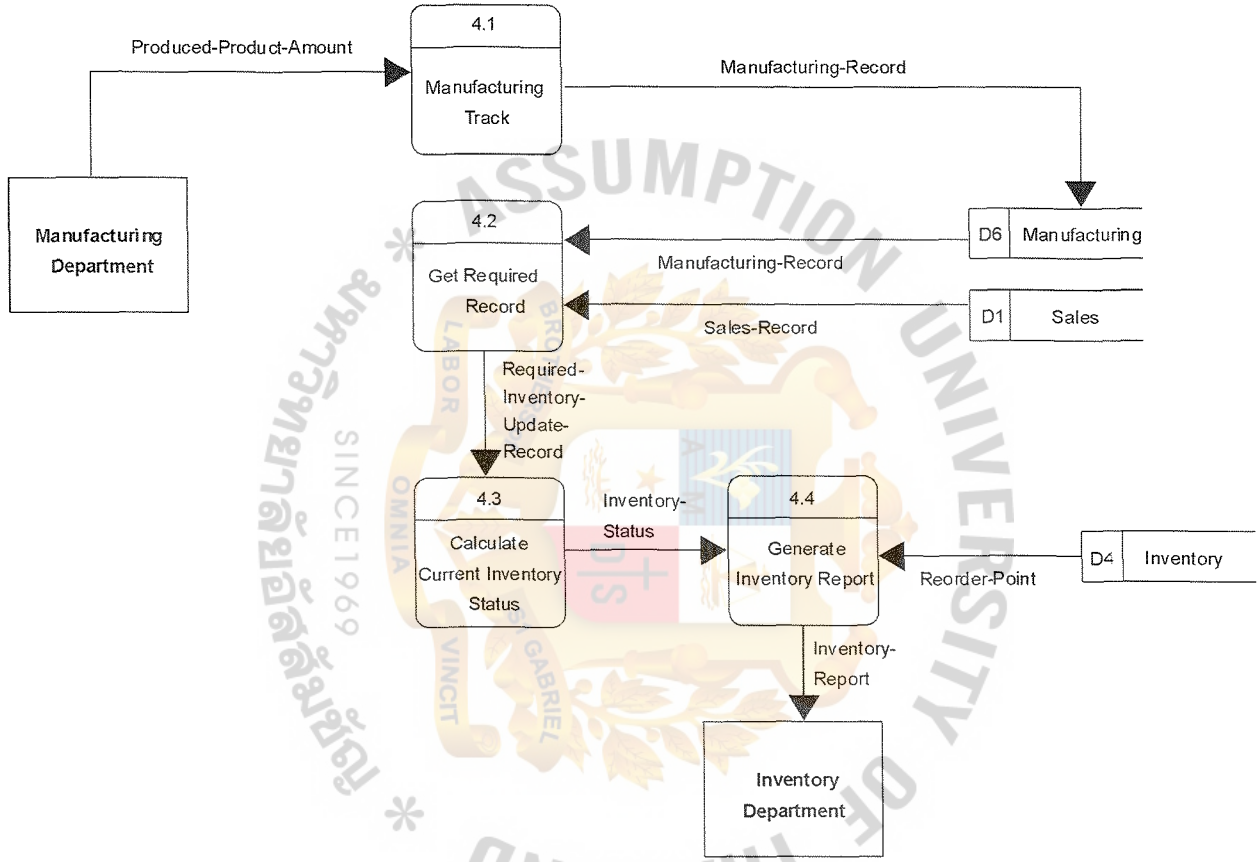

Figure A.8. Level 1 Data Flow Diagram of Process Inventory Operation.

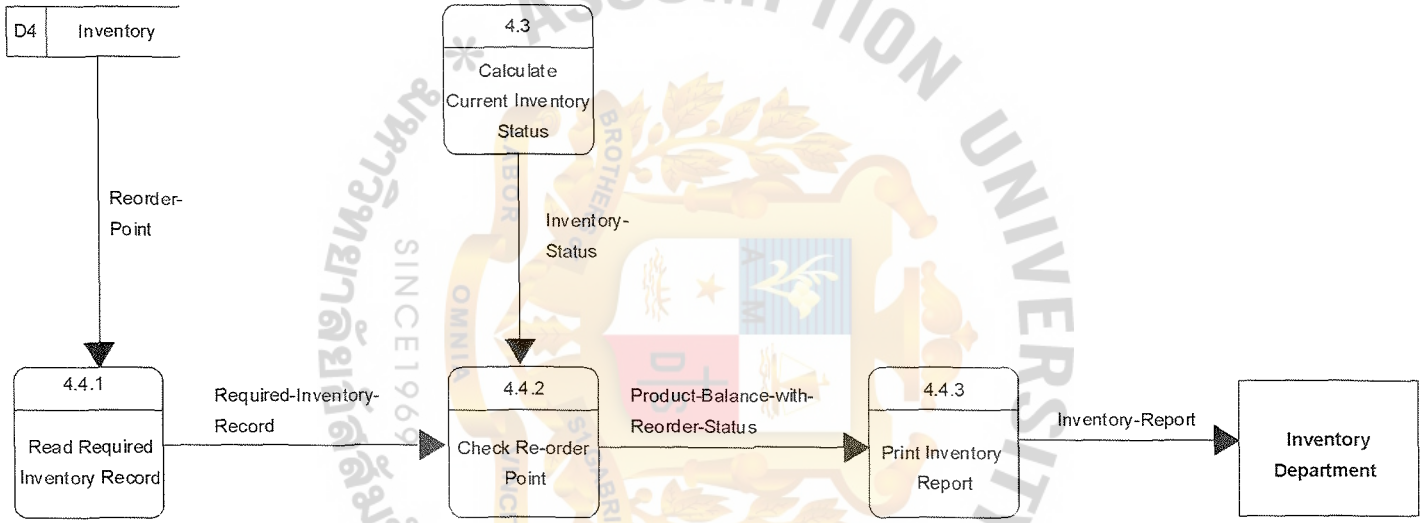

Figure A.9. Level 2 Data Flow Diagram of Generate Inventory Report.

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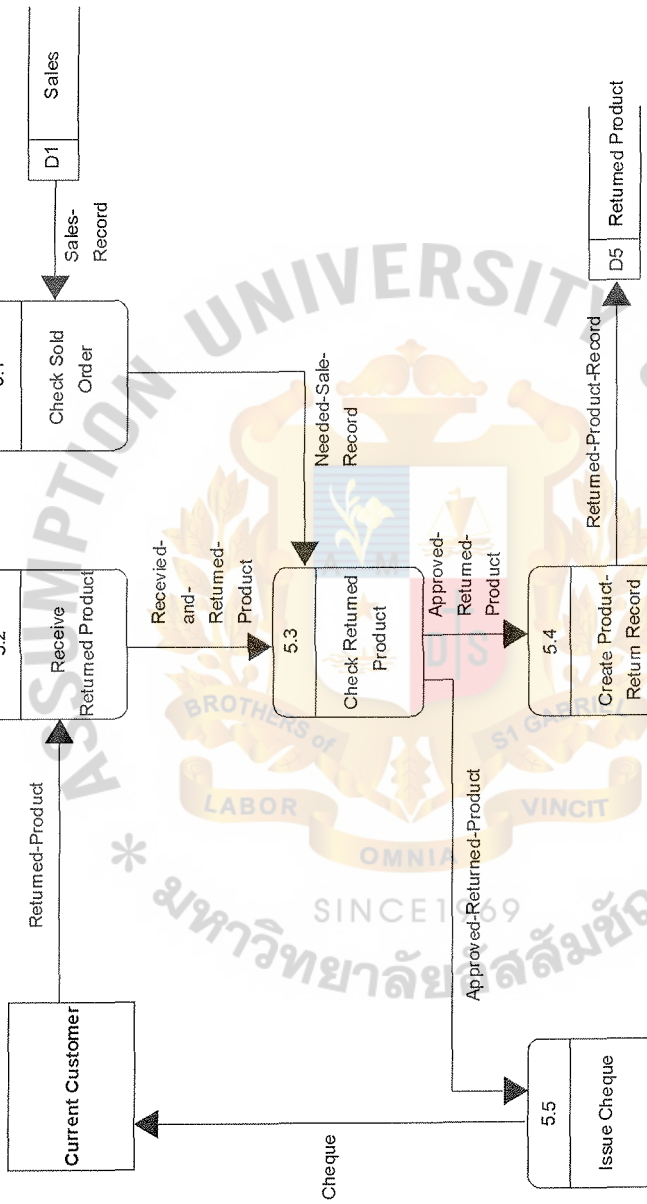

Figure A.10. Level 1 Data Flow Diagram of Process Product Return Operation.

APPENDIX B

PROCESS SPECIFICATION

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PROCESS SPECIFICATION

Process: 1.1

Name: Receive Order

Input Data Flows:

Product Order

Output Data Flows:

Product List

Process Logic:

BEGIN

GET Product Order FROM Customer

CREATE Product List

SEND TO Process 1.2

END

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Process: 1.2

Name: Check Stock

Input Data Flows:

Product List

Output Data Flows:

Available Product List

Process Logic:

```
BEGIN
        GET  Product List  FROM  Process 1.1
        READ  Stock Record  FROM  Inventory Database
        COMPARE  Product list  WITH  Stock Record
            IF  Product list  <=  Stock Record  THEN
                CREATE  Available Product List
                SEND TO  Current Customer
                SEND TO  Process 1.4
            ELSE
                PRINT "Required Product is out of Stock"
            END IF
END
```

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Process: 1.3

Name: Receive Cheque or LC

Input Data Flows:

Cheque or LC

Output Data Flows:

Approved Cheque or LC

Process Logic:

BEGIN

GET Cheque or LC FROM Current Customer

GET Approved of Sales Manager

CREATE Approved Cheque or LC

SEND TO Process 1.4

END

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Process: 1.4

Name: Process Generate Sales

Input Data Flows:

Available Product List

Approved Cheque or LC

Output Data Flows:

Approved Sales

Process Logic:

```
BEGIN
        GET  Available Product List  FROM  Process 1.2
        GET  Approved Cheque or LC  FROM  Process 1.3
        COMPUTE Sales Value
            SUM ( Quantity * Unit Price )
        COMPARE  Sales Value  WITH  Value of CHECK or LC
            IF  Product list  =  Stock Record  THEN
                CREATE  Approved Sales
                SEND TO  Process 1.5
            ELSE
                PRINT "Value in the cheque is not match"
            END IF
END
```

Process: 1.5

Name: Generate Sales Document

Input Data Flows:

Approved Sales

Output Data Flows:

Sales Record

Sales Document

Process Logic:

BEGIN

GET Approved Sales FROM Process 1.4

PRINT OUT Sales Document TO The Current Customer

WRITE Sales Record TO Sales Database

END

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Process: 2.1

Name: Create New Customer Record

Input Data Flows:

New Customer Information

Output Data Flows:

New Customer Record

Process Logic:

BEGIN

GET New Customer Information FROM New Customer

CREATE New Customer Record

WRITE New Customer Record TO Customer Database

END

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Process: 2.2

Name: Update Customer Record

Input Data Flows:

Changed Customer Profile

Output Data Flows:

Updated Customer Record

Process Logic:

BEGIN

GET Changed Customer Profile FROM Current Customer

GET Customer Record FROM Customer Database

UPDATE Customer Record

END

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Process: 2.3.1

Name: Find Each Customer Record

Input Data Flows:

Customer Record

Sales Record

Returned Product Record

Output Data Flows:

The Customer Sales Record

Process Logic:

BEGIN

GET Sales Record FROM Sales Database

GET Returned Product Record FROM Returned Product Database

GET A Customer Record FROM Customer Database

CREATE The Customer Sales Record

SEND TO Process 2.3.2

END

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Process: 2.3.2

Name: Calculate Total Sales Value / Customer

Input Data Flows:

The Customer Sales Record

Output Data Flows:

The Customer Status

Process Logic:

```
BEGIN
        GET  The Customer Sales Record  FROM  Process 2.3.1
        COMPUTE  Status
            Actual Sales = SUM (Total Sales Value – Total Product Return Value)
            IF  Actual Sales > 5,000,000  THEN
                Status = A
            ELSE IF  Actual Sales > 1,000,000 && Actual Sales > 5,000,000
                Status = B
            ELSE
                Status = C
            END IF
        CREATE  The Customer Status
        SEND TO  Process 2.3.3
END
```

Process: 2.3.3

Name: Print A Customer Report

Input Data Flows:

The Customer Status

Output Data Flows:

Customer Report

Process Logic:

BEGIN

GET The Customer Status FROM Process 2.3.2

CREATE Customer Report

PRINT OUT Customer Report TO Marketing Department

END

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Process: 3.1

Name: Create New Product Record

Input Data Flows:

New Product Model Information

Output Data Flows:

New Product Record

Process Logic:

BEGIN

GET New Product Model Information FROM New Product Model

CREATE New Product Record

WRITE New Product Record TO Product Database

END

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Process: 3.2

Name: Update Product Record

Input Data Flows:

Changed Product Model

Output Data Flows:

Updated Product Record

Process Logic:

BEGIN

GET Changed Product Model FROM Existing Product Model

GET Product Record FROM Product Database

UPDATE Product Record

END

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Process: 3.3.1

Name: Find Each Product Record

Input Data Flows:

Sales Record

Product Record

Output Data Flows:

The Product Sales Record

Process Logic:

BEGIN

GET Sales Record FROM Sales Database

GET A Product Record FROM Returned Product

CREATE The Product Record

SEND TO Process 3.3.2

END

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Process: 3.3.2

Name: Calculate Total Sales Value / Product

Input Data Flows:

The Product Sales Record

Output Data Flows:

The Product Status

Process Logic:

```
BEGIN
        GET  The Product Sales Record  FROM  Process 2.3.1
        COMPUTE  Status
            Total Sales = SUM ( Total Sales Value )
            IF  Total Sales > 3,000,000  THEN
                Status = A
            ELSE IF  Total Sales > 500,000 && Total Sales > 3,000,000
                Status = B
            ELSE
                Status = C
            END IF
        CREATE  The Product Status
        SEND TO  Process 3.3.3
END
```

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Process: 3.3.3

Name: Print A Product Report

Input Data Flows:

The Product Status

Output Data Flows:

Product Report

Process Logic:

BEGIN

GET The Product Status FROM Process 3.3.2

CREATE Product Report

PRINT OUT Product Report TO Manufacturing Department

END

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Process: 4.1

Name: Manufacturing Track

Input Data Flows:

Produced Product Amount

Output Data Flows:

Manufacturing Record

Process Logic:

BEGIN

GET Produced Product Amount FROM Manufacturing Department

CREATE Manufacturing Record

WRITE TO Manufacturing Database

END

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Process: 4.2

Name: Get Required Record

Input Data Flows:

Manufacturing Record

Sales Record

Stock Record

Output Data Flows:

Required Inventory Update Record

Process Logic:

BEGIN

GET Manufacturing Record FROM Manufacturing Database

GET Sales Record FORM Sales Database

CREATE Required Update Inventory Record

SEND TO Process 4.3

END

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Process: 4.3

Name: Calculate Current Inventory Status

Input Data Flows:

Required Inventory Update Record

Output Data Flows:

Updated Stock Record

Process Logic:

BEGIN

GET Required Inventory Update Record FROM Process 4.2

COMPUTE Inventory Status

SELECT A product

FROM ALL Required Inventory Update Record

Product Remainder =

SUM (Manufacturing Quantity) - SUM (Sales Quantity)

SEND Inventory Status TO Process 4.4

REPEAT UNTILL EOF.

END

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Process: 4.4.1

Name: Read Required Inventory Record

Input Data Flows:

Updated Stock Record

Output Data Flows:

Required Inventory Record

Process Logic:

BEGIN

GET Reorder Point FROM Inventory Database

CREATE Required Inventory Record

SEND TO Process 4.2.2

END

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Process: 4.4.2

Name: Check Re-Order Point

Input Data Flows:

Required Inventory Record

Output Data Flows:

Product Balance with Reorder Status

Process Logic:

```
BEGIN
        GET  Required Inventory Record  FROM  Process 4.4.1
        GET   Inventory Status   FROM   Process 4.3
        COMPARE  Available Amount  WITH  Re-order Point
            IF Available Amount > Re-order Point THEN
                SET  Status = Available
            ELSE
                SET  Status = Re-order
            END IF
        SEND  Product Balance with Reorder Status  TO  Process 4.4.3
END
```

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Process: 4.4.3

Name: Print Inventory Report

Input Data Flows:

Product Balance with Reorder Status

Output Data Flows:

Inventory Report

Process Logic:

BEGIN

GET Product Balance with Reorder Status FROM Process 4.4.2

CREATE Inventory Report

SEND TO Inventory Department

END

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Process: 5.1

Name: Check Sales Order

Input Data Flows:

Sales Record

Output Data Flows:

Needed Sales Record

Process Logic:

```
BEGIN
        FIND  The Sales Record
            READ  Sales Record  FROM  Sales Database
            COMPARE  Needed Sales ID  WITH  Sales ID
                IF  Needed ID = Sales ID  THEN
                    GET  The Sales Record
                        SEND TO  Process 5.3
                ELSE
                    REPEAT COMPARE
                END IF
END
```

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Process: 5.2

Name: Receive Returned Product

Input Data Flows:

Returned Product

Output Data Flows:

Received and Returned Product

Process Logic:

BEGIN

GET Returned Product

CREATE Received and Returned Product

SEND TO Process 5.3

END

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Process: 5.3

Name: Check Returned Product

Input Data Flows:

Received and Returned Product

Needed Sales Record

Output Data Flows:

Approved Returned Product

Process Logic:

BEGIN

GET Received and Returned Product FROM Process 5.2

GET Needed Sales Record FROM Process 5.1

GET Approved of Sales Manager

CREATE Approved Returned Product

SEND TO Process 5.4

END

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Process: 5.4

Name: Create Product Return Record

Input Data Flows:

Approved Returned Product

Output Data Flows:

Returned Product Record

Process Logic:

BEGIN

GET Approved Returned Product FROM Process 5.4

CREATE Returned Product

WRITE TO Returned Product Database

END

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Process: 5.5

Name: Issue Cheque

Input Data Flows:

Approved Returned Product

Output Data Flows:

Cheque

Process Logic:

