Sales and Inventory Information System For Printing Business

by

Mr. Viwat Jiranukul

A Final Report of the Six-Credit Course
CS 6998 - CS 6999 System Development Project

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
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Project Title	Sales and Inventory Information System
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Academic Year	November 2003

The Graduate School of Assumption University has approved this final report of the three-credit course, CS 6998 – CS 6999 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

This system development project focuses on developing a computerized information system to support the sales and inventory information system functions for the Niwatporn Co., Ltd. which is a printing house company. The study for the project starts from finding all the processes related to the sales transactions, inventory control and focused on the areas of improvement, both the manual functions and where the automated functions can be replaced. The analysis tools such as data flow diagram, data dictionary and process specification are the main techniques for developing the environmental and behavioral models.

Since the existing system is a manual system and there is no integration between the sales and inventory control, problems occur in many areas. The proposed system is created using MS Visual FoxPro. This is the database management system running on centralized PC-LAN. Procurement and inventory transactions are keyed into the centralized database. This help to reduce and simplify the redundant or unnecessary works in sales and inventory process for the operational level, and the security problems can be solved by the password approach and user authorization.

The new computerized system, it is expected to provide the sale and inventory information rapidly, allowing immediate access to the information and also providing more up-to-date information for decision making. Moreover, it provides the convenience and fast services for recording, finding or reporting the sales and inventory information.

ACKNOWLWDGEMENTS

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

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Finally, the writer is grateful to all the lecturers of MS (CIS) program who have imparted their knowledge to him and made him prepare to take up this project, as the various subjects taught, and the various course assignments given by them, have a relationship in some way or another to the project.

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I. INTRODUCTION

1.1 Background of the Project

Nowadays, there is a high competition in every industry especially in the printing business. The reason is because this business is very attractive which returns the company with the profit at a very high rate. Therefore, it is not unusual that the new companies increase in this kind of business every year. Today, the way of conducting business has changed in which production oriented traditional ways have transformed into marketing oriented as in nowadays. Marketing oriented is simply known as a customer's own market in which the customer has a chance to select the product from the company he likes rather than rely on a the small group of companies. The latter implies a seller's own market because there is a low rate of competition in the market and the seller has an opportunity to set the price he wants, and which the customer needs to accept because he does not have too much choice as in today's market.

From all the things mentioned above, Niwatporn Co., Ltd., which is the printing house company, adapts its way of conducting business to be market oriented. All the problems, which do not satisfy the customer, must be eliminated. The current system of the company encounters many problems including order received from the customer is not processed carefully by the computer so that delivery date appointed to the customer is always postponed. In addition, orders confirmed from the customer can not be checked to see if there in enough product or material to produce. The Manager cannot check the cash flow each month. Getting the material purchased in the past to verify consumed a lot of time. The company needs to have a lot of employees to process the current system. Sometimes, the manager cannot set the information the customers want because that information is lost from non systematic storing.

From the problem mentioned in previous section, the management has the policy to transform the current manual system to be a computerized system with an aim to improve the company itself to be able to compute with the competitor in today's market. The new computerized system must be secure and reliable.

1.2 Objectives of the Project

The objectives of this system development project are as follows:

(1) To study the problem existing in the current system in order to implement corrective solutions taken from the computerized system.

(2) To alert the staff of material reorder point.

(3) To inform that the customer pays on due date and already receives the receipt.

(4) To minimize error on purchase order, customer order and etc.

(5) To provide invoice information for the customer payments.

(6) To generate reports that will aid in the decision making of management.

(7) To estimate and compare cost and benefit between the manual and the computerize system.

(8) To perform system testing on the complete system.

1.3 Scope of the Project

The project covers all the major parts of the Niwatporn Company System which include:

(1) The system will be recording all the data into the database such as supplier details and customer details (name, address, buying products, total amount, etc.), sales information or even prints out the receipt to the customer.

(2) The system will reduce time in checking stock. When selling the products or using raw material, the system will automatically update the stock.

(3) The system will summarize the total amount in selling and purchasing every month.

1.4 Deliverables

Sales and Inventory Information System will apply the data, process and network modeling technique to analyze the existing system for delivering Entity Relationship Diagram (ERD), Data Flow Diagram (DFD) and Network Diagram respectively. Once the system analysis is completed, the system design begins with candidate solutions and feasibility analysis, system architecture, structure design, process specification, database design, data dictionary, software interface and output design. Then, the cost benefit analysis will also be done for both the existing and the proposed system.

1.5 Project Plan

After the approval of the project from the management, the development team has prepared the project plan for Sale and Inventory Information System as follows:

(1) System Analysis Phase

It is a survey and planning stage of the project, which studies the existing business process to define the business requirements of the proposed system. Then, requirements are prioritized and analyzed for the solutions. Results are Entity Relationship, Data Flow and Network Diagram.

(2) System Design Phase

It evaluates alternative solutions for the proposed system. It describes the specification with feasibility analysis of each solution for selection. It mainly focuses on technical specification and implementation of the proposed system rather than the logical modeling in the system analysis phase. The main activities are database, interface, network and program design.

(3) System Implementation Phase

The proposed system is constructed and delivered into daily operation in this stage. The system testing and training are the activities carried out in this phase. Testing is done after completing construction of the proposed system to ensure that the system can operate in accordance with the requirements, while system-training aims to provide users and system administrators with adequate information on how to use and configure the proposed system.

The Sale and Inventory Information System takes four months to implement. The project plan of the proposed system is represented in Figure 1.1.