BEGIN

GET Approved Returned Product FROM Process 5.4

ISSUE Cheque TO Current Customer

END

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APPENDIX C

STRUCTURE CHART

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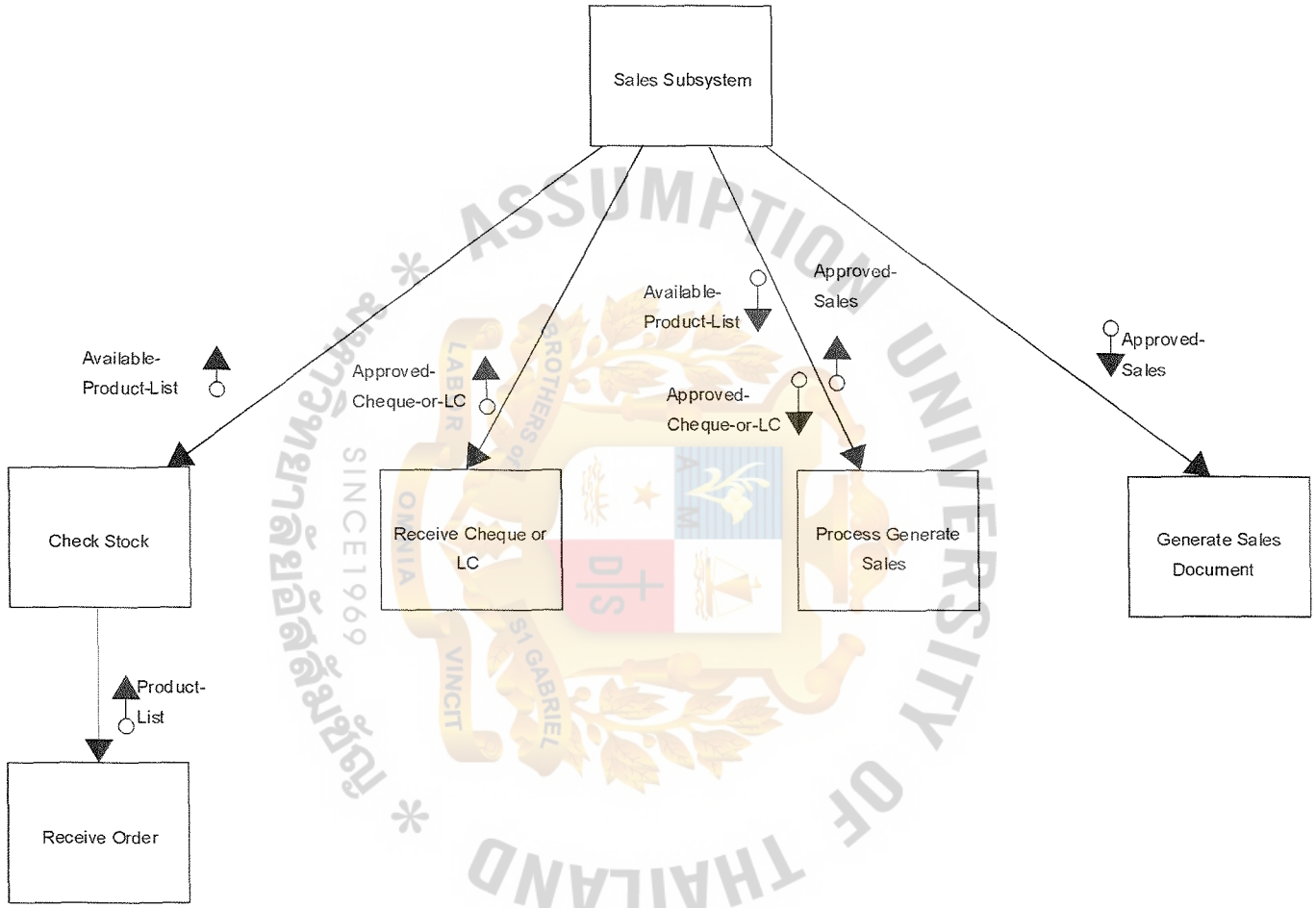

Figure C.1. Structure Chart of Process Sales Operation.

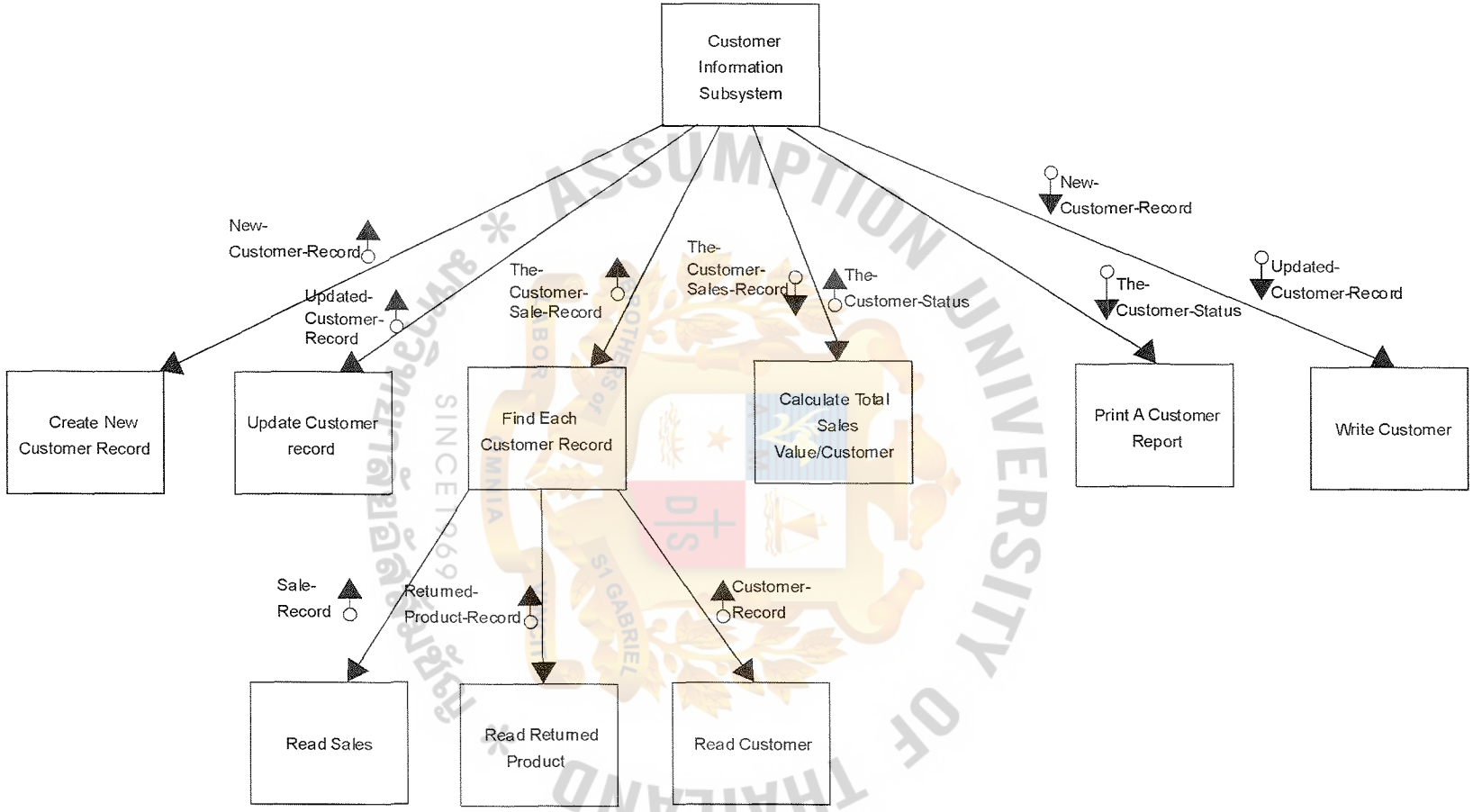

Figure C.2. Structure Chart of Process Customer Information.

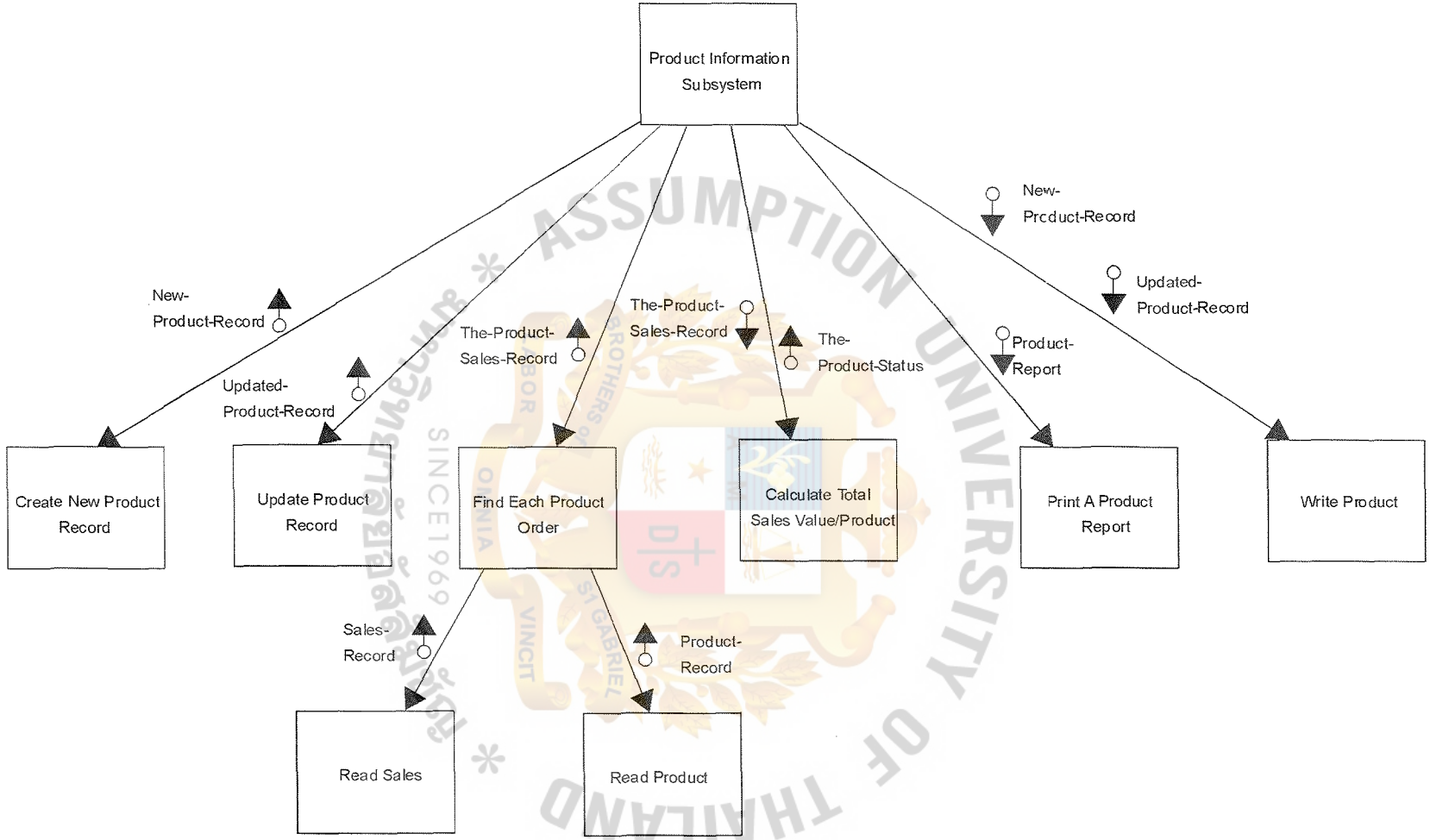

Figure C.3. Structure Chart of Process Product Information.

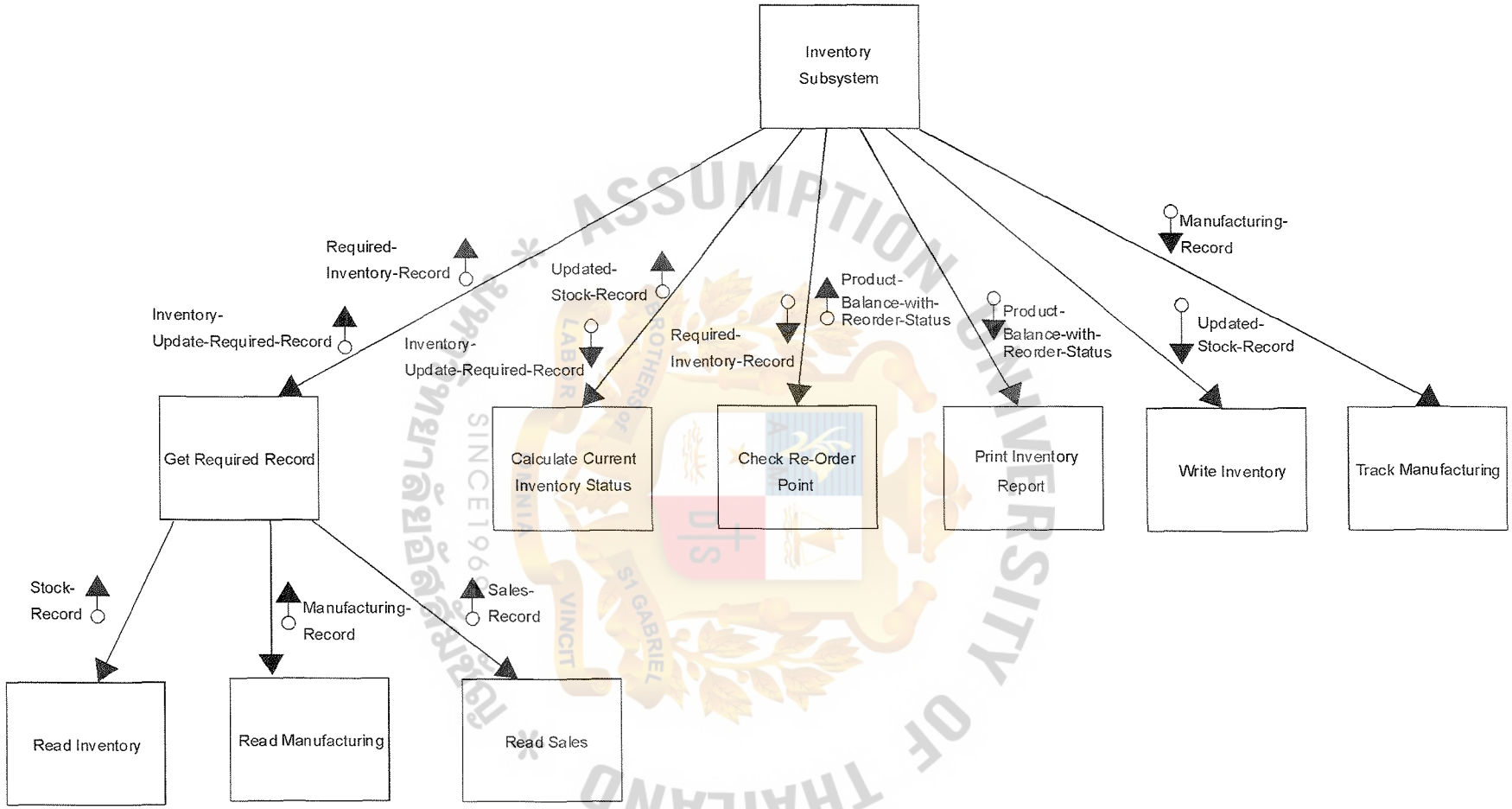

Figure C.4. Structure Chart of Process Inventory Operation.

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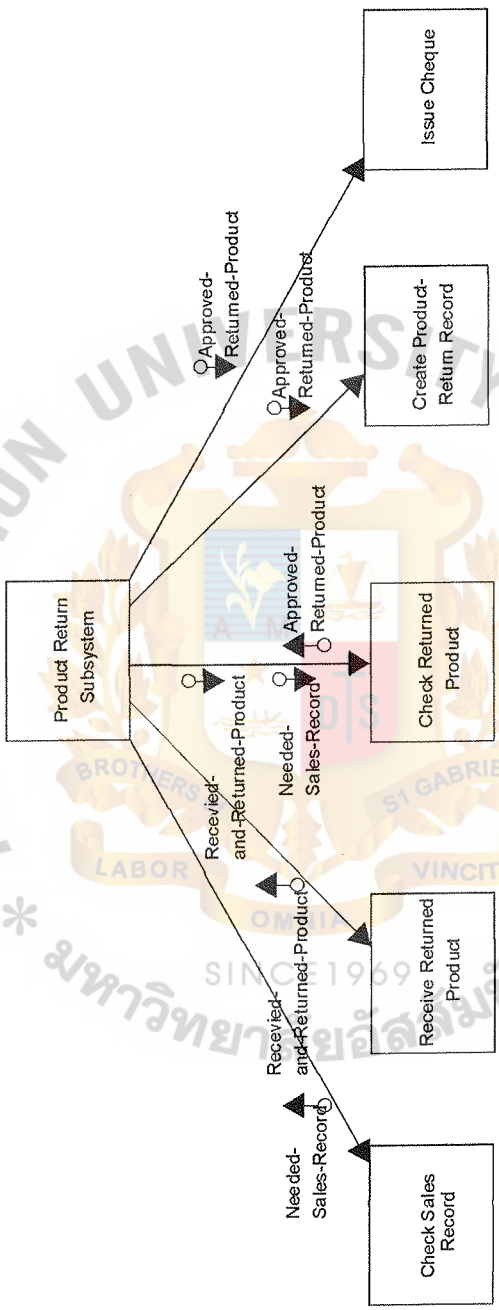

Figure C.5. Structure Chart of Process Product Return Operation.

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APPENDIX D

ENTITY RELATIONSHIP DIAGRAM

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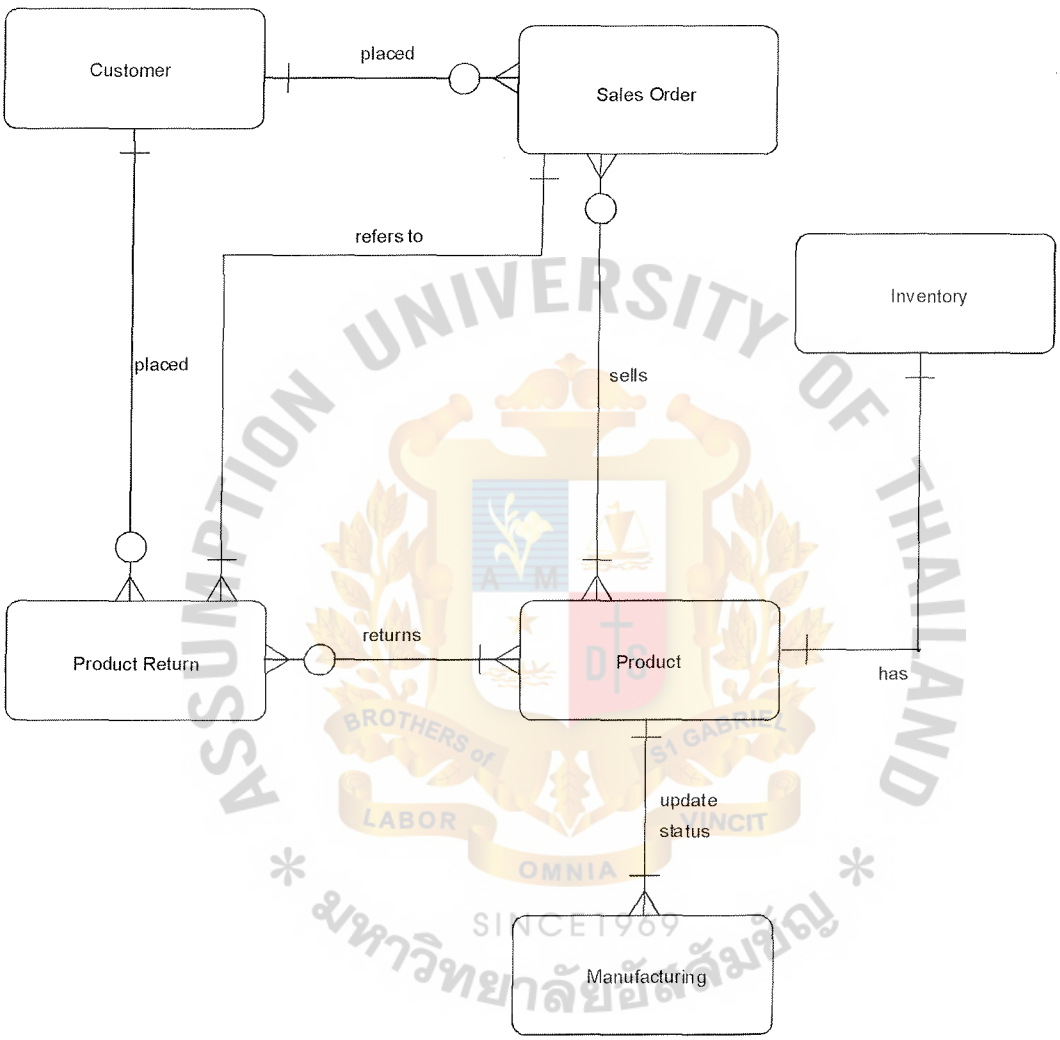

Figure D.1. Context Data Model.

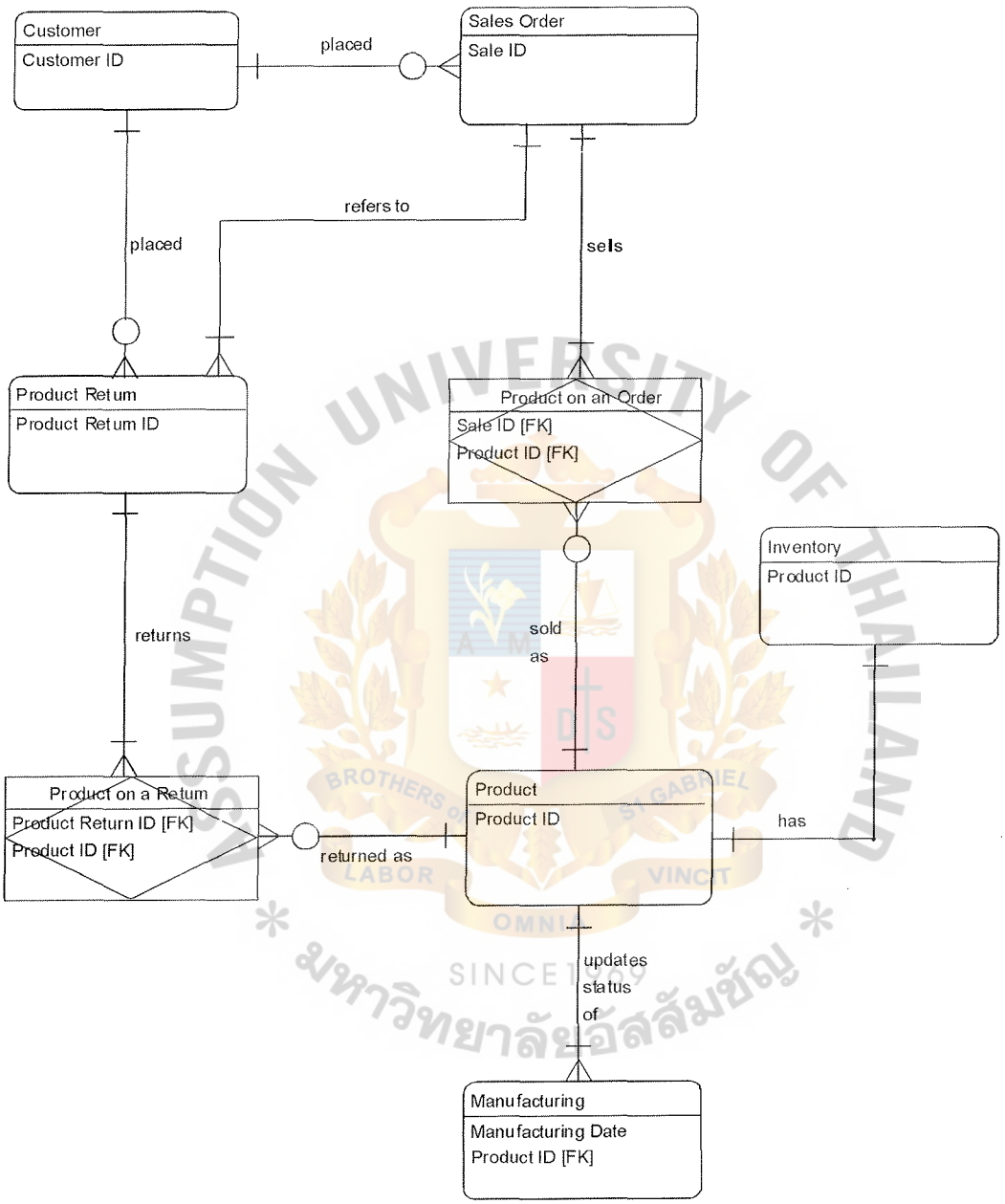

Figure D.2. Key-Based Data Model.

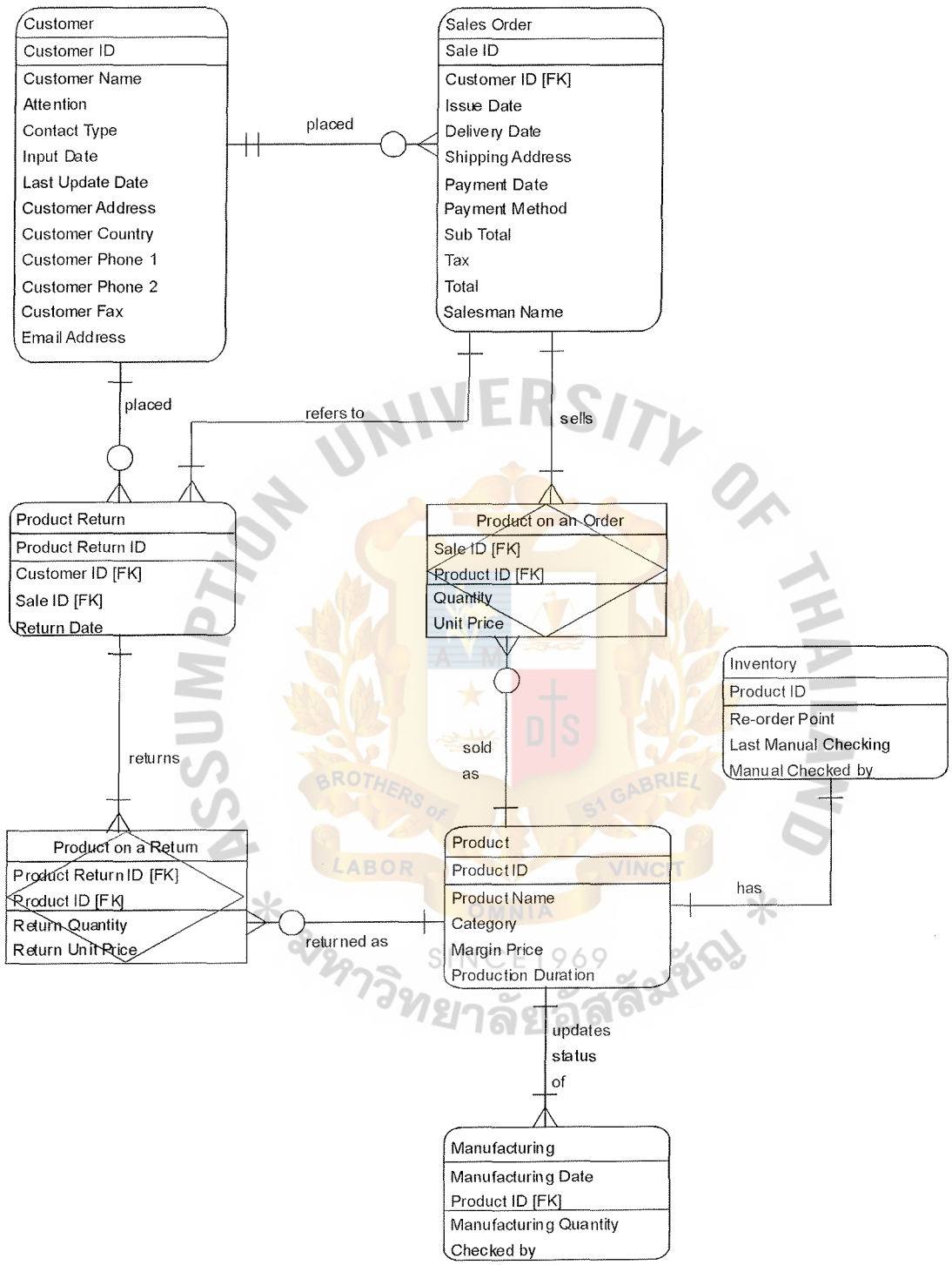

Figure D.3. Fully Attributed Data Model.

APPENDIX E

FILE LAYOUT

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Table E.1. Structure of Customer Table.

Table : Customer								
Column Name	Domain	Length	Null	Default Value	Index	Unique	Check	Key Type
Customer ID	Character	8	Not allow	-	N	Y	-	Primary Key
Customer Name	Character	50	Not allow	-	Y	Y	-	Attribute
Attention	Character	40	Not allow	-	N	N	-	Attribute
Contact Type	Decimal	1	Not allow	1	N	N	Between 1 and 2	Attribute
Input Date	Date	-	Not allow	Today()	N	N	> 1-Jan-00	Attribute
Last Update Date	Date	-	Not allow	Today()	N	N	> 1-Jan-00	Attribute
Customer Address	Character	200	Not allow	-	N	N	-	Attribute
Customer Country	Character	25	Not allow	-	N	N	-	Attribute
Customer Phone 1	Decimal	11	Allow	-	N	N	-	Attribute
Customer Phone 2	Decimal	11	Not allow	-	N	N	-	Attribute
Customer Fax	Decimal	11	Not allow	-	N	N	-	Attribute
Email Address	Character	30	Allow	-	N	N	-	Attribute

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Table E.2. Structure of Inventory Table.

Table : Inventory								
Column Name	Domain	Length	Null	Default Value	Index	Unique	Check	Key Type
Product ID	Character	8	Not allow	-	Y	Y	-	Primary Key
Re-Order Point	Decimal	5	Not allow	-	N	N	> 0	Attribute
Last Manual Checking	DateTime	-	Allow	Now()	N	N	> 1-Jan-00	Attribute
Manual Checked by	Character	15	Allow	-	N	N	-	Attribute

Table E.3. Structure of Manufacturing Table.

Table : Manufacturing								
Column Name	Domain	Length	Null	Default Value	Index	Unique	Check	Key Type
Manufacturing Date	DateTime	-	Not allow	Now()	Y	Y	> 1-Jan-00	Primary Key
Product ID	Character	8	Not allow	-	N	N	-	Primary Key
Manufacturing Quantity	Decimal	10	Not allow	-	N	N	>0	Attribute
Checked by	Character	15	Not allow	-	N	N	-	Attribute

Table E.4. Structure of Product on an Order Table.

Table : Product on an Order								
Column Name	Domain	Length	Null	Default Value	Index	Unique	Check	Key Type
Sale ID	Character	8	Not allow	-	Y	N	-	Primary Key
Product ID	Character	8	Not allow	-	N	N	-	Primary Key
Quantity	Decimal	10	Not allow	-	N	N	-	Attribute
Unit Price	Money	5	Not allow	-	N	N	>0	Attribute

Table E.5. Structure of Product Table.

Table : Product								
Column Name	Domain	Length	Null	Default Value	Index	Unique	Check	Key Type
Product ID	Character	8	Not allow	-	Y	Y	-	Primary Key
Product Name	Character	50	Not allow	-	N	Y	-	Attribute
Category	Decimal	1	Not allow	1	N	N	Between 1 and 5	Attribute
Margin Price	Money	5	Not allow	-	N	N	>0	Attribute
Production Duration	Decimal	2	Not allow	-	N	N	-	Attribute

Table E.6. Structure of Product on a Return Table.

Table : Product on a Return								
Column Name	Domain	Length	Null	Default Value	Index	Unique	Check	Key Type
Product Return ID	Character	8	Not allow	-	Y	N	-	Primary Key
Product ID	Character	8	Not allow	-	N	N	-	Primary Key
Return Quantity	Decimal	10	Not allow	-	N	N	>0	Attribute
Return Unit Price	Money	5	Not allow	-	N	N	>0	Attribute

Table E.7. Structure of Product Return Table.

Table : Product Return								
Column Name	Domain	Length	Null	Default Value	Index	Unique	Check	Key Type
Product Return ID	Character	8	Not allow	-	Y	Y	-	Primary Key
Return Date	DateTime	-	Not allow	Now()	N	N	> 1-Jan-00	Attribute
Sale ID	Character	8	Not allow	-	N	N	-	Foreign Key
Customer ID	Character	8	Not allow	-	N	N	-	Foreign Key

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Table E.8. Structure of Sales Order Table.

Table : Sales Order								
Column Name	Domain	Length	Null	Default Value	Index	Unique	Check	Key Type
Sale ID	Character	8	Not allow	-	Y	Y	-	Primary Key
Customer ID	Character	8	Not allow	-	N	N	-	Foreign Key
Issue Date	DateTime	-	Not allow	Now()	N	N	-	Attribute
Delivery Date	Date	-	Not allow	Today()	N	N	> 1-Jan-00	Attribute
Shipping Address	Character	250	Not allow	-	N	N	-	Attribute
Payment Date	Date	-	Not allow	Today()	N	N	> 1-Jan-00	Attribute
Payment Method	Decimal	1	Not allow	1	N	N	Between 1 and 3	Attribute
Sub Total	Money	10	Not allow	-	N	N	>0	Attribute
Tax	Float	-	Not allow	0.07	N	N	>0	Attribute
Total	Money	10	Not allow	-	N	N	>0	Attribute
Salesman Name	Character	8	Not allow	-	N	N	-	Attribute

APPENDIX F

DATA DICTIONARY

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Data Element

Attention — Data Element

Description:

Data element attributes

Storage Type:	Char
Length:	40
Null Type:	Constraint: NotNull

Location:

Entity --> Customer

Available Quantity — Data Element

Description:

Available product quantity in our warehouse

Data element attributes

Storage Type:	Decimal
Length:	10
Null Type:	NotNull

Location:

Entity --> Inventory

Category — Data Element

Description:

1= Wood (W), 2=Wood and Glass (WG), 3= Wood and Iron (WI), 4=Wood and Rattan (WR), 5=Wood and Clothes (WCL)

Data element attributes

Storage Type:	Decimal
Length:	1
Null Type:	Constraint: NotNull

Location:

Entity --> Product

Checked by — Data Element

Description:

The name of the officer who authorizes this product

Data element attributes

Storage Type:	Char
Length:	15
Null Type:	Constraint: NotNull

Location:

Entity --> Manufacturing

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Contract Type Data Element

Description:

1- Organization, 2- Individual

Data element attributes

Storage Type:	Decimal
Length:	1
Default:	1
Null Type:	Constraint: NotNull

Location:

Entity --> Sales Order

Customer Address Data Element

Description:

The customer address (home or company)

Data element attributes

Storage Type:	Char
Length:	200
Null Type:	Constraint: NotNull

Location:

Entity --> Customer

Customer Country Data Element

Description:

The country of customer's residence (permanent)

Data element attributes

Storage Type:	Char
Length:	25
Null Type:	Constraint: NotNull

Location:

Entity --> Customer

Customer Fax Data Element

Description:

The customer fax number

Data element attributes

Storage Type:	Decimal
Length:	11
Null Type:	NotNull

Location:

Entity --> Customer

Customer ID Data Element

Description:

Identification number for specific customer

Data element attributes

Storage Type: Char

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Length: 8
Null Type: NotNull
Location:
Entity --> Product Return
Entity --> Customer
Entity --> Sales Order

Customer Name Data Element
Description:
A name of the current customer
Data element attributes
Storage Type: Char
Length: 50
Null Type: NotNull
Location:
Entity --> Customer

Customer Phone 1 Data Element
Description:
The customer phone number 1
Data element attributes
Storage Type: Decimal
Length: 11
Null Type: Constraint:
NotNull
Location:
Entity --> Customer

Customer Phone 2 Data Element
Description:
The customer phone number 2 (option)
Data element attributes
Storage Type: Decimal
Length: 11
Null Type: Null
Location:
Entity --> Customer

Delivery Date Data Element
Description:
The date that the product in order will be delivered to customer
Data element attributes
Storage Type: Date
Default: Constraint:
today()
Null Type: NotNull
Location:
Entity --> Sales Order

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Email Address Data Element

Description:
The customer Email address
Data element attributes
Storage Type: Char
Length: 30
Null Type: Null
Location:
Entity --> Customer

Input Date Data Element

Description:
The date that this record is created
Data element attributes
Storage Type: Date
Default: today()
Null Type: Constraint: NotNull
Location:
Entity --> Customer

Issue Date Data Element

Description:
The date and time that this record is created
Data element attributes
Storage Type: DateTime
Default: Constraint: now()
Null Type: NotNull
Location:
Entity --> Sales Order

Last Manual Checking Data Element

Description:
The last time that available product quantity in warehouse is checked manually
Data element attributes
Storage Type: DateTime
Default: now()
Null Type: NotNull
Location:
Entity --> Inventory