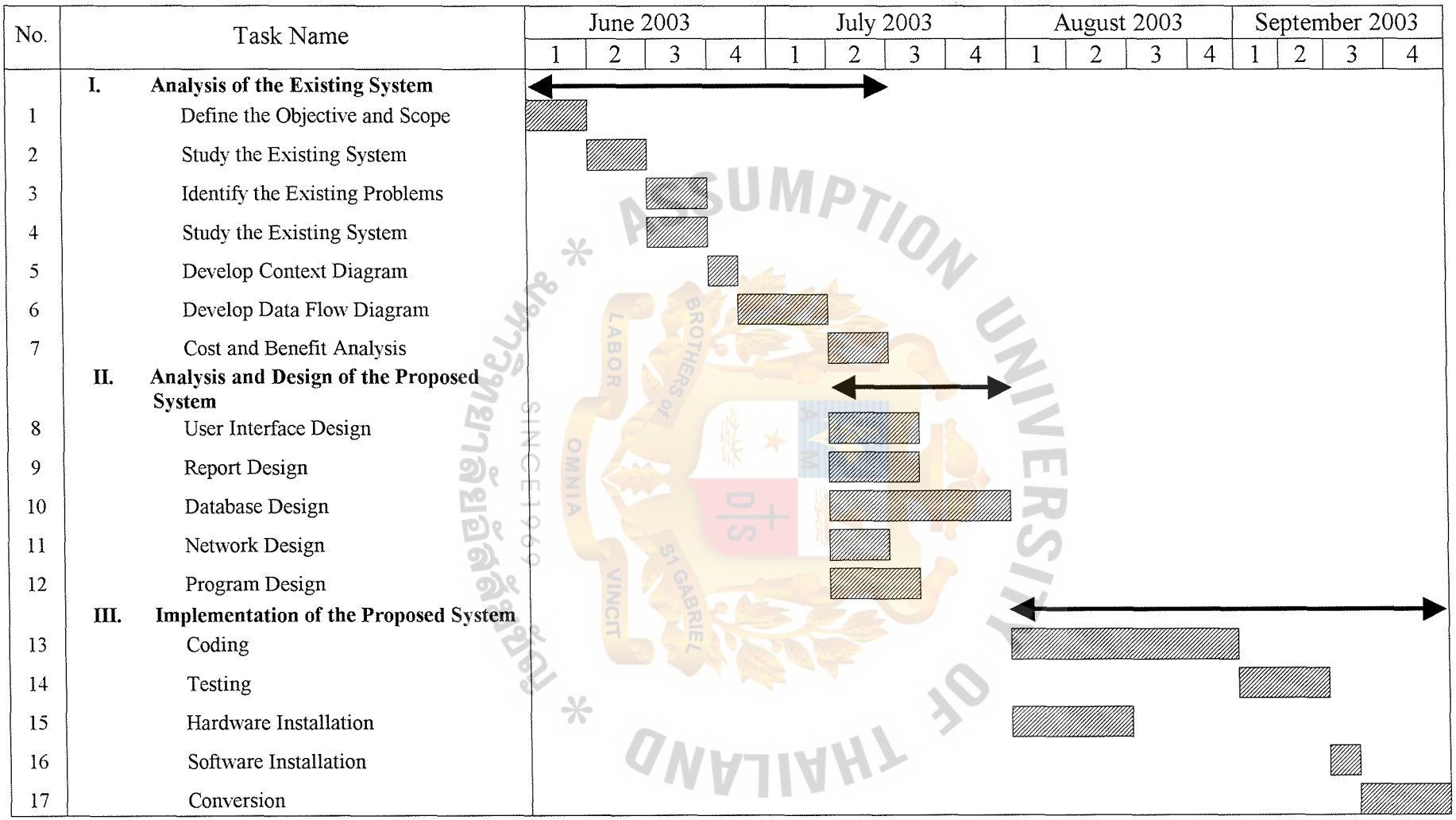

Figure 1.1. Project Plan of Sales and Inventory Information System.

II. THE EXISTING SYTEM

2.1 Background of the Organization

This system is designed for Niwatporn Co., Ltd. which was incorporated since 1983. The company itself located at 167/4 Prachasongkroh Road 45, Dindaeng, Dindaeng, Bangkok. Niwatporn Co., Ltd. is the company with the printing house that receives order from customers to print books, brochures and various kinds of forms and documents. The company accepts various kinds of work including the work with standardized paper and non-standardized paper. The customers of the company can be classified into two main groups. First, cash customers; the proportion of cash customers is about 15%. Second, credit customers; most of this group buy in 30-credit terms and the proportion of this group is about 85%. Product that the company has made to the customer order will be reordered by customers after running out. Those products are very easy to produce because it refers to the old order.

The company consists of 5 sections including marketing section, production section, accounting section, inventory section and administrator section which has the general manager on top. For the organization chart of Niwatporn Co., Ltd., see Figure 2.1. The details on each of them are shown as follows.

(1) General Manager

The general manager has the responsibility to design the strategic planning, objectives of the company and direct all employees in order to meet the company's objectives.

(2) Marketing Section

The marketing section has salespersons to contact customers for selling the products and to contact suppliers for buying the raw materials.

(3) Accounting section

The accounting section has the responsibility to take care of all accounting systems such as account receivable, account payable and etc.

(4) Inventory Section

The inventory section has the responsibility to deliver the products to the customer, control raw material in stock and control product in inventory.

(5) Production Section

The production staff's duty is to produce products that come from salespersons.

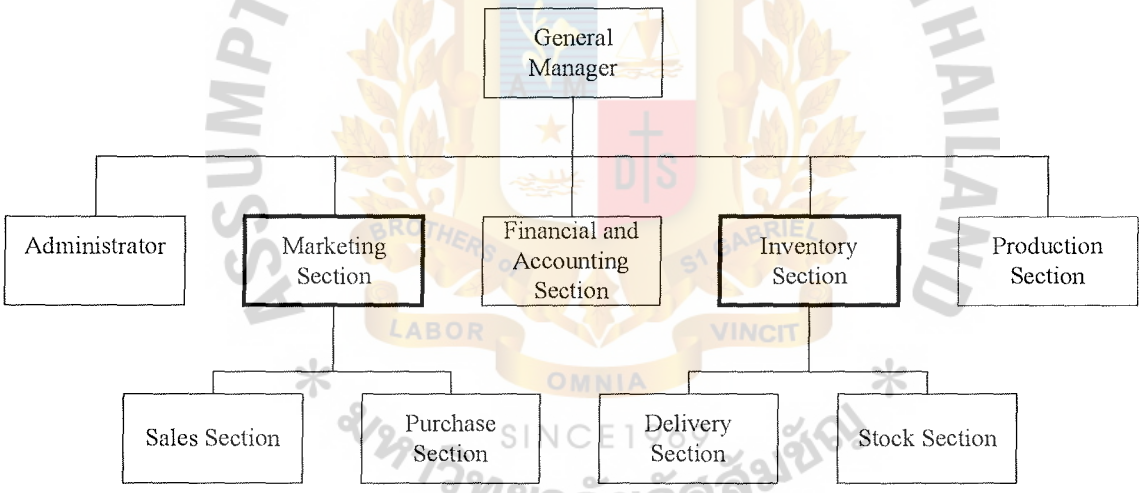

Figure 2.1. Organization Chart of Niwatporn Co., Ltd.

2.2 The Existing Business Functions

Nowadays the staff performs all, the company's process manually. When customer order product to the company by telephone or walk in, first the salesperson will check whether the customers are new or old. If they are new customers, their information is kept. After that, quotation is made and sent to customers. The price of the product in quotation depends on many factors including material cost, working process, period of production and so on. After the quotation has been made, it is sent to customers via FAX. After customers sign their signature on the quotation, they have to send it back to the company to confirm order.

After the company receives the confirmation, the customer order is sent to the inventory section to check the product. If there is no such product in the inventory, the product will be produced. In the production process, job order is created by the salesperson and submitted to the production section. After receiving the job order, the production section starts producing by checking if the raw materials required for producing, are enough. If the raw material is not enough the production section will notify the salesperson for the required material to issue purchase order to suppliers which means the period of producing must be extended to wait for the material and may not be delivered on due date. After the company has the product for customers, invoice is created and the delivery section delivers the product to the customer. The account section receives the bill with the customer's signature. On the due date, the account section will prepare the receipt and the salesperson will collect money from the customer and send the receipt to the customer.

All of these processes are essential for the sales and inventory process as they are interrelated with each other. Figure 2.2 and 2.3 are context and data flow diagram of the manual system.

2.3 Current Problems and Areas for Improvement

The current system of the company operates manually. This causes many problems such as duplication of work, too much paperwork, and too much manpower. As a result, the current system results in low productivity, high operating cost and inefficient workflow. The existing problems can be analyzed as follows:

(1) For the process of the system, it deals and contacts many sections in the organization. The information, which usually must be transferred to other sections, is missing in the manual process. For example, if some changes in a document occurred in the inventory section and it does not match with the invoice document which is issued by the sales section, data consistency can occur.

(2) When the customer orders anything, the salesperson needs to check whether those orders have been made before and this process consumes a lot of the staff's time.

(3) The daily transactions, which are transferred to another section, must be rewritten and recorded in the document files. Therefore, every transaction occurring in a day takes a lot of time and causes the staffs to be faced with the routine jobs.

(4) There are a lot of errors in the system. At the end of a year, the account auditing of the company, will be faced with a lot of problems about the figures of sales amount, vat, cost, stock balance, etc. Therefore, he must spend a lot of time clearing and finding the correct thing to close the yearly account. In this case, it will make a high cost for hiring outsource auditor.