Last Update Date Data Element

Description:
The date that this record is changed
Data element attributes
Storage Type: Date
Default: today()
Null Type: Constraint:

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NotNull

Location:

Entity --> Customer

Manual Checked by Data Element

Description:

Sometime warehouse officer will be assigned to count the product in warehouse to compare with computer calculation

Data element attributes

Storage Type: Char

Length: 15

Null Type: Null

Location:

Entity --> Inventory

Manufacturing Date Data Element

Description:

Date and time that each product is produced already

Data element attributes

Storage Type: DateTime

Default: Constraint: now()

Null Type: NotNull

Location:

Entity --> Manufacturing

Manufacturing Quantity Data Element

Description:

The number that shows a quantity of produced product

Data element attributes

Storage Type: Decimal

Length: 10

Null Type: Constraint: NotNull

Location:

Entity --> Manufacturing

Margin Price Data Element

Description:

Minimum price per unit that the company can sell

Data element attributes

Storage Type: Money

Length: 5

Null Type: NotNull

Location:

Entity --> Product

Payment Date Data Element

Description:

The date that customer allows cheque to deposit

Data element attributes

Storage Type: Date
Default: today()
Null Type: NotNull

Location:

Entity --> Sales Order

Payment Method Data Element

Description:

1- Cash, 2- Cheque, 3- Letter of Credit (LC)

Data element attributes

Storage Type: Decimal
Length: 1
Null Type: NotNull

Location:

Entity --> Sales Order

Product ID Data Element

Description:

Identification number for specific product

Data element attributes

Storage Type: Char
Length: 8
Null Type: NotNull

Location:

Associative Entity -->Product on an Order
Entity --> Manufacturing
Entity --> Product
Associative Entity -->Product on a Return
Entity --> Inventory

Product Name Data Element

Description:

A name of the product

Data element attributes

Storage Type: Char
Length: 50
Null Type: Constraint:
NotNull

Location:

Entity --> Product

Product Return ID Data Element

Description:

Identification number for specific Product Return

Data element attributes

Storage Type: Char
Length: 8
Null Type: NotNull
Location:
Entity --> Product Return
Associative Entity -->Product on a Return

Production Duration Data Element
Description:
The duration to produce the product
Data element attributes
Storage Type: Decimal
Length: 2
Null Type: NotNull
Location:
Entity --> Product

Quantity Data Element
Description:
Quantity of each product in the order
Data element attributes
Storage Type: Decimal
Length: 10
Null Type: NotNull
Location:
Associative Entity -->Product on an Order

Re-order Point Data Element
Description:
Minimum quantity is allowed in the warehouse
Data element attributes
Storage Type: Decimal
Length: 5
Null Type: NotNull
Location:
Entity --> Inventory

Return Date Data Element
Description:
Date and time that sold product was returned
Data element attributes
Storage Type: DateTime
Default: Constraint:
now()
Null Type: NotNull
Location:
Entity --> Product Return

Return Quantity Data Element

Description:
Quantity of each product in the Product Return
Data element attributes
Storage Type: Decimal
Length: 10
Null Type: NotNull
Location:
Associative Entity -->Product on a Return

Return Unit Price Data Element

Description:
Price of return for a unit
Data element attributes
Storage Type: Money
Length: 5
Null Type: NotNull

Sale ID Data Element

Description:
Identification number for specific sales
Data element attributes
Storage Type: Char
Length: 8
Null Type: NotNull
Location:
Associative Entity -->Product on an Order
Entity --> Product Return
Entity --> Sales Order

Salesman Name Data Element

Description:
A name of the salesman of this sales order
Data element attributes
Storage Type: Char
Length: 8
Null Type: NotNull
Location:
Entity --> Sales Order

Shipping Address Data Element

Description:
The address for product delivery to customer
Data element attributes
Storage Type: Char
Length: 250
Null Type: NotNull
Location:
Entity --> Sales Order

Sub Total Data Element

Description:
Total Sales value before tax
Data element attributes
Storage Type: Money
Length: 10
Null Type: NotNull
Location:
Entity --> Sales Order

Tax Data Element

Description:
Government Tax
Data element attributes
Storage Type: Float
Default: Constraint:
0.07
Null Type: NotNull
Location:
Entity --> Sales Order

Total Data Element

Description:
Total Sales value after tax
Data element attributes
Storage Type: Money
Length: 10
Null Type: NotNull
Location:
Entity --> Sales Order

Unit Price Data Element

Description:
Price of sales for a unit
Data element attributes
Storage Type: Money
Length: 5
Null Type: NotNull
Location:
Associative Entity -->Product on an Order

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APPENDIX G

USER INTERFACE DESIGN

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Interface Design

At first, user needs to apply user name and their password to login the computer. This step is required for both client and server computers.

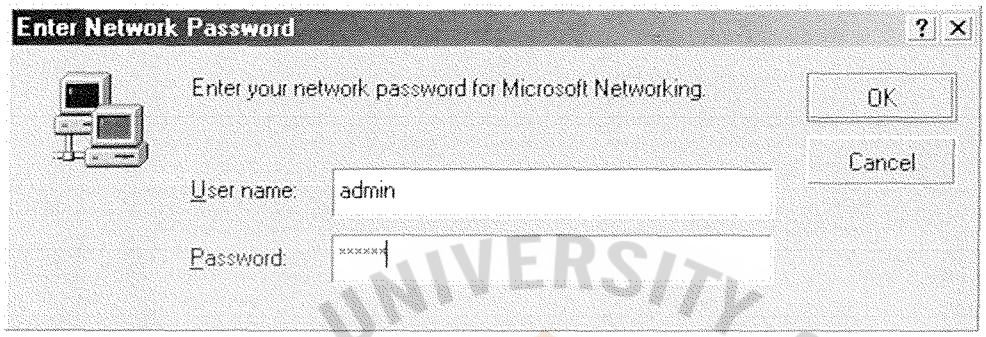

Figure G.1. Microsoft Windows Logon Interface.

When a Manufacturer Information System Program is opened, a logon interface will appear to check authority to access of the user. The interface is shown in figure below.

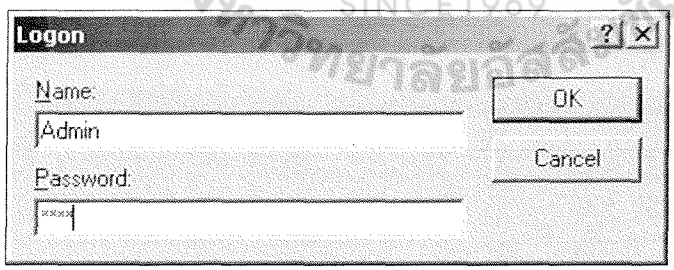

Figure G.2. Microsoft Access Logon Interface.

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If a logon process is successful, a main menu interface will appear. The main menu is shown in Figure G.3.

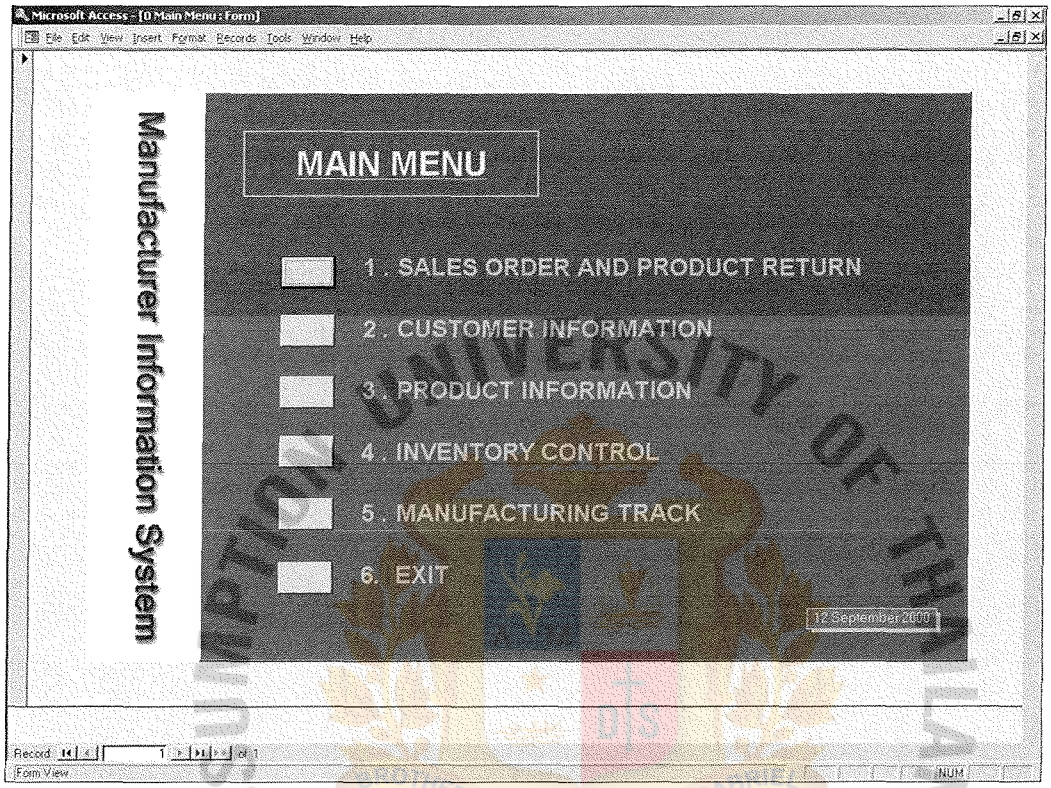

Figure G.3. Main Menu Interface.

In the main menu, there are six items, which are:

(1) Sales order and product return has a submenu about sale and product return.

(2) Customer Information has a submenu about customer record maintenance and customer classification report.

(3) Product Information has a submenu about product record maintenance.

(4) Inventory control has a submenu about inventory maintenance.

(5) Manufacturing Track has a submenu to create manufacturing record.

(6) Exit is a button to end the application.

1. Sales Order and Product Return

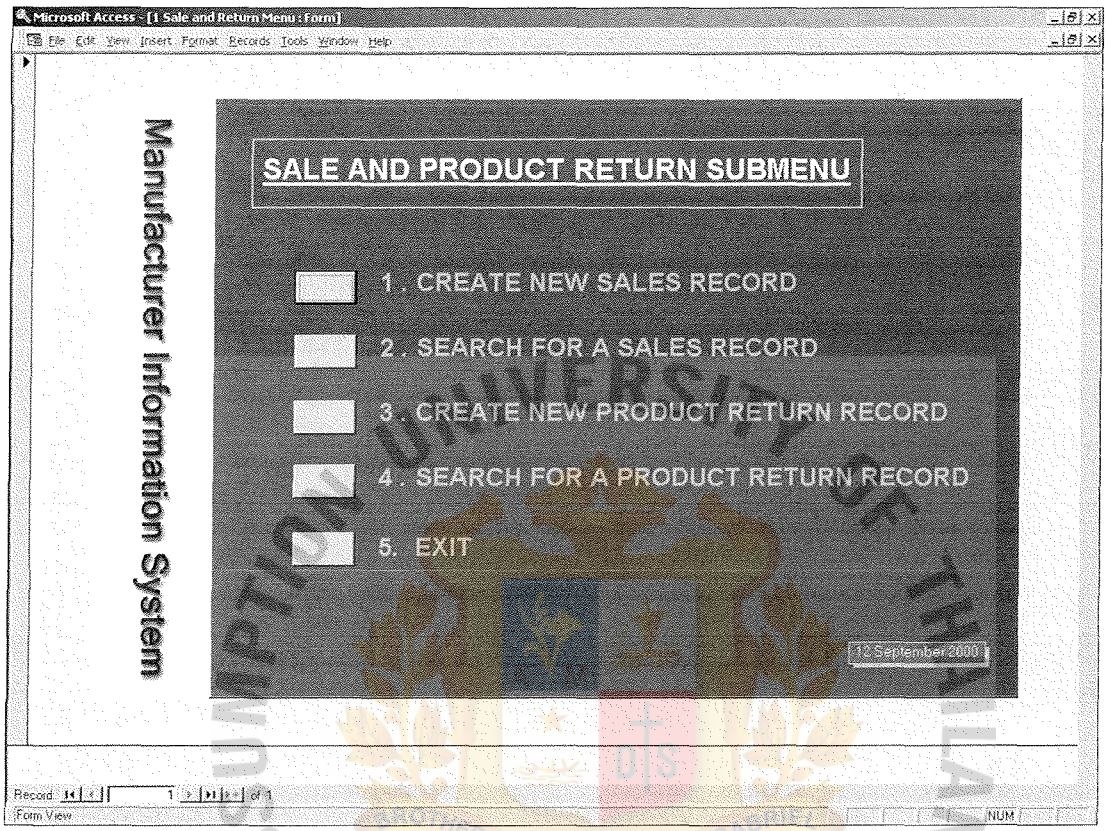

Figure G.4. Sales and Product Return Submenu.

This submenu consist of 5 functions which are:

(1) Creating new sales record is shown in Figure G.5 and Figure G.6.

(2) Searching for a sales record is shown in Figure G.7.

(3) Creating new product return record is shown in Figure G.9.

(4) Searching for a product return record is shown in Figure G.10.

(5) Exit

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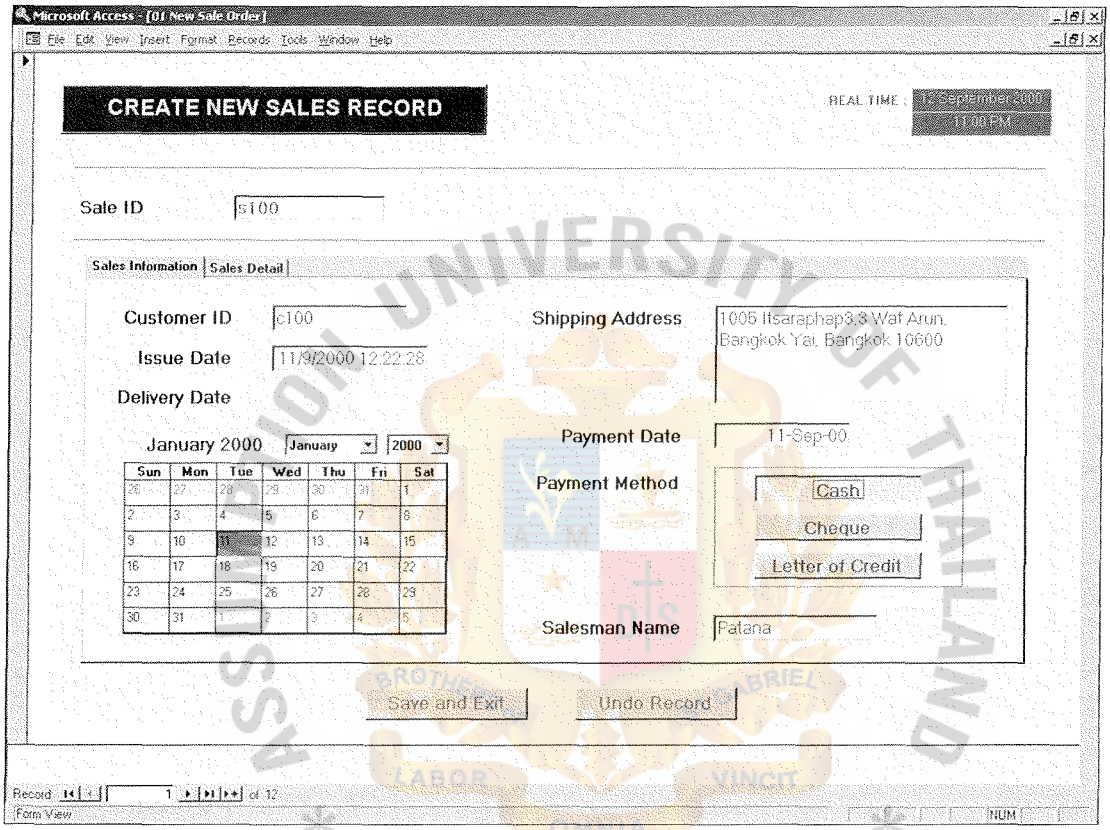

Figure G.5. Create New Sales Record Interface – Sales Information Tab.

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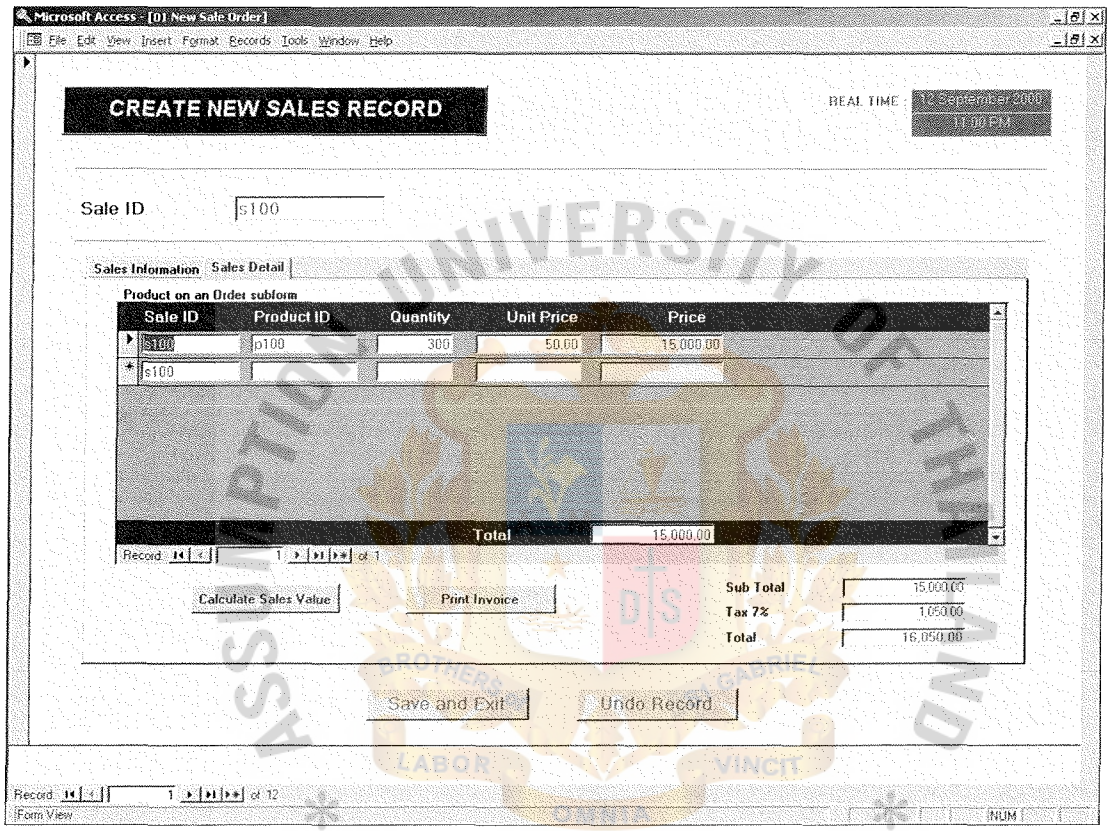

Figure G.6. Create New Sales Record Interface – Sales Detail Tab.

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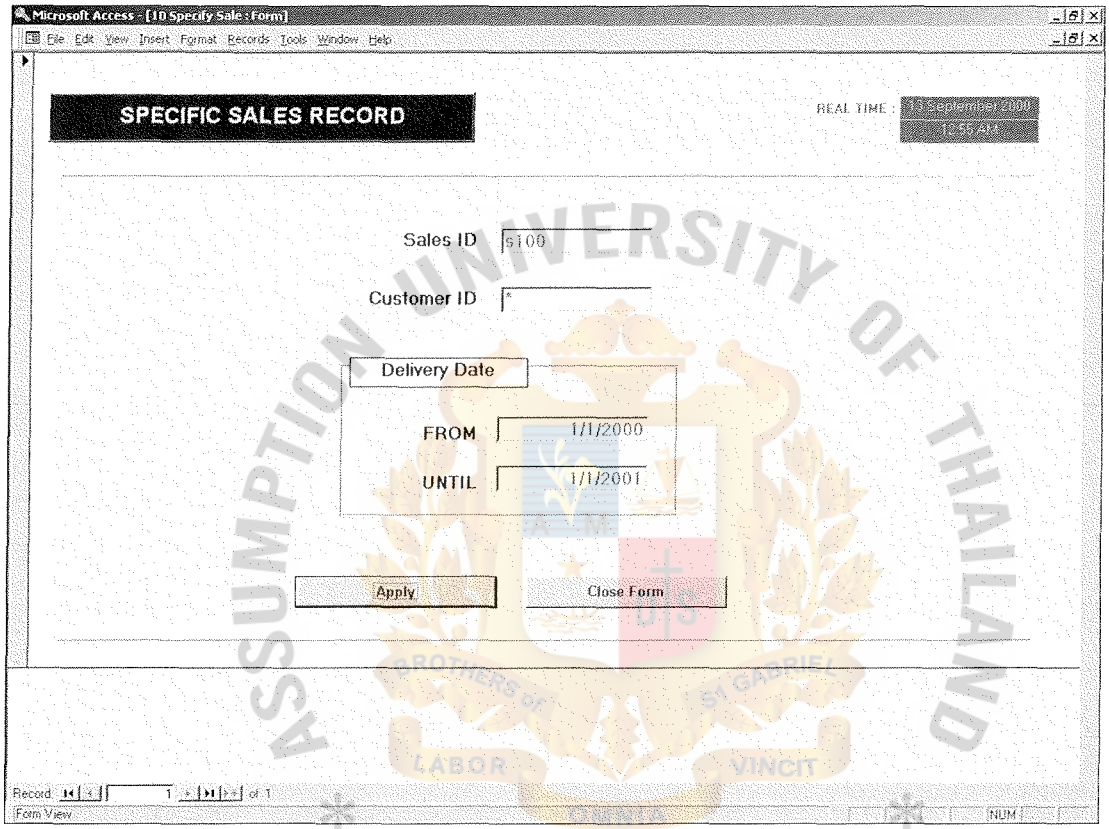

Figure G.7. Specific Sales Record Interface.

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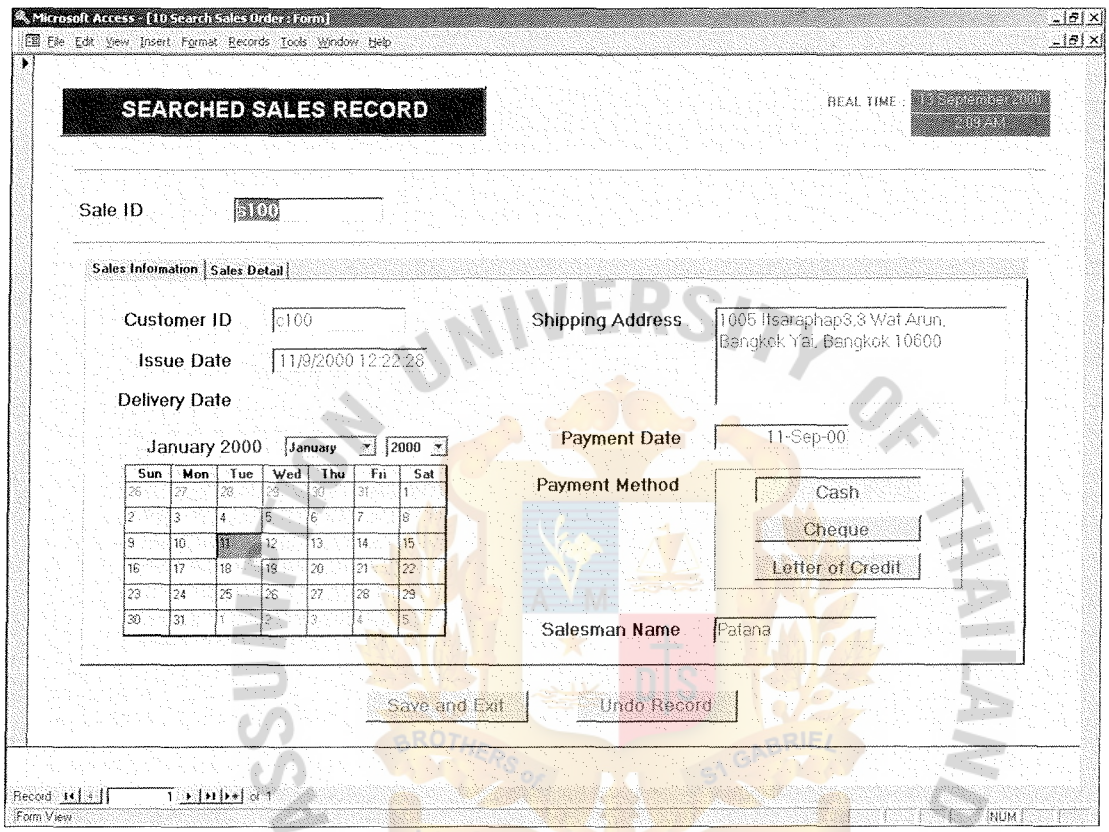

Figure G.8. Searched Sales Record Interface.

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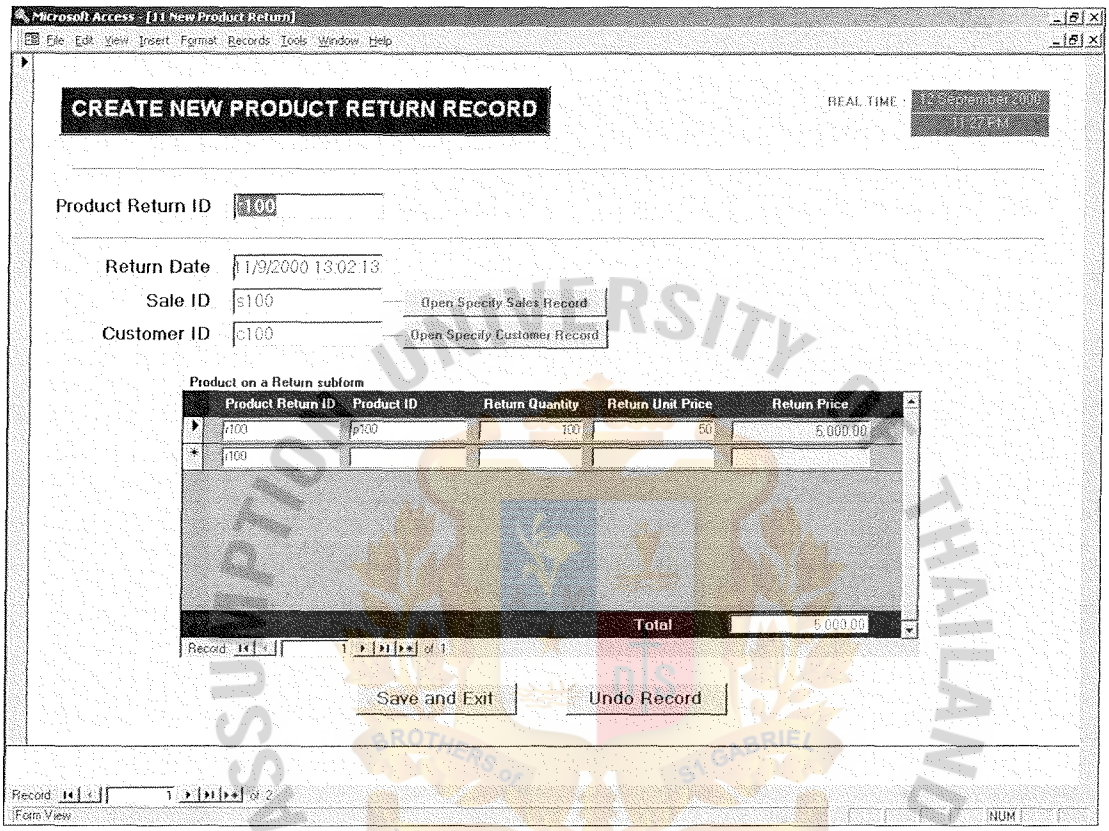

Figure G.9. Create New Product Return Record Interface.

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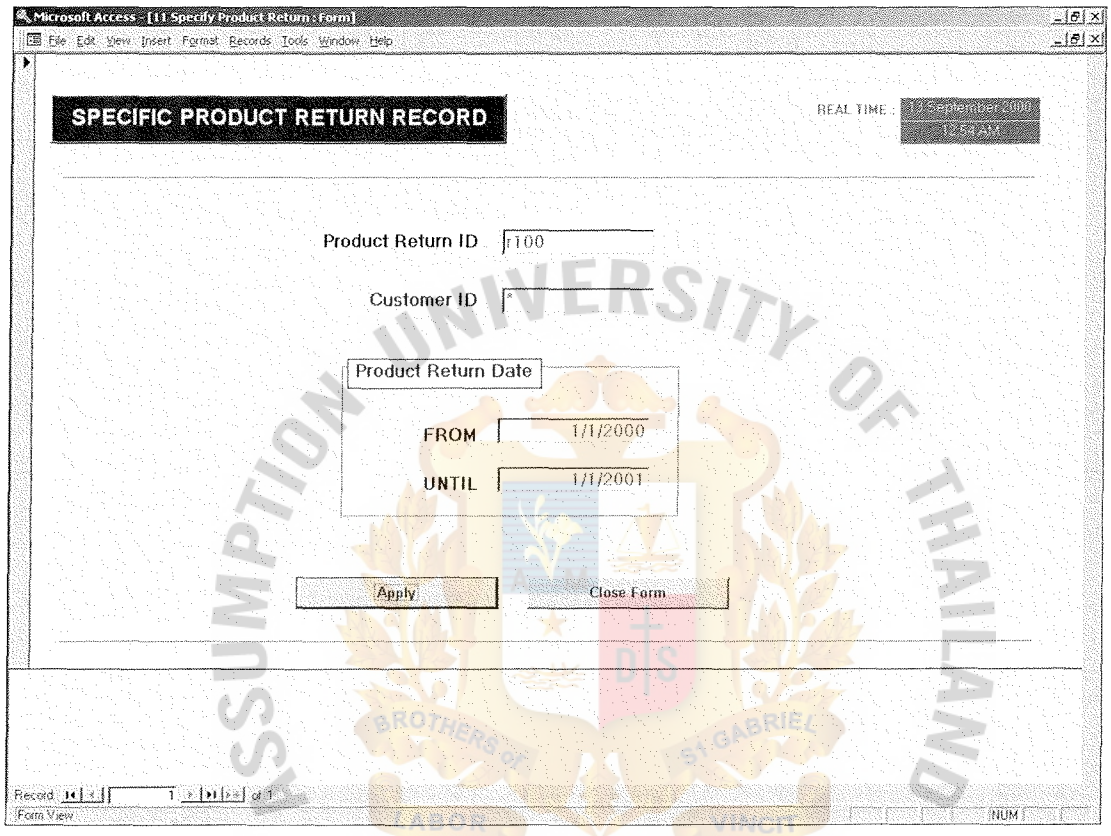

Figure G.10. Specify Product Return Record Interface.

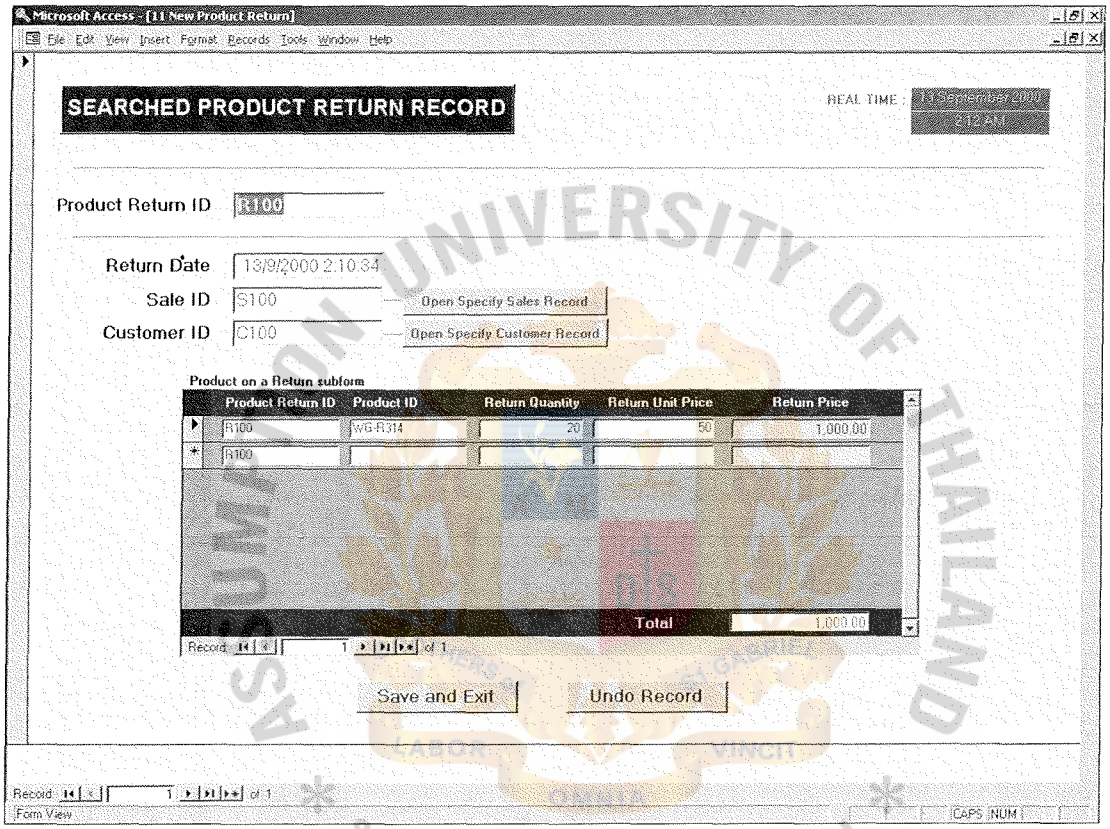

Figure G.11. Searched Product Return Record Interface.

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2. Customer Information

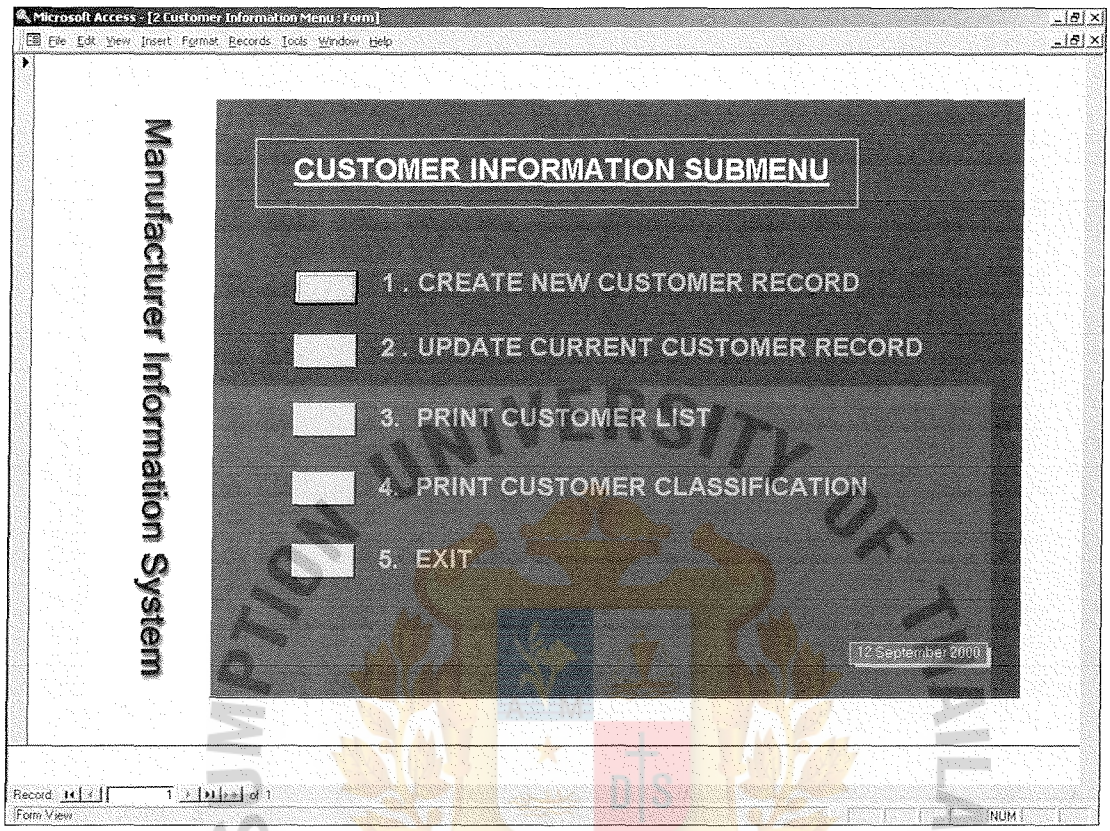

Figure G.12. Customer Information Submenu.