(5) The organization will have a lot of document files in each section and must spend the cost of office supplies and space for these duplicated documents.

Not only the form control documents in each section, the organization will also have many reports, which are ordered for a time for each requirement.

(6) There are many reports in the system. Each report will take a lot of time and it cause a delay for the manager to make a decision. This problem will make the company lose the opportunity cost.

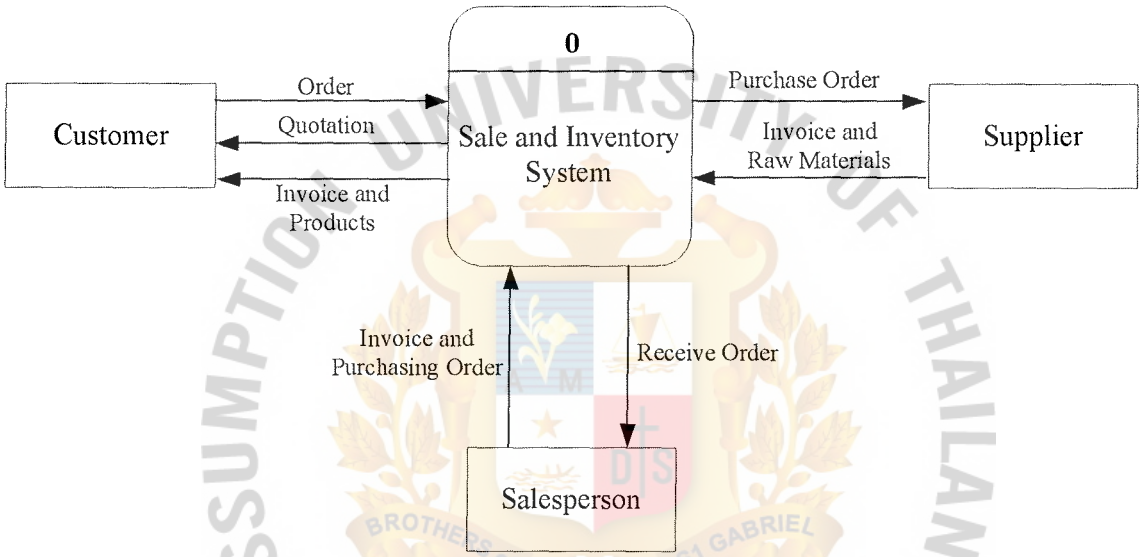

Figure 2.2. The Context Diagram of the Manual System.

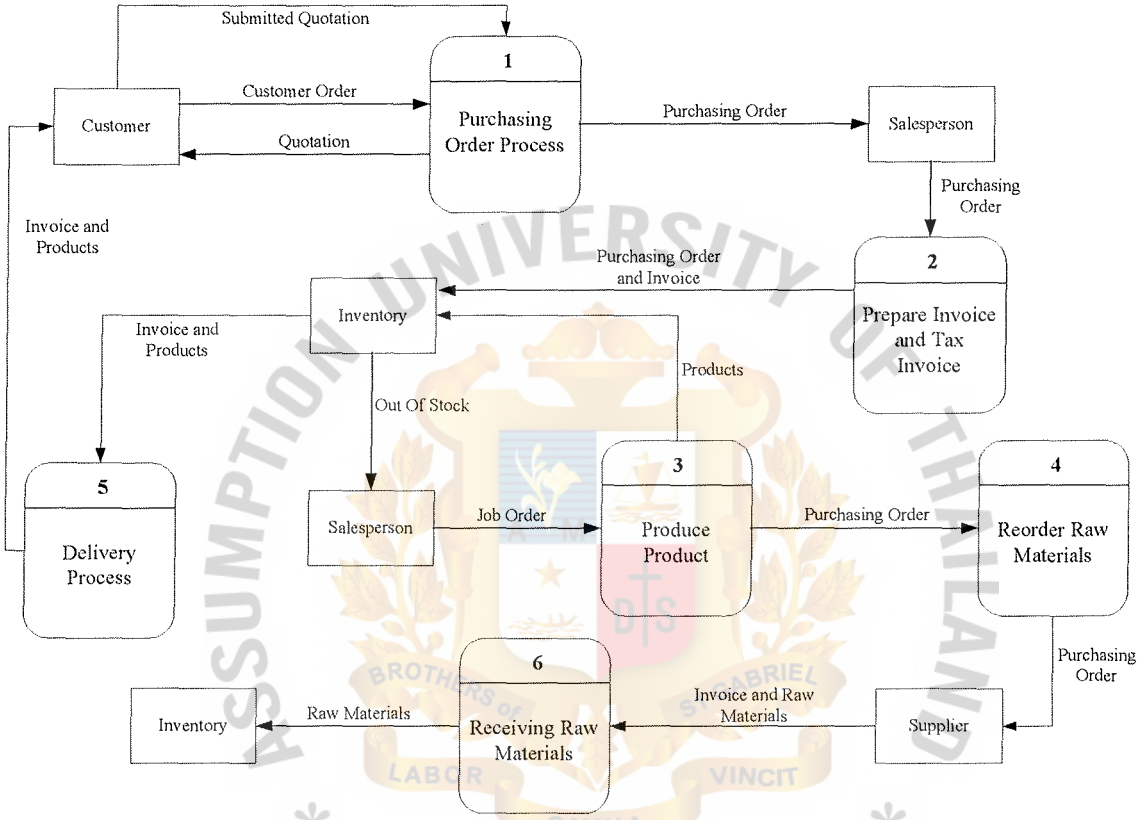

Figure 2.3. Data Flow Diagram Of the Manual System.

III. THE PROPOSED SYSTEM

3.1 User Requirement

According to previous section, Niwatporn Co., Ltd. requires an effective Sales and Inventory Information System which will solve the problem occurring from the existing manual system and improve the way to conduct business. In order to achieve the targets mentioned above, database for various tables are constructed as well as user interfaces are developed. In addition, the proposed computerized system should have the functions as follows.

(1) The system should be reducing the paper documents and time consuming for every section.

(2) The system should be reducing the redundancy process for the overall system.

(3) The system should be the forecasting for the manager to control inventory or buy raw materials.

(4) The system should be providing the monthly sales report for the manager to plan marketing and to control their salespersons.

(5) The system should store customer information, supplier information, product information, raw material information, customer order information, purchase order information, and so on into database.

(6) The system should generate quotation, invoice, receipt, and delivery order to customers.

(7) The system should generate purchase order to suppliers.

(8) The system should query data product and raw material in the inventory quickly and correctly.

(9) The system should reduce the errors which will be partially achieved by automation and eliminate human error from the manual work.

(10) The system should be reliable and have consistent procedures to eliminate errors.

(11) The system should be user friendly.

(12) The system should have backup and recovery.

3.2 System Analysis

3.2.1 Data Model

It is a technique for organizing and documenting a system's data. Data modeling is sometimes called database modeling because a data model is eventually implemented as a database. Three models including Context Data Model, Key-based Data Model and Fully attributed Data Model are constructed. First task, Context Data Model is constructed in which it is the data model that includes only entities and relationship with out attribute. Next, Key-based Data Model is constructed which will eliminate nonspecific relationships, add associative entities, include primary and alternate keys, and include precise cardinalities and any generalization hierarchies. Finally, Fully attributed Data Model is constructed which will include all remaining descriptive attributes and sub setting criteria. Each attribute is defined in the repository with data types, domains, and defaults. Figure 3.1 illustrates Context Entity Relationship Diagram of the proposed system.

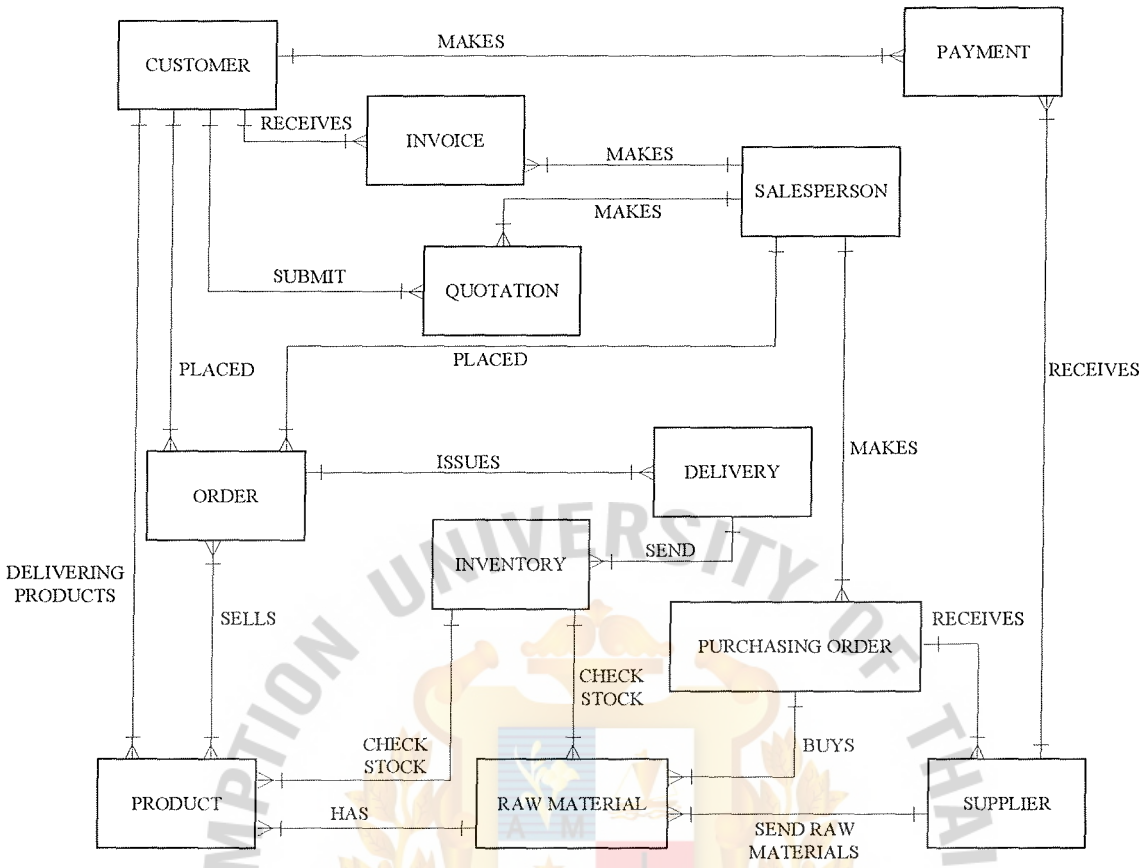

Figure 3.1. Context Entity Relationship Diagram of the Proposed System.

The Key Based Entity Relationship Diagram and Fully Attribute Diagram are depicted in Appendix A.

3.2.2 Process Modeling

Process modeling is a technique for organizing and documenting the structure and flow of data through a system's processes and /or the logic, policies, and procedures to be implemented by a system's processes. The Data Flow Diagram (DFD) is a tool that depicts the flow of data through a system and the work or processing performed by that system. Context Data Flow Diagram is first drawn to define the scope boundary for the system. Data Flow Diagram level 0 is exploded from the single process that is created on the Context Data Flow Diagram which show all the events for the system on a single diagram. Data Flow Diagram Level 1 shows the detailed process on each process in

Data Flow Diagram Level 0. The Data Flow Diagram level 0 and Data Flow Diagram level 1 are shown in Appendix B. Figure 3.2 illustrates Context Data Flow Diagram of the proposed system.

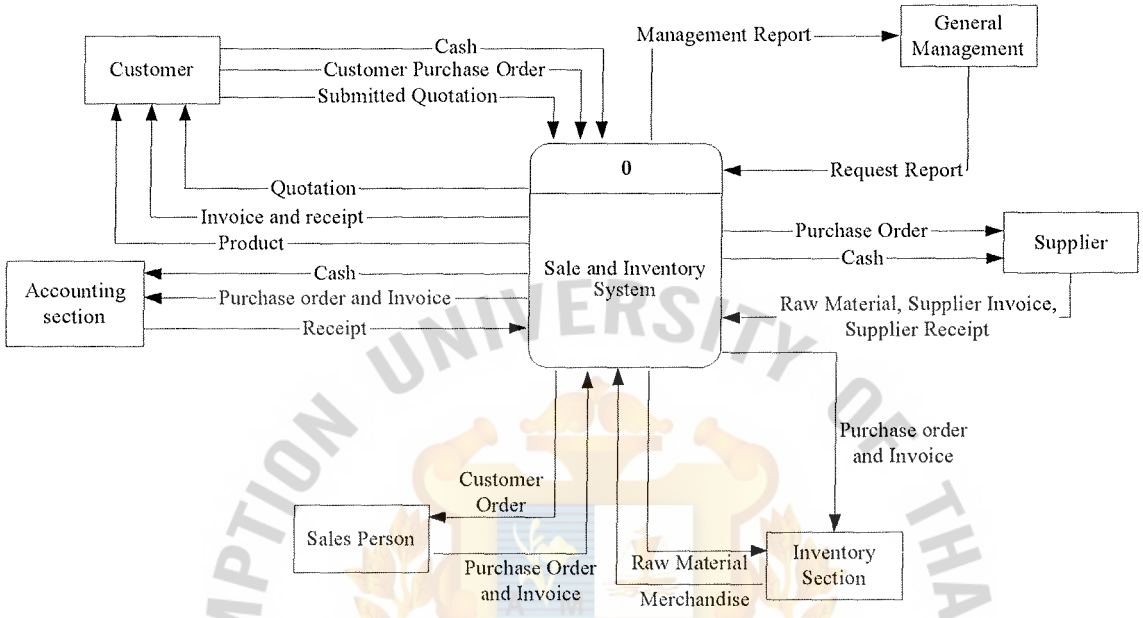

Figure 3.2. Context Data Flow Diagram of the Proposed System.

3.3 System Design

3.3.1 Candidate Solution Analysis

After the system diagrams are completed, the candidate solutions for the proposed system must be identified. Each solution has its own application development tools and database management system (DBMS) is shown as follows:

(1) Candidate 1: MS Visual FoxPro 8.0 & MS SQL Server 2000

MS Visual FoxPro 8.0 is used for application development, because of its rapid application development (RAD) environment. With its visual style, it makes application development easier. For DBMS, MS SQL Server 2000 is chosen, because it is standard DBMS for Windows platform.

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

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

(3) Candidate 3: MS Access 2000

In this solution, we use MS Access 2000 because Access is suitable for dealing with relational database, the kind of database we are in use. Microsoft Access is the efficient database software package. The price of the application is another factor we have to be concerned with. The price of Access is cheap compared to other kinds of programs.

After alternatives are identified, each candidate solution needs to be analyzed in more details. Candidate system matrix is used to describe the characteristics of each alternative as shown in Table 3.1.