This submenu consists of 5 functions which are:

(1) Creating new customer record is shown in Figure G.13.

(2) Updating current customer record is shown in Figure G.14 and Figure G.15.

(3) Printing customer list is shown in Appendix H, page 138.

(4) Printing customer classification is shown in Appendix H, page 139.

(5) Exit

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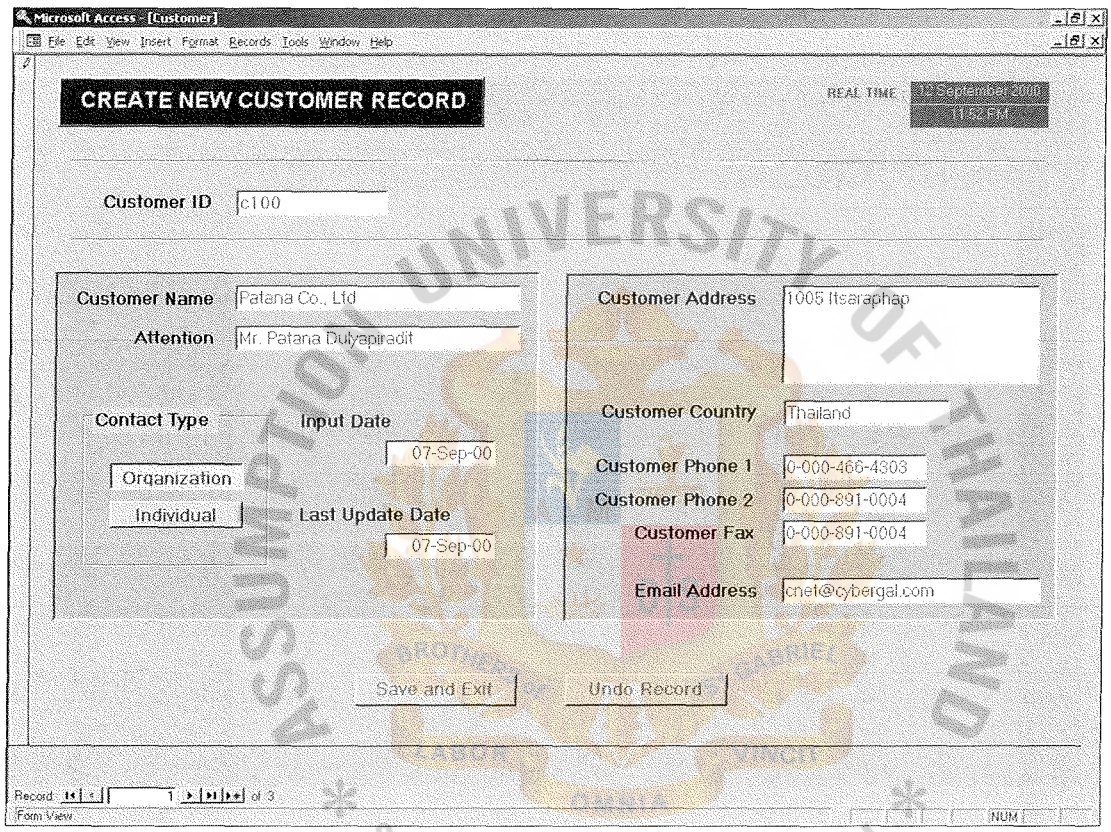

Figure G.13. Create New Customer Interface.

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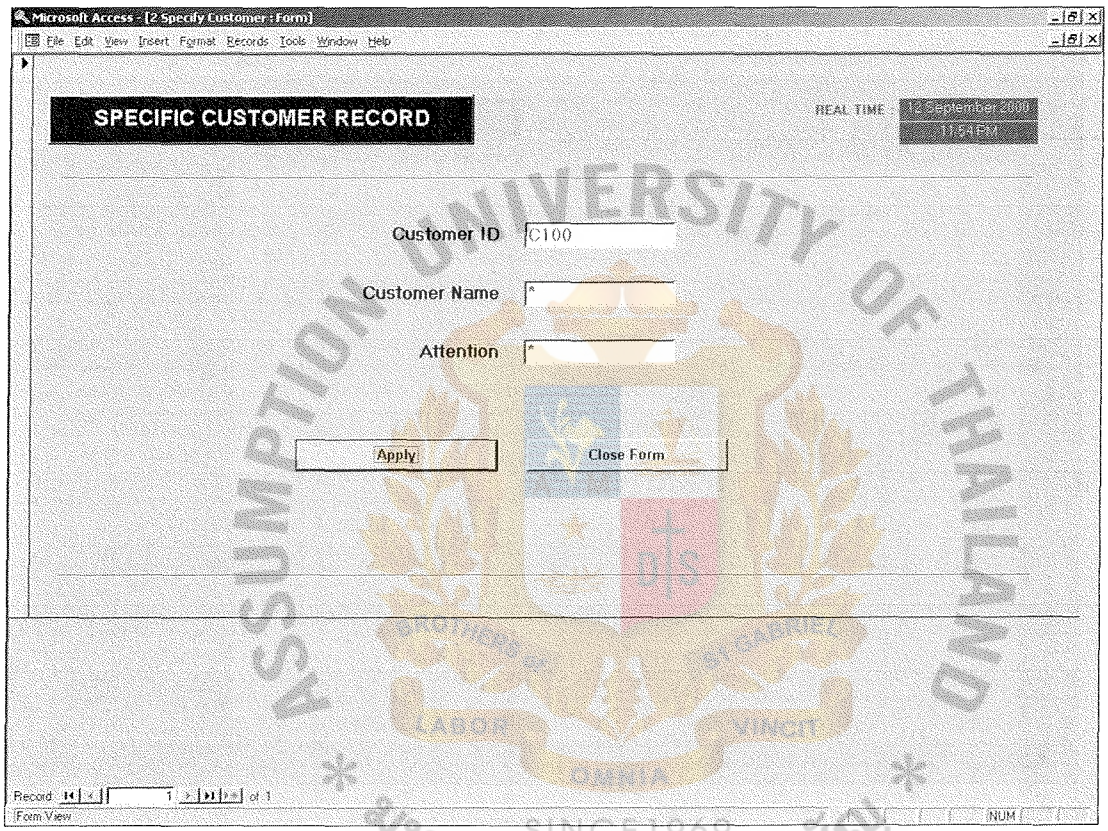

Figure G.14. Specific Customer Record Interface.

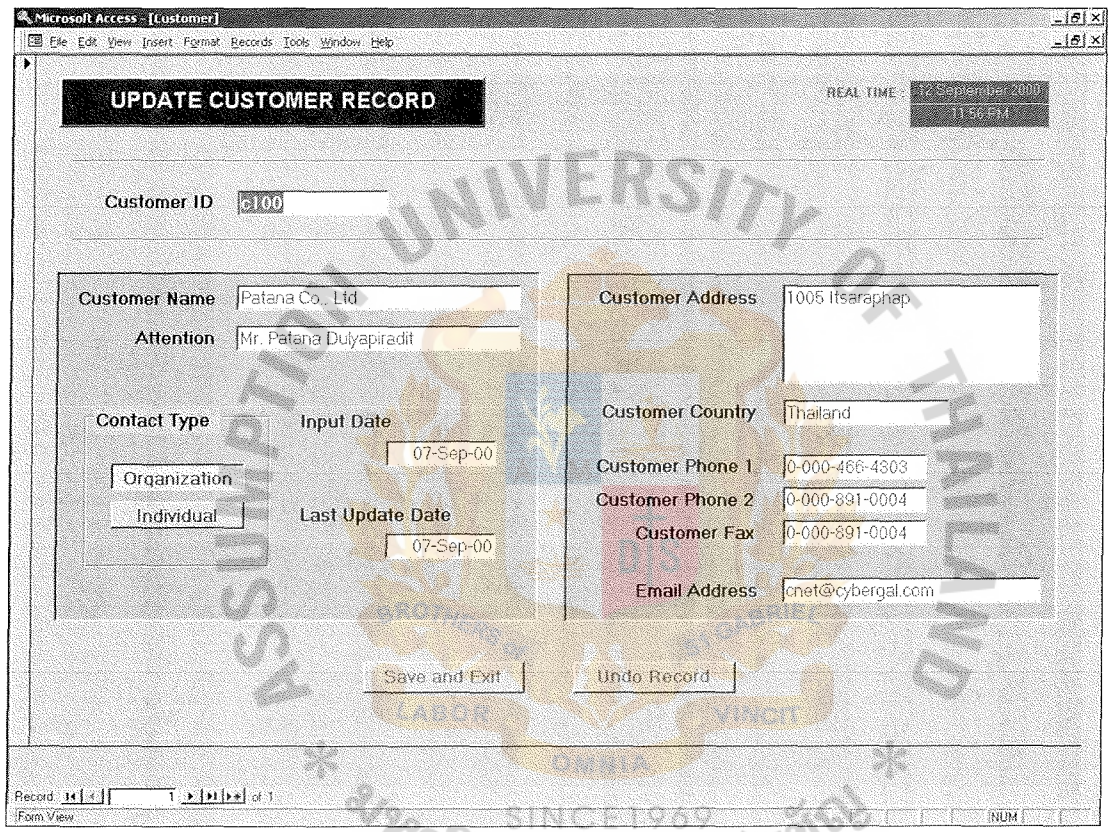

Figure G.15. Update Customer Record Interface.

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3. Product Information

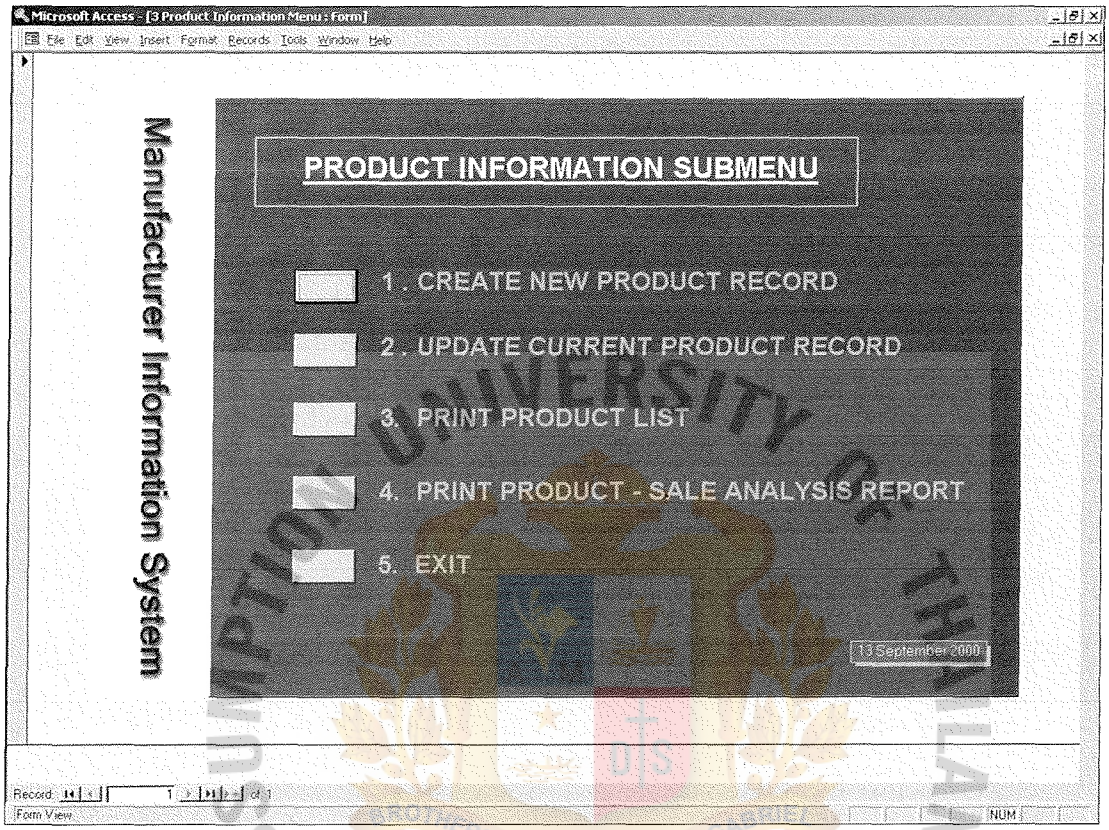

Figure G.16. Product Information Submenu.

This submenu consists of 5 functions which are:

(1) Creating new product record is shown in Figure G.17.

(2) Updating current product record is shown in Figure G.18 and Figure G.19.

(3) Printing product list is shown in Appendix H, page 140.

(4) Printing product – sales analysis report is shown in Appendix H, page 141.

(5) Exit

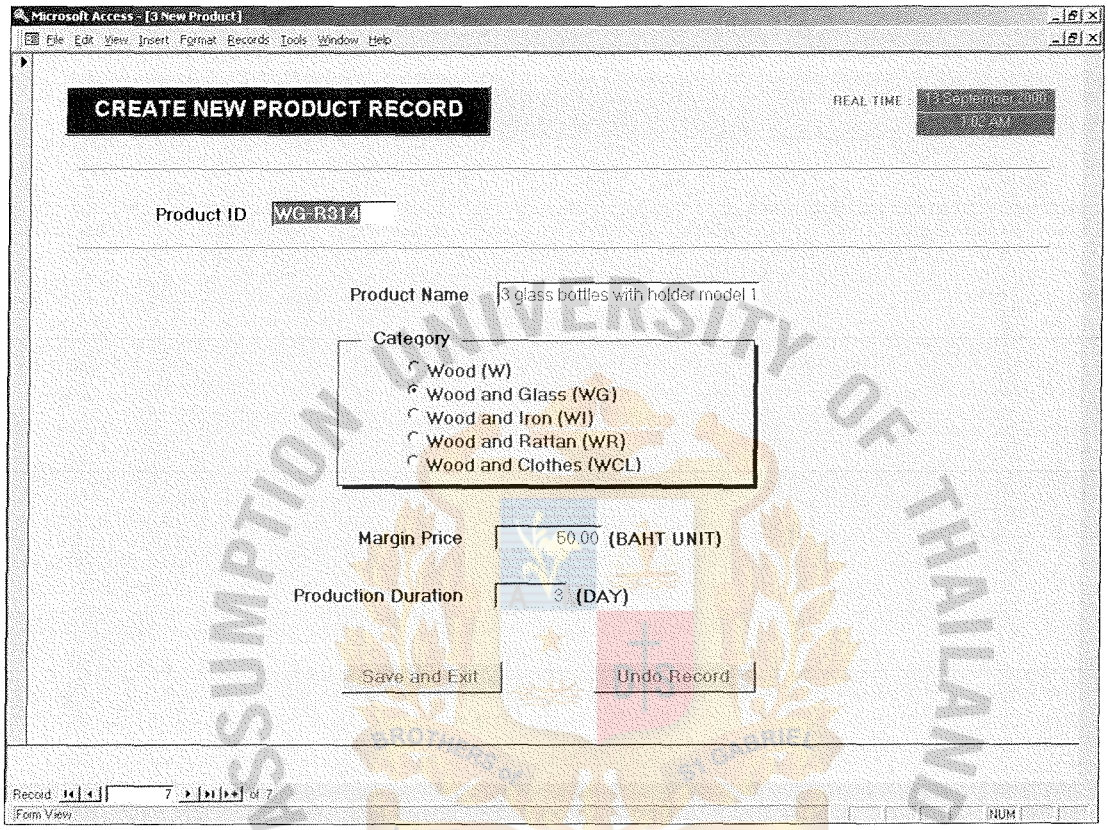

Figure G.17. Create New Product Record Interface.

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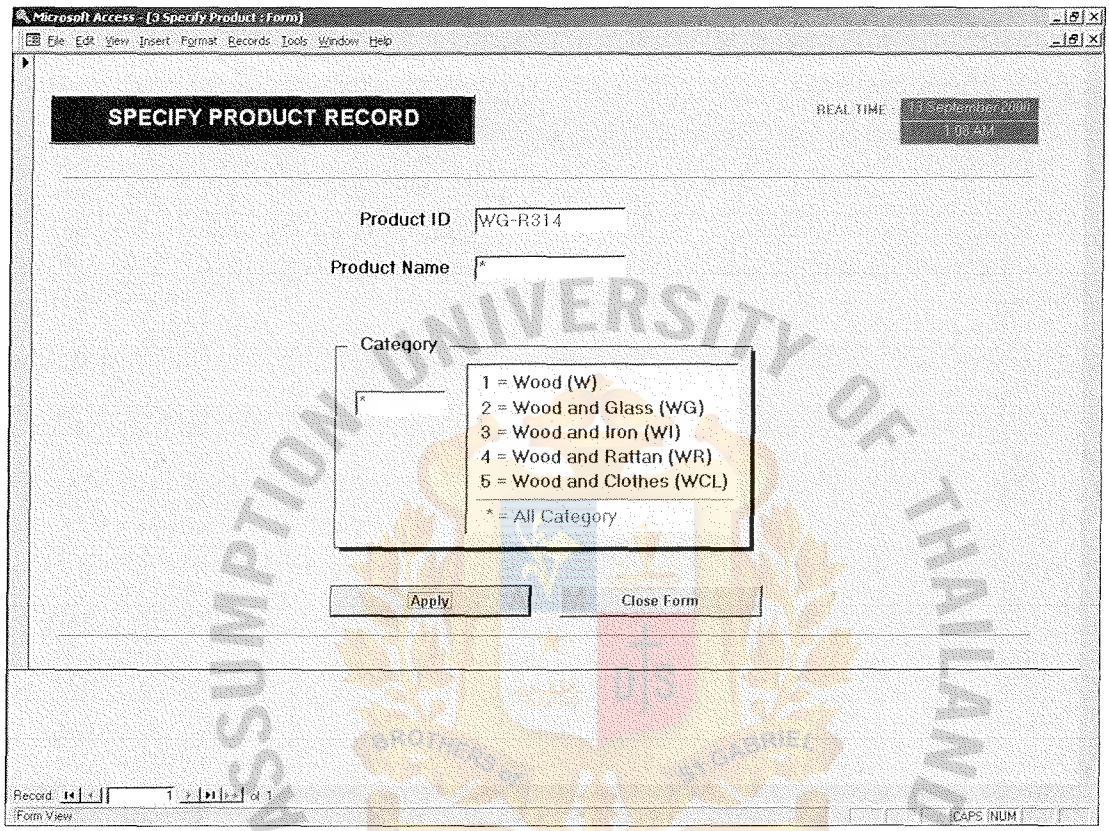

Figure G.18. Specify Product Record Interface.