Table 3.1. Candidate Systems Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized Brief description of that portion of the system that would be computerized in this candidate.	Fully Computerized with purchased software package	Same as candidate 1	Access offers and easy-to-use database for managing and sharing data across a variety of platforms and user levels
Benefits Brief description of the business benefits that would be realized for this candidate.	Short implementation schedule can be accomplished for the reason that it is a purchased solution. Benefits of reengineering gains may be offset by implementation costs.	This candidate provides consistency and integration with the other applications in the office suite. Besides, it combines the power of desktop database with the power of the web	Same as candidate 1
Servers And Workstations A description of the servers and workstations needed to support this candidate.	MS Windows 2000 Server for server and use Window 2000 professional on workstation.	Same as candidate 1	Same as candidate 1
Software tools needed Software tools needed to design and build the candidate (e.g., database management system, emulators, operating systems, languages etc,) Not generally applicable if applications software packages are to be purchased.	MS Visual FoxPro 8.0	Oracle provides the following tools to develop and enhance application code.	MS Access 2000 to manage, store database of stock and make necessary report.
Application software A description of the software to be purchased, built, accessed, or some combination of these techniques.	Custom Solution	Package Solution	Custom Solution
Method of data processing Generally some combination of: online, batch, deferred batch, remote batch, and real-time.	Database stored on server and processed on workstation	Oracle uses a two-tier Client/Server architecture with a monolithic application server	Database stored on server and processed on workstation.

Table 3.1. Candidate System (Continued).

Characteristics	Candidate 1	Candidate 2	Candidate 3
Output Devices and Implications A description of output devices that would be used, special output requirements (e.g., network, preprinted form, etc.), and output considerations (e.g., timing constraints).	- Screen - Epson printer - HP Laser Printer	Same as candidate 1	Same as candidate 1
Input Devices and Implications A description of input methods to be used, input devices (e.g. keyboard, mouse, etc.), special input requirements (e.g., new or revised forms from which data would be input), and input considerations (e.g. timing of actual inputs)	Keyboard and mouse	Same as candidate 1	Same as candidate 1
Storage Devices and Implications Brief description of what data would be stored, what data would be accessed from existing stores, what storage media would be used, how much storage capacity would be needed, and how data would be organized.	Up to 20 GB hard disk (database only) and tape back up	Oracle DBMS with 50 GB storage capacity.	Same as candidate 1

3.3.2 Feasibility Analysis

Once alternative candidates are identified, the feasibility of each candidate is then analyzed. The following are the four criteria for evaluating the feasibility of each solution.

(1) Operational feasibility states whether the solution fulfills the user's requirement or not and to what degree. What is the effect of the changing in working environment? How do users reacts to the new system?

(2) Technical feasibility tries to identify whether the solution is technically practical. The staff in the company have expertise or able to user the new system well or not.

(3) Schedule feasibility indicates whether the solution can be designed and implemented with in an acceptance time period or not.

(4) Economic feasibility, the main objective of it is to identify whether the solution is cost-effective or not.

Once all feasibility criteria are evaluated, the weight of each criteria must be identified for evaluating the candidate solution. The analysis results are shown in Table 3.2 below.

Table 3.2. Feasibility Analysis Matrix.

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility Functionality. A description of to what degree the candidate would benefit the organization and how well the system would work. Political. A description of how well received this solution would be from user management, user, and organization perspective.	30%	Fully support the user's requirement but some trainings are required. However, this candidate provides the space for further development. Score: 90	Fully supports user requirements in terms of functionality and business process. Score: 80	Same as candidate 2. Score: 80
Technical Feasibility Technology. An assessment of the maturity, availability (or ability or acquire), and desirability of the computer technology needed to support this candidate. Expertise. An assessment of the technical expertise needed to develop, operate and maintain the candidate system.	20%	MS Visual FoxPro 8.0 is the latest release available for this software tool from the number one software vendor. However, MS Visual FoxPro and MS SQL Server was originated form the small scale enterprise software and attempted to move the medium-size enterprise, and it is quite a new product to the market so this has made this solution less reliable in term of scalability and performance. Although MS	Oracle is a well-known DBMS in the information technology world. Having oracle tools (Oracle Developer) communicate directly with the same proprietary DMS would even provide more efficiency in the software features usage. Oracle Designer and Developer release2000 is the late version and the successor of Designer, which provides more features to support business requirements. Easy to use and more friendly user-interface	MS Access is the simple way to develop database. It can be proved that it is suitable for a small system with less number of users.

Table 3.2. Feasibility Analysis Matrix (Continued).

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
		Visual FoxPro is easy to use and training can be done by self-study, support services from local office are scarce. Score: 90	available on GUI. Score: 65	 Score: 75
Economic Feasibility Cost to develop: Payback Period (discounted): Net present value: Detailed calculations:	30%	 Approximately 1,574,000 Baht Approximately 46 months Approximately 1,635,930 Baht See Attachment: Score: 90	 Approximately 1,984,000 Baht Approximately 56 months Approximately 1,133,691 Baht See Attachment: Score: 70	 Approximately 1,604,000 Baht Approximately 47 months Approximately 1,569,034 Baht See Attachment: Score: 80
Schedule Feasibility An assessment of how long the solution will take to design and implement.	20%	Approximately 8 months Score: 90	Approximately 12 months Score: 60	Approximately 9 months Score: 85
	100%	90	70	80

3.3.3 Structure Design

Structure Design is the recommended tool for designing a modular, top-down system. Structure Chart is a graphic specification of hardware or physical details. They describe the interaction between independent modules and the data passing between modules that interact with one another.

3.3.4 Process Specification

Process Specification is use to depict the flow of data from process to data store and external agent and vice versa. It is detailed description of the user's business policy that each bubble carries out. The process specification is shown in Appendix C.

3.3.5 Database Design

To convert Entity Relationship Diagram into database structure, normalization technique is used to design the database of the proposed system. It transforms all attributes and relations ship of each entity into a table structure that is represented in Appendix D.

3.3.6 Data Dictionary

Data Dictionary is used to show the meaning of all attributes within the tables in the database. Relying on those definitions is beneficial in prototyping because it saves time. The data dictionary is shown in Appendix E.

3.3.7 Input Design

Input design requires information from both Entity Relationship Diagram and Data Flow Diagram of the proposed system. Inputs are represented by the data flows that connect external entities to process and process to process. The selected data flows are reviewed to define the appropriate captions that clearly identify their meanings. These captions appear on the input screen of the proposed system. These captions are normally the attributes of entities in Entity Relationship Diagram. The prototypes of the input screen are shown in Appendix F.

3.3.8 Output Design

The output requirements also come from Entity Relationship Diagram and Data Flow Diagram of the proposed system. They are identified from data flows in the diagrams that are connected to external entities of database. The specific details of output design will be gathered from interviewing the users about their requirements. The output design is shown in Appendix G.

3.4 Hardware and Software Requirements

Hardware requirement can be summarized as follows in the Table 3.3., Table 3.4., Table 3.5. and Table 3.6.

Table 3.3. The Hardware Specification for the Database Server (1 Set).

Hardware	Specification
Processor Type and Speed	Intel Xeon 2.0 GHz
Memory Type	512MB ECC DDR-SDRAM PC2100
Hard Drive Capacity (GB)	80
Hard Disk Controller	Not specific
Monitor Type	Acer CRT Monitor 17"
Network Card	Gigabit Ethernet on-board with load balancing and fault tolerance supported
CD Speed (X)	52x CD-ROM
Floppy Drive	1.44MB Floppy Disk Drive
Serial Port	2
Parallel Port	1
USB Port	2
PS/2 Port	2
Network port	2 RJ-45 network port
Keyboard (keys)	Acer 104 key Windows PS/2 keyboard
Pointing Device	PS/2 2-button mouse
Printer	HP Laser 2500 L, EPSON LQ2180
Hub	3Com 12 ports, 10/100 Mbps
LAN. Card	3Com 3C905C PCI, 10/100 WOL
Controller	Adaptec 7899W (2-channel, Ultra160 SCSI)
UPS.	APC Smart UPS 1000

Table 3.4. The Software Specification for the Database Server (1 Set).

Software	Specification
Operation System	Microsoft® Windows® 2000 Server
Database Server	Microsoft SQL Server 2000
Anti-Virus Software	Norton Anti-Virus

Table 3.5. The Hardware Specification for Each Client Machine (4 Sets).

Hardware	Specification
Processor Type and Speed	Intel® Celeron™ Processor 2.4 GHz
Memory Type	PC-2100 DDR 128 MB
Hard Drive Capacity (GB)	40
Hard Drive Interface	UltraATA/100
Monitor Type	Acer Monitor CRT 15"
Graphics Memory (MB)	4
Graphics Subsystem	Intel i845 G on-die VGA with DVMT 2.0 Technology
Network Card	LAN on board Intel 10/100
Modem Type	Internal
Modem Speed (Kbps)	56
CD Speed (X)	52X CD-ROM Drives
Floppy Drive	1.44MB Floppy Disk Drive
Serial Port	1
Parallel Port	1
USB Port	6
PS/2 Port	2
Keyboard (keys)	Multimedia Keyboard with Hot Keys
Pointing Device	Rolling Mouse
LAN. Card	LAN on board Intel 10/100

Table 3.6. The Software Specification for Each Client Machine (4 Sets).

Software	Specification
Operation System	Microsoft Windows XP Professional
Application Software	Microsoft Office 2000, Microsoft Visual FoxPro Run-time Library
Anti-Virus Software	Norton Anti-Virus

3.5 Network Configuration

The objective of network connection is sharing database or source of data. This system is designed by using bus topology that uses Hub for center or connecting workstations. The advantage of this network system is easy to maintain and use less wire than other topology.

The selected solution uses the Client/Server computing in which the information system's database, software and interfaces are distributed across a network of clients and servers that communicate and cooperate to achieve system objectives. This kind of computing architecture exploits distributed data that is sometimes called Two-Tiered Client/Server. It places the information system's stored data on a server and the business logic and user interfaces on the clients. A local area network usually connects the clients to the server.

Network Details:

(1)	Server	PC, Database Server
(2)	Workstation	PC 4 sets
(3)	Network topology	Bus topology
(4)	Interconnection	3Com 12 ports, 10/100 Mbps
(5)	Wiring and cable	UTP 4 pair CAT5
(6)	Protocol	TCP/IP

The network detail of proposed as shown in the Figure 3.1.

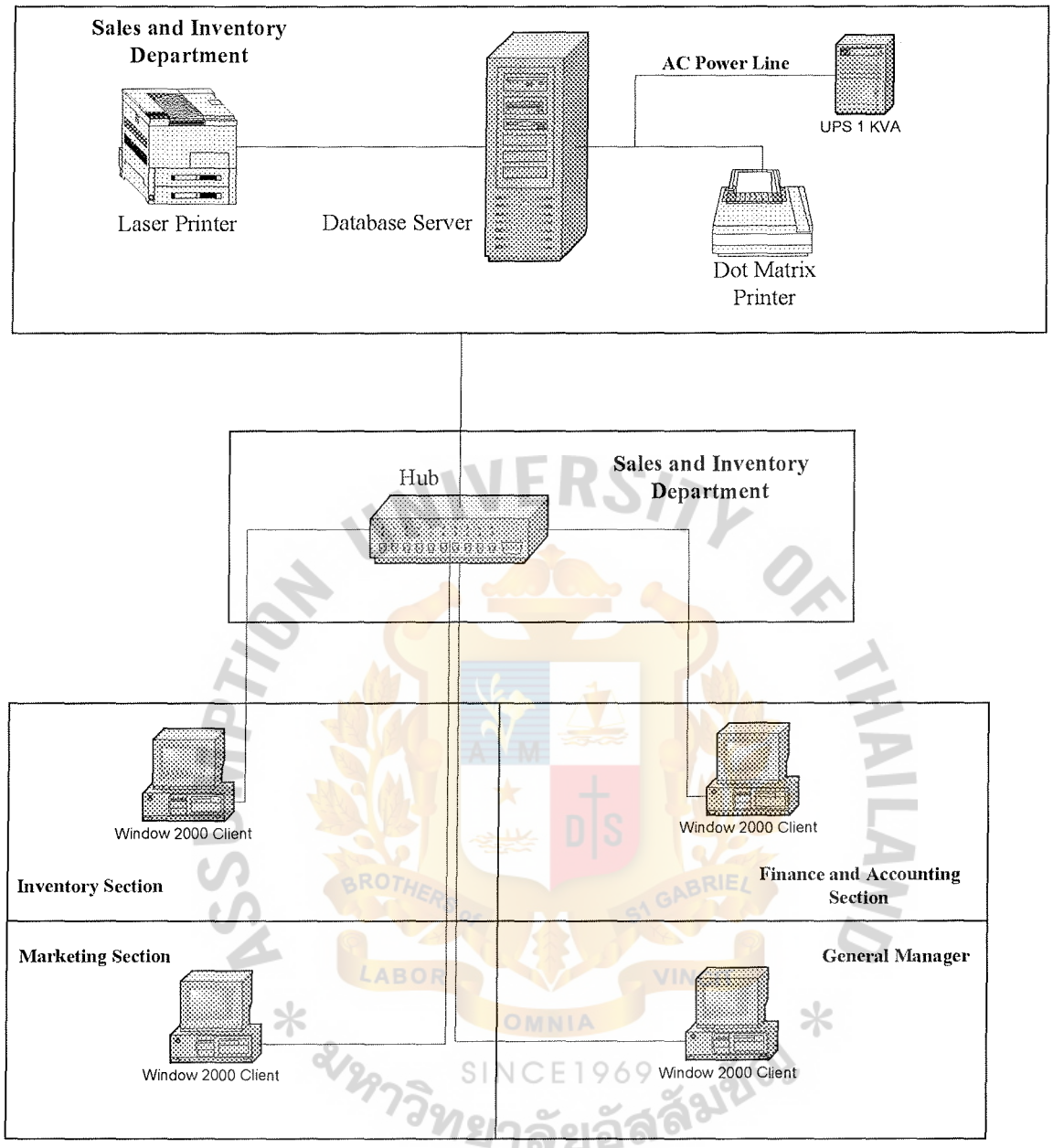

Figure 3.3. The Hardware Configuration of Sales and Inventory Information System.

3.6 Security and Control

With current security standard, the purposed system must apply the following securities and control policies to prevent unauthorized access to information and accidental or malicious deletion or corruption of data.

(1) Identification

The system must have the unique user ID and administrative system ID. For user ID creation, there must be a control procedure to ensure the proper verification of all users. Each user ID must be specified with its responsibility prior to the user ID assignment. Each user ID cannot be shared among users. The system log is needed to keep track of the system usage.

(2) Authentication

The purpose is to authenticate users through the user of the user ID.System security parameters must be configured to ensure the password secrecy. The characteristics of good password feature are the specification of minimum range of password (normally 6 to 8 lengths), non-displaying password on system screen, forcing users to change password automatically when the password is expired in specified duration, and locking user ID when entering incorrect password more than specified time. The user must keep their password secretly to prevent unauthorized persons to use their password to enter the system and cause the unauthorized alteration to the system.