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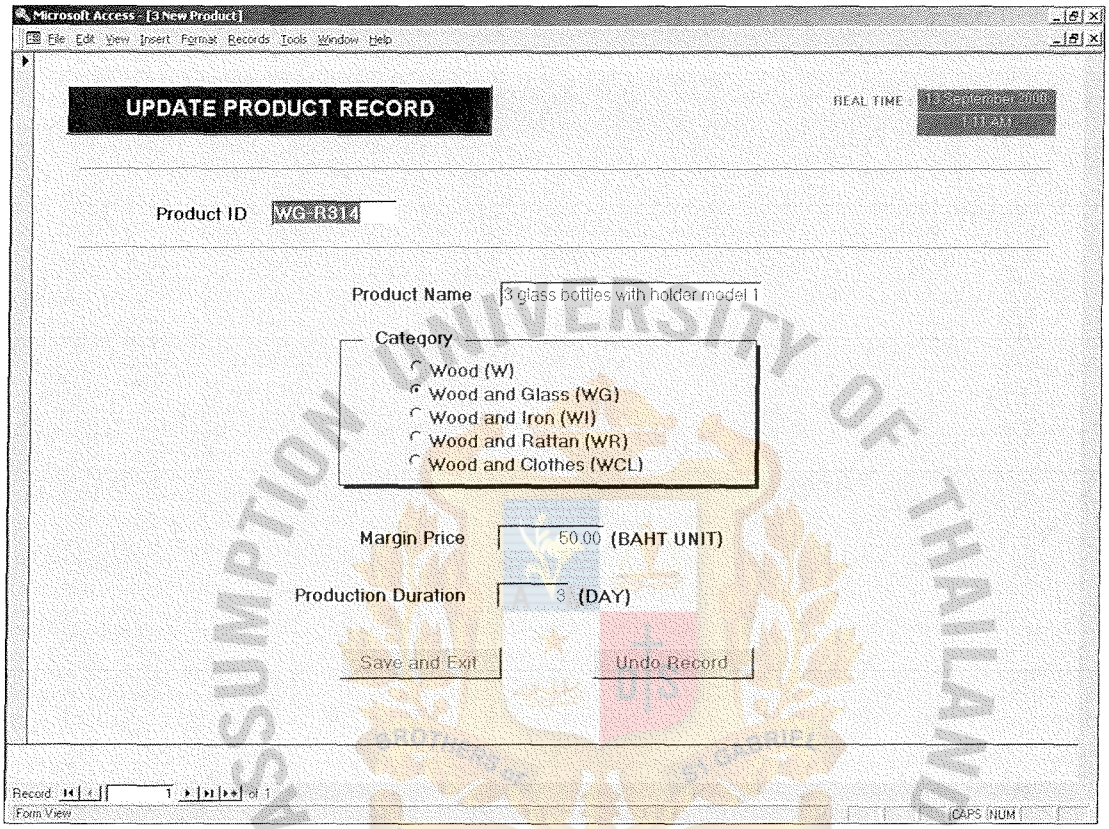

Figure G.19. Update Product Record Interface.

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4. Inventory Control

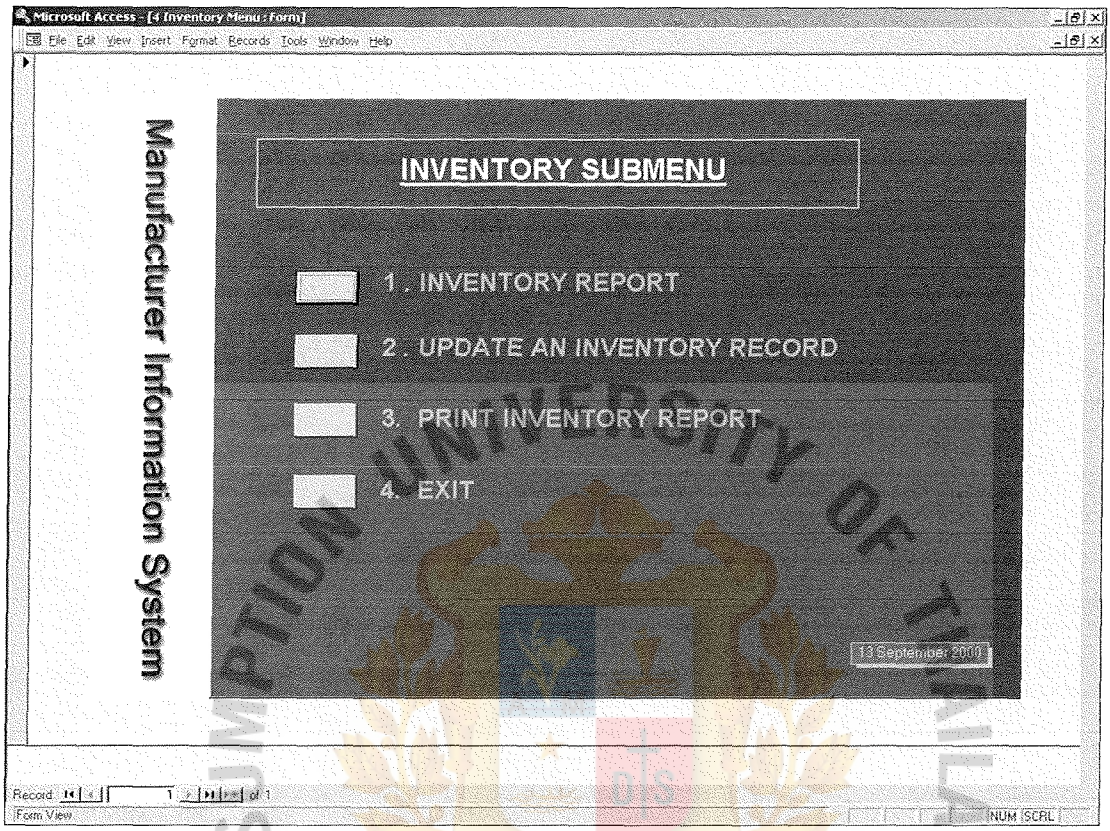

Figure G.20. Inventory Control Submenu.

This submenu consists of 4 functions which are:

(1) Inventory report is shown in Figure G.21.

(2) Updating an inventory record is shown in Figure G.22 and Figure G.23.

(3) Printing inventory report is shown in Appendix H, page 142.

(4) Exit

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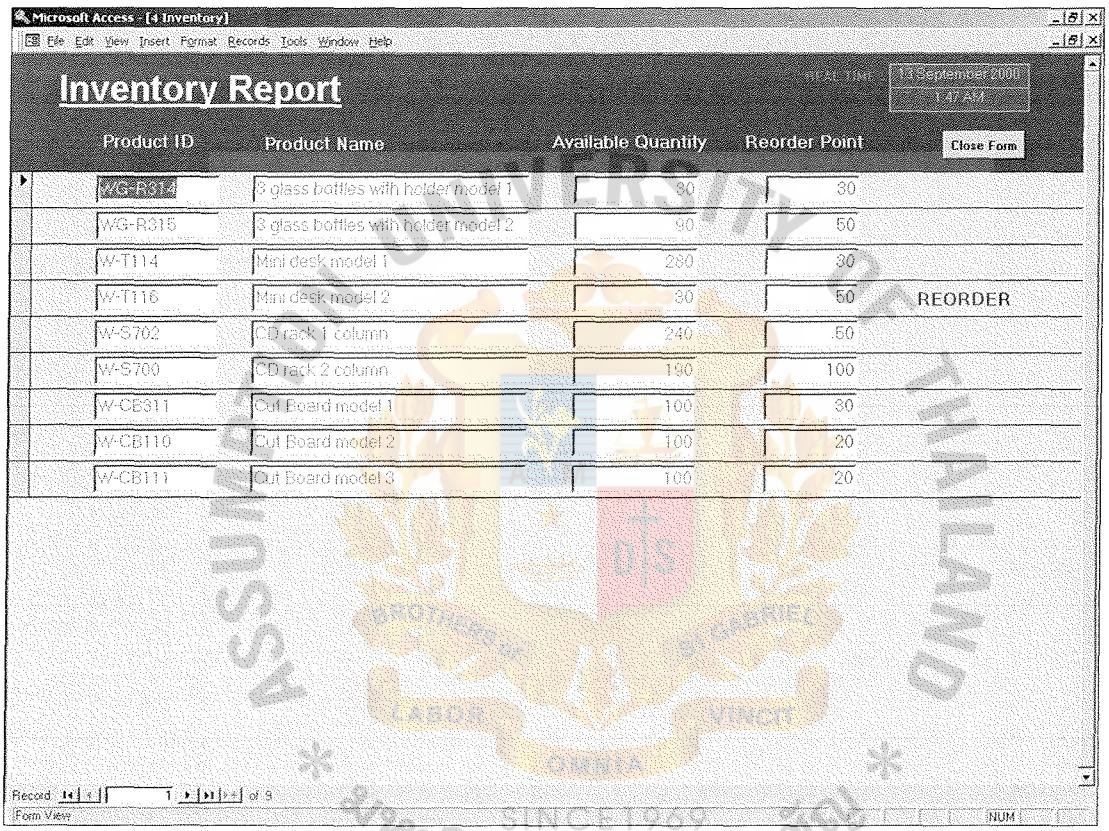

Figure G.21. Inventory Report Interface.

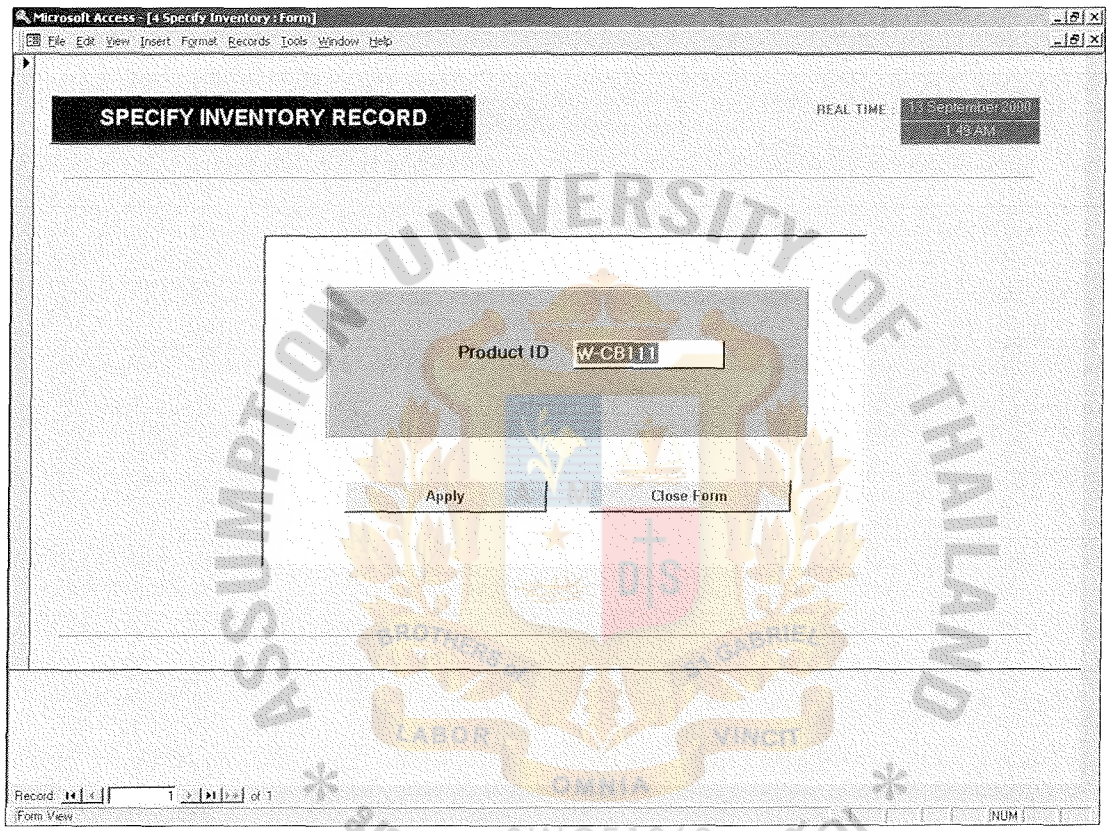

Figure G.22. Specify Inventory Record Interface.

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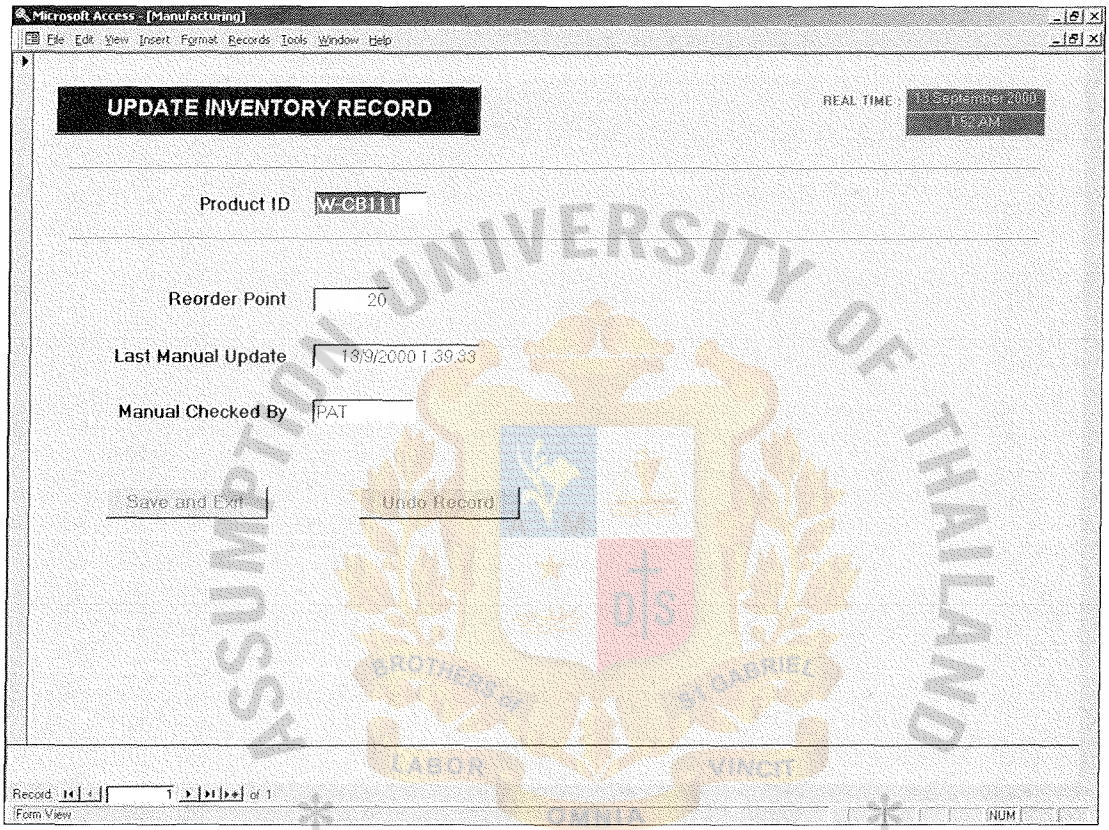

Figure G.23. Update Inventory Record Interface.

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5. Manufacturing Track

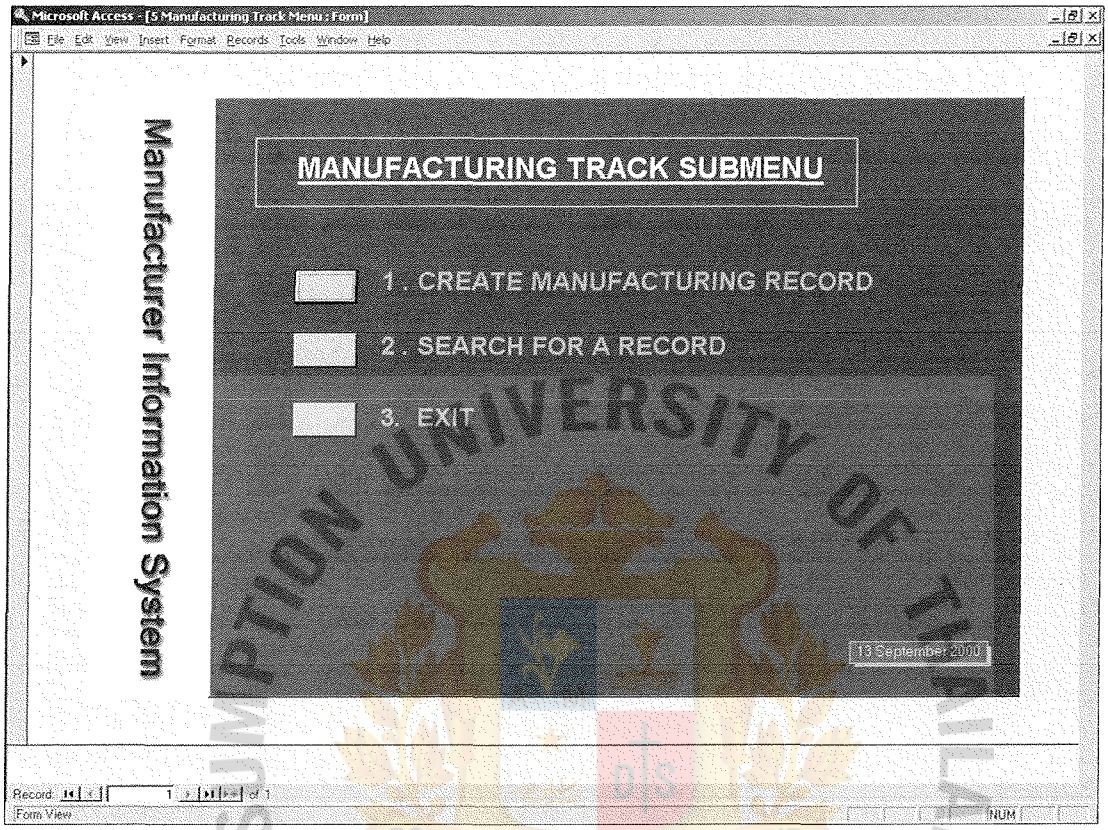

Figure G.24. Manufacturing Track Submenu.

This submenu consists of 3 functions which are:

(1) Creating manufacturing record is shown in Figure G.25

(2) Searching for a record is shown in Figure G.26 and Figure G.27.