(3) Auditing

The system must have an audit trial that record all transactions done by each user. It is used for investigating an unauthorized access an alteration

in the system. It must be reviewed on a consistent basis by the authorized person.

(4) Production Environment

The production system must be separated from the development system, in order to ensure the control over the application version in the production system. The control procedure must be setup to control the program migration to production environment. Before the migration, the developed application must be tested and accepted by the system owner.

(5) Backup and Recovery

The purposed system must protect information from damages that may occur. Normally, the backup period is on a weekly, monthly and annual basis. The monthly backup must be on the last Friday of the month and the month and the backup disk is kept in another place. The scan virus policy that is done weekly on Friday is recommended to use the virus protection software provided by Norton Anti-Virus. UPS must be used to prevent electronic shock and shortage. The ability of stabilizer is also recommended.

3.7 Cost and Benefit Analysis

Before deciding to develop the proposed system, the benefits of implementing the proposed system must be done. Furthermore the benefits of implementing the proposed system must be addressed. Cost and Benefit analysis provides quantitative analysis for both systems for the system owner to make a decision on the system development. Once both cost and benefits are analyzed, the analysis techniques are applied to indicate the value for implementing the proposed system. Break-even, payback and net present value analysis techniques are used in the proposed system.

3.7.2 Cost Analysis

(1) Cost of the existing system

(a) Development cost of equipment cost includes typewriter, and calculator.

(b) Operating cost includes salary of manager and staff, office supplies and miscellaneous cost.

All costs in the existing system will increase by 20% per annum with an exception of personnel cost, which will grow only by 10% per annum. The detailed calculation of the existing system cost is shown in Appendix H. For comparison purpose, the summarized cost of the existing system is presented in Table 3.7.

Table 3.7. Summarized Cost of Existing System, Baht.

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	115,000	-	-	-	-
Operation Cost					
1. Personnel Cost	2,688,000	2,956,800	3,252,480	3,577,728	3,935,501
2. Office Supplies & Miscellaneous Cost	174,000	191,400	210,540	231,594	254,753
Total Annual Operating Cost	2,862,000	3,148,200	3,463,020	3,809,322	4,190,254
Total Manual System Cost	2,977,000	3,148,200	3,463,020	3,809,322	4,190,254

(2) Cost of the proposed system

In developing the proposed system, there are two major costs-system development and system operating cost. The system operating costs are expected to increase by 10% per annum.

(a) System Development Cost

It includes the hardware, software, people-ware and implementation cost. The major hardware and software are workstation, operating system, application, database management

system software and UPS. All of those resources need to be acquired for the development of the proposed system. For people-ware cost, it is the salary of the development team, which is composed of the system analyst, the network specialist, the programmer, the database specialist, etc. Each personnel's cost varies according to his involvement in the system development. Implementation cost has two main items-training cost and installation cost. Training cost includes training manual and training course. Installation cost includes hardware and software configuration and installation.

(b) System Operating Cost

It consists of hardware maintenance cost, people-ware cost, office supplies and miscellaneous cost. For hardware maintenance cost, the expense is based on the number of workstation. This expense is the charge for technical support from vendors. For people-ware cost, there are two categories of personnel involved-users and system administration. Users include salespersons, sale managers, inventory staff, and inventory managers. The system administration is a new operation unit in this proposed system that is formed to support in technical issues related to the proposed system. Office supplies & miscellaneous cost will be reduced as a result of implementation of the proposed system.

Detailed calculations of each candidate solution cost are illustrated in Appendix I. Summarized cost of the proposed system is shown in Table 3.8.

Table 3.8. Summarized Cost of the Proposed System, Baht.

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost					
1. Hardware Cost	639,000	-	-	-	-
2. Software Cost	240,000	-	-	-	-
3. People-Ware Cost	585,000	-	-	-	-
4. Implementation Cost	110,000	-	-	-	-
Total System Development Cost	1,574,000	-	-	-	-
Operating Cost					
1. Personnel Cost	2,004,000	2,204,400	2,424,840	2,667,324	2,934,056
2. Office Supplies & Miscellaneous Cost	100,000	105,000	110,250	115,762	121,550
Total Annual Operating Cost	3,678,000	2,309,400	2,535,090	2,783,086	3,055,607
Total Computerized System Cost	3,678,000	2,309,400	2,535,090	2,783,086	3,055,607

(3) Comparison of System Cost

Once the system cost of both existing and proposed systems has been identified, this information can be used to construct the system cost comparison table to evaluate the cost saving from implementing the proposed system. The figures are summarized in the Table 3.9.

Table 3.9. Comparison of Accumulated Cost of the Existing System and the Proposed System, Baht.

Year	Accumulated Cost of Existing System	Accumulated Cost of Proposed System
1	2,977,000.00	3,752,400.00
2	6,125,200.00	6,148,640.00
3	9,588,220.00	8,784,504.00
4	13,397,542.00	11,638,954.00
5	17,587,796.20	14,873,349.84

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

3.7.3 Benefit Analysis

(1) Tangible Benefits

They compose of personnel reduction, operating time saving, and office supplies expense reduction. These benefits have an expected growth rate of 10% per annum. Moreover, it can reduce redundancy of record keeping for each personnel's information that affects the decreasing amount of unnecessary documents. Management will get more accurate information so that they can get better control. Furthermore, it will reduce time in searching or producing the standard report required by each personnel. The details of tangible benefits from implementing the proposed system are as follows:

(a) Personnel Reduction is reduced because the computerized system can replace employees. The number of staff is reduced from 22 to 16 persons. It can save 684,000 Baht.

(b) Paper resource is reduced 15% in the first year. It can save 10,800 Baht.

(c) Stationery cost is reduced. It can save 10,000 Baht in the first year.

(d) Sales volume is increased by 35% or 175,000 Baht per month or 2,100,000 Baht (175,000x 12 months), which is derived from:

Estimated sales volume per month derived		
From operating the proposed system	=	675,000 Baht
Less average sales volume per month derived		
From operating the existing system	=	500,000 Baht
Increased sales volume per month	=	175,000 Baht

Total estimated tangible benefit derived from reduced operation cost is 704,800 Baht.

Total estimated tangible benefit derived from increased sales volume is 2,100,000 Baht.

Total estimated tangible benefit derived from operating the proposed system is 2,804,800 Baht (2,100,000+704,800).

(2) Intangible Benefits

The proposed system is expected to increase user satisfaction, work efficiency, security and control on information data consistency and integrity, while reducing data redundancy. It also facilitates the work process among relevant units, which in turn reduces operating time of each unit. All of those reflect better service for customers. In addition, the information in the proposed system can be shared by other systems as necessary.

3.7.4 Cost Benefit Analysis Technique

(1) Break-even Analysis

The technique for comparing the costs and benefits of the proposed system is presented below. The benefits of the new system include 3 types:

(1) Cost saving

(2) Cost avoidance

(3) Improved information

The cost of the new system includes 2 types:

(1) Development costs or the costs of system development.

(2) Operating costs or the costs of system after installation.

Break-even point shows the level where the accumulative cost of the existing system is equal to the accumulative cost of the proposed system.

The main factor comes from the development cost. However in the long term, the proposed system can effectively decrease the annual operating cost. When comparing the accumulative cost of both systems, the cost of the existing system is higher than the cost of the proposed system. The break-even point is the period of time when the cost differences of both the existing and proposed systems are equal to zero. The break-even point is calculated from interpolation technique by summing the number of years where the cost difference between both systems is still positive and the fraction of year where the cost difference is still positive.