(3) Exit

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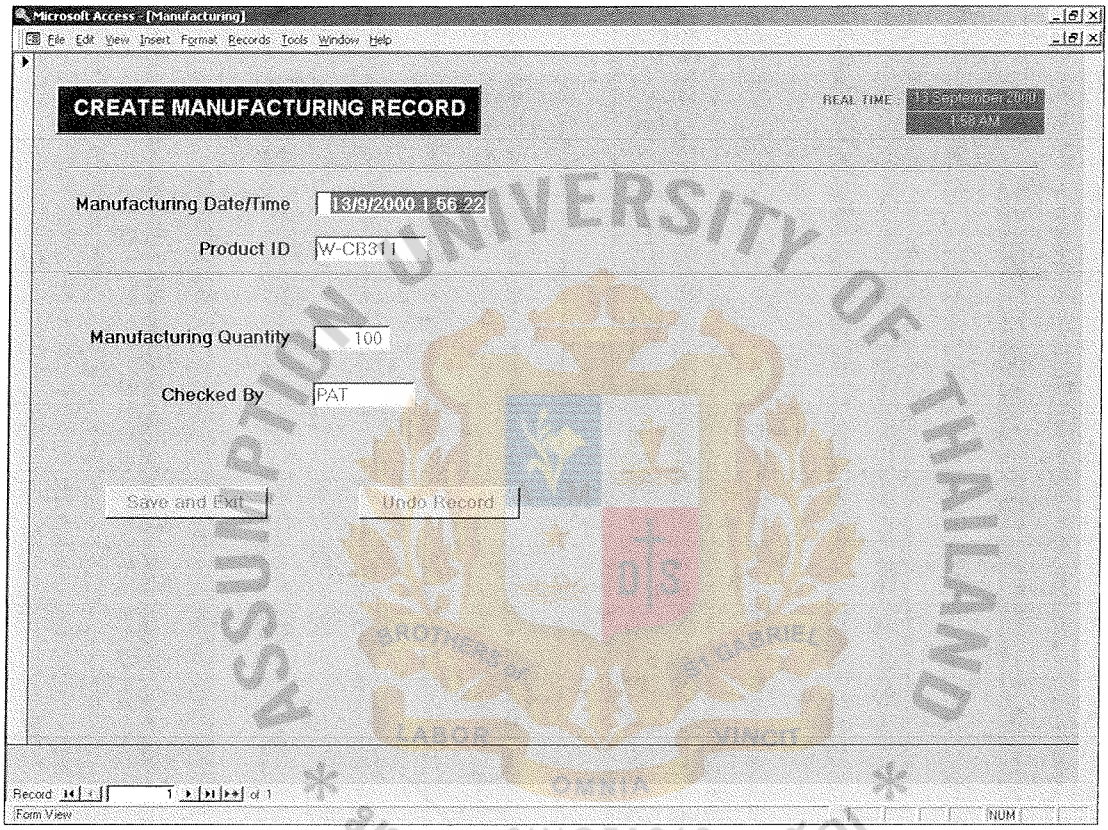

Figure G.25. Manufacturing Record Interface.

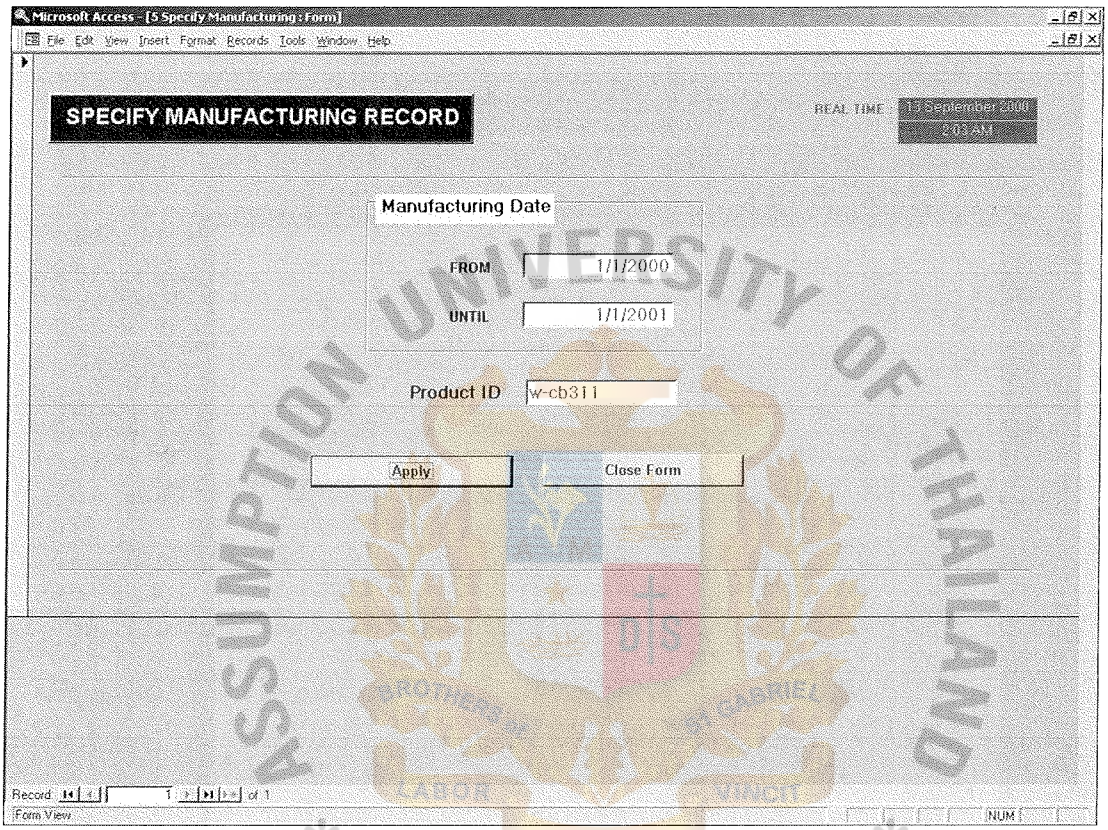

Figure G.26. Specify Manufacturing Record Interface.

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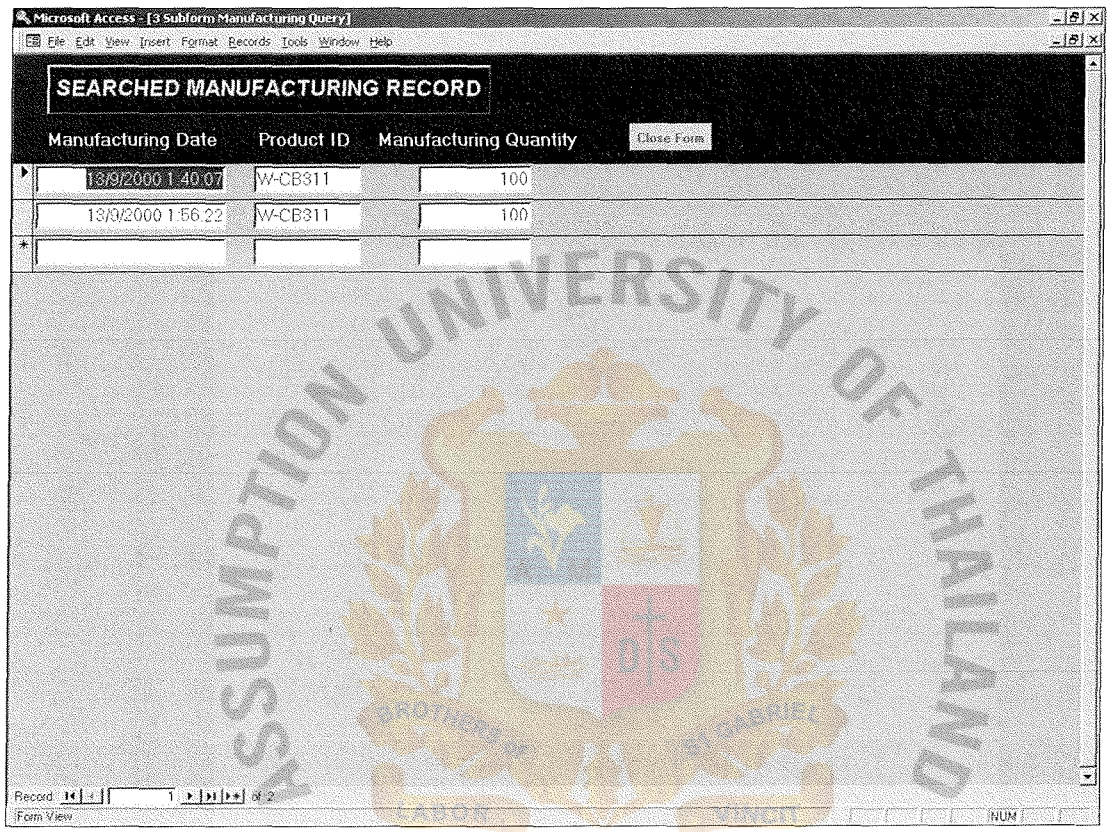

Figure G.27. Searched Manufacturing Record Interface.

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APPENDIX H

REPORT DESIGN

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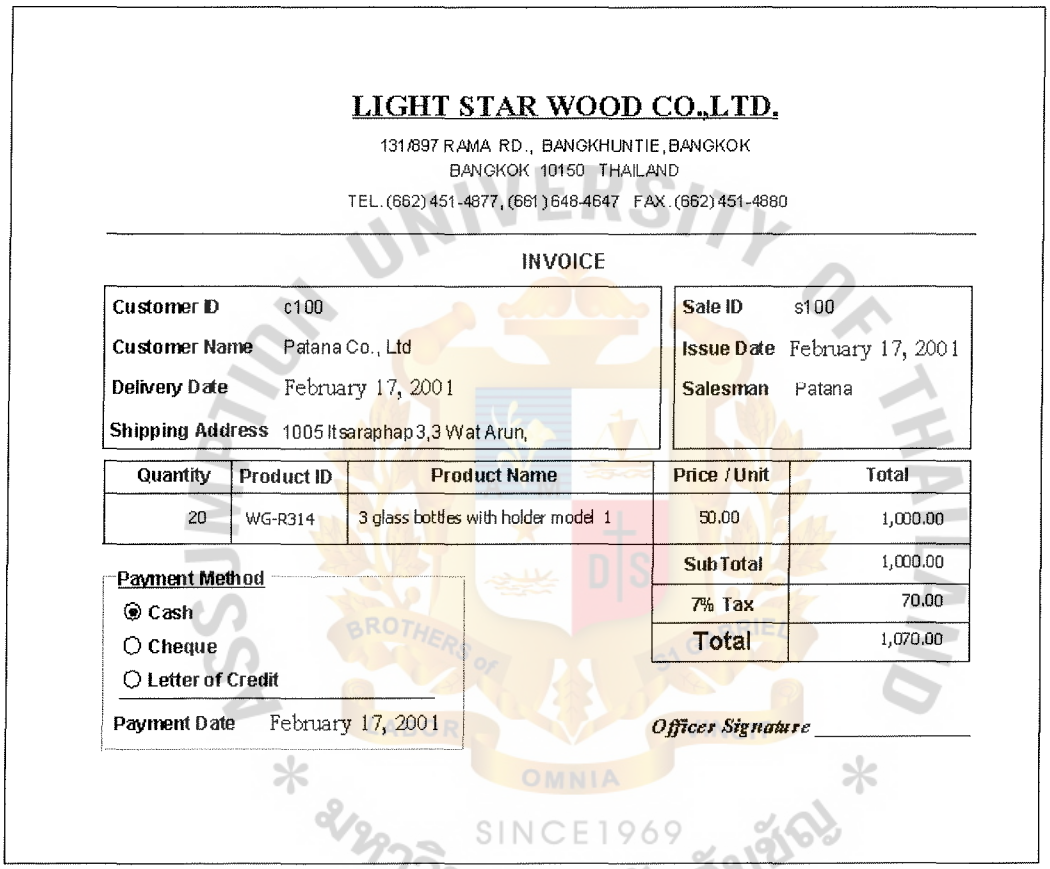

LIGHT STAR WOOD CO.,LTD.

131/897 RAMA RD., BANGKHUNTIE, BANGKOK
BANGKOK 10150 THAILAND
TEL.(662)451-4877,(661)648-4647 FAX.(662)451-4880

INVOICE

Customer ID	c100	**Sale ID**	s100
Customer Name	Patana Co., Ltd	**Issue Date**	February 17, 2001
Delivery Date	February 17, 2001	**Salesman**	Patana
Shipping Address	1005 Itsaraphap 3,3 Wat Arun,		

Quantity	Product ID	Product Name	Price / Unit	Total
20	WG-R314	3 glass bottles with holder model 1	50.00	1,000.00
			SubTotal	1,000.00
			7% Tax	70.00
			Total	1,070.00

Payment Method

- (•) Cash
- ( ) Cheque
- ( ) Letter of Credit

Payment Date February 17, 2001

Officer Signature _____

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Figure H.1. Invoice.

LIGHT STAR WOOD CO.,LTD

Customer List

Printed On : Saturday, February 17, 2001

ID. c100	**Customer Name**	Patana Co., Ltd
	Customer Address	1005 Itsaraphap
	Customer Country	Thailand
	Customer Phone 1	0-000-466-4303
	Email Address	cnet@cybergal.com
ID. c200	**Customer Name**	MT Export Co.,Ltd
	Customer Address	121/52 Sirom Road, Bang Ruk
	Customer Country	Thailand
	Customer Phone 1	0-000-245-8658
	Email Address	mtexport@loxinfo.co.th
ID. c300	**Customer Name**	ASID AUTEC ASIA PRIVATE
	Customer Address	17/70 PRARAM 2 RD., TAMBOL SAMDAM, AMPHER BANGKHUNTIEI
	Customer Country	Thailand
	Customer Phone 1	0-000-643-5354
	Email Address	

Figure H.2. Customer List.

LIGHT STAR WOOD CO.,LTD

Customer Classification

Printed On : Saturday, February 17, 2001

ID.	Customer Name	Country	Sale Value	Return Value	Total Sale Value
c100					
CLASS: C	Patana Co., Ltd	Thailand	166,599.00	7,000.00	**159,599.00**
c200					
CLASS: C	MT Export Co.,Ltd	Thailand	3,210.00		**3,210.00**
c300					
CLASS: C	ASID AUTEC ASIA PRIVATE	Thailand	2,739.20		**2,739.20**

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Figure H.3. Customer Classification.

LIGHT STAR WOOD CO.,LTD

Product List

Printed On : Saturday, February 17, 2001

ID. W-CB110	**Product Name**	Cut Board model 2			
	Margin Price	15.00	**Production Duration**	1	**day**
ID. W-CB111	**Product Name**	Cut Board model 3			
	Margin Price	25.00	**Production Duration**	1	**day**
ID. W-CB311	**Product Name**	Cut Board model 1			
	Margin Price	25.00	**Production Duration**	1	**day**
ID. WG-R314	**Product Name**	3 glass bottles with holder model 1			
	Margin Price	50.00	**Production Duration**	3	**day**
ID. WG-R315	**Product Name**	3 glass bottles with holder model 2			
	Margin Price	35.00	**Production Duration**	2	**day**
ID. W-S700	**Product Name**	CD rack 2 column			
	Margin Price	65.00	**Production Duration**	3	**day**

Figure H.4. Product List.

LIGHT STAR WOOD

Product - Sales Analysis Report

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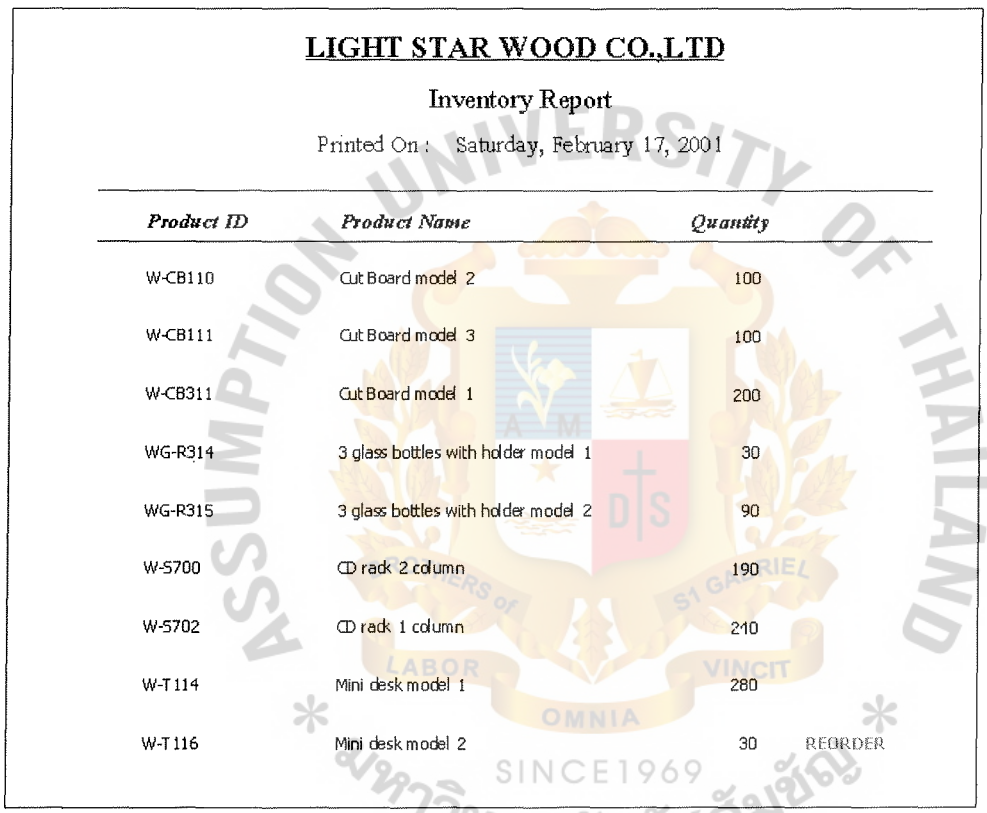
Product ID	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WG-R314	70	20									50		
WG-R315	60											50	10
W-S700	60		50						10				
W-S702	60		20							40			
W-T114	220		30	50	100	40							
W-T116	170						100	70					

Page 1 of 1

Figure H.5. Product - Sales Analysis.



LIGHT STAR WOOD CO.,LTD

Inventory Report

Printed On : Saturday, February 17, 2001

Product ID	*Product Name*	*Quantity*	
W-CB110	Cut Board model 2	100	
W-CB111	Cut Board model 3	100	
W-CB311	Cut Board model 1	200	
WG-R314	3 glass bottles with holder model 1	30	
WG-R315	3 glass bottles with holder model 2	90	
W-S700	CD rack 2 column	190	
W-S702	CD rack 1 column	210	
W-T114	Mini desk model 1	280	
W-T116	Mini desk model 2	30	REORDER

Figure H.6. Inventory Report.

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