The break-even chart is a graph that represents 2 curves of a cost curve and a benefit curve. Whenever these two curves intersect means "The break-even point" has happened.

The break-even point is represented in a chart to show the payback period and break-even point. The information in this chart is the decision making tool. The business should not invest in a proposed system based on how long it will take for the benefits of the system to payback the costs of developing it.

Referring to Table 3.9, it indicates that the existing system will have accumulated cost less than the proposed system in the first two years. However, the accumulated cost of the proposed system in the third year will be less than the existing system.

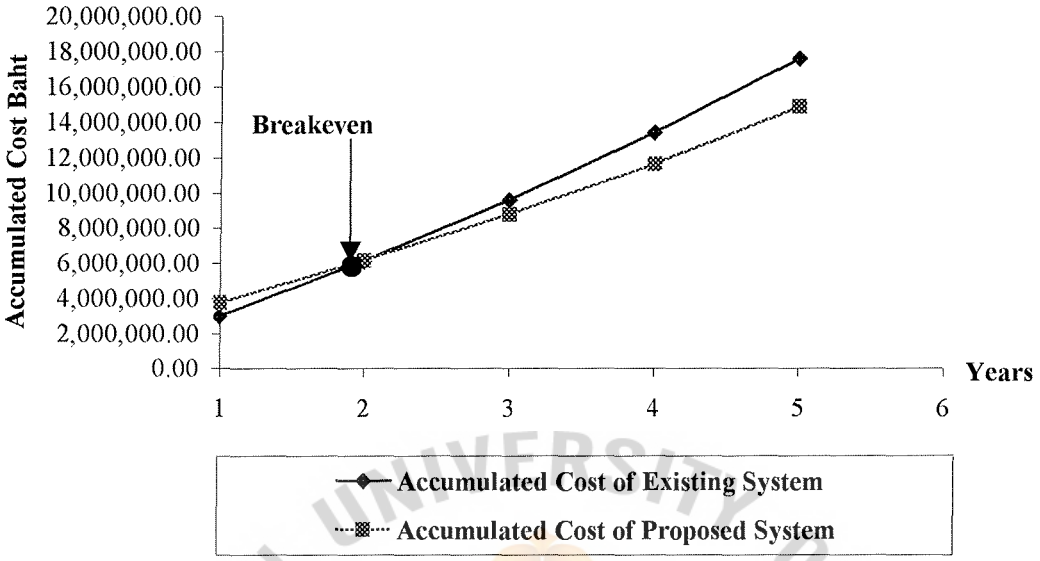

Figure 3.4. Break-even Point Analysis.

(2) Payback Period

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

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

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

For the proposed system, the desired payback period is assumed to be four years and the discount rate is 12.00% per annum as per the current deposit interest rate. The analysis result show that the payback period of the proposed system is 2 years 10 months, thus its payback period is acceptable.

The detailed calculation of payback period of each candidate solution is illustrated in Appendix I. The payback period of the proposed system is indicated in Figure 3.2 below.

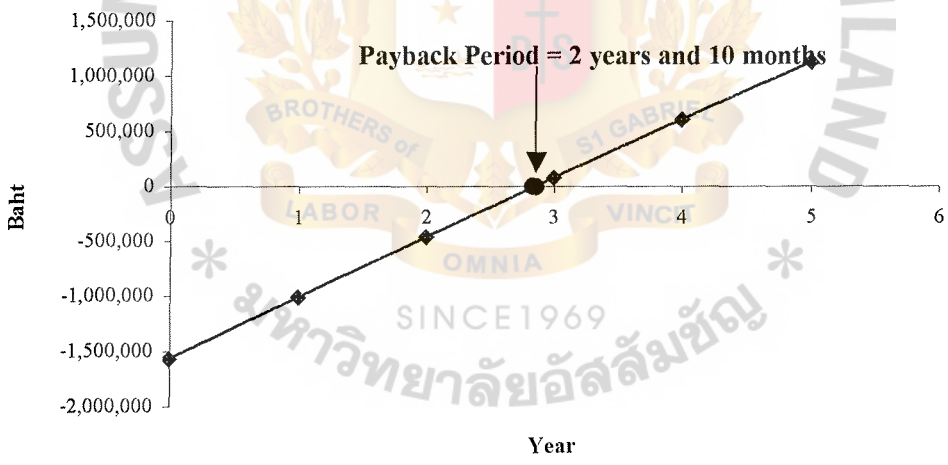

Figure 3.5. Payback period Analysis.

(3) Net Present Value

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

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

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

For the proposed system, the required rate for return is equal to current deposit interest rate or 12% per annum. The analysis indicates that net present values of all candidates are positive. But candidate 1 gives net present value of 1,635,930 Baht, which is the highest among all alternatives. The detailed calculation of net present value analysis for each candidate is shown in Appendix H.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

The implementation process will begin after the top management agrees with the outline of the proposal for the new system and analyzes the cost compared with the benefits. The typical processes of system implementation are presented in detail as follows:

(1) Hardware and Software acquisition and installation

The company needs to acquire new hardware and software for the proposed system. The acquired hardware is server machine and client machine. Regarding software acquisition, the required server software is OS, database server and application server. The required client software is operating system and software applications.

For hardware and software installation, all hard and software for server and client need the technical support staff for installation.

(2) Personal Training

There are two training sessions for the purpose system - users training and system administrator training.

User training describes how to use the purposed system in their workplace. It enables the user to do some basic configurations and controls over their daily operations.

System administration training focuses on the technical aspects of the purposed system. It describes how to configure and control the system, such as maintaining and creating new user ID and password.

(3) System Testing

The module testing method is adopted for the system software development. This testing allows the system developers to test the system module by module to ensure the system performs properly and meets its requirements; special cases of testing are validation, verification, and certification. Besides, the programming and testing can be carried out in parallel and thus, reduce time consumption.

The two levels of testing are unit testing and system testing. At first, the analyst tests the programs, making up the system. In contrast, system testing is aimed at finding any discrepancies between the system and its original objectives, so failures in testing show up quickly when the system is implemented.

Testing of specific programs, subsystems and total systems, is essential to quality assurance. Testing is done to turn up any existing problems and interface before the system is actually used.

(4) Conversion Plan

The conversion plan must be prepared by the development team to be used as a guideline for converting the existing system into the proposed system. The main objective of conversion plan is to ensure that the responsible persons and tasks are clearly identified. This would help the conversion process to operate smoothly.

4.2 State of Implement

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

(1) Construction Stage

This stage aims to develop the information system that can fulfill the business objectives. After the system development is complete, testing need to be done to ensure that it would operate properly. Prior to the system testing, the following tasks must be completed first– hardware and software acquisition and installation and data preparation.

(2) Delivery Stage

In the delivery stage, the conversion plan is prepared to provide a smooth transition to the new system. Database is installed, and network is configured for the new system. The training and document is provided to the individuals who use the new system. Finally, the old system is converted to the new system with a predefined procedure to ensure the transition is smooth. After the new system is operated, the system evaluation is conducted to measure the new system performance, and to discover any troubles that may occur in the developed system.

4.3 Training and Documentation

Before the proposed system is fully implemented, the training package and documentation must be prepared for users and system administrators. Any useful document must be collected for use as reference in preparing the user manual.

The user manual must clearly identify how to use the proposed system in the work areas. In addition, all system features must be described for the system administrators to be able to configure them correctly.

The training package for each user group must be reviewed based on the requirements. It should also encourage the group learning possibilities, as it would reduce the learning curve of users.

4.4 Conversion

This project selects the parallel conversion to convert the old system to the new system. Both the old and new systems are operated for some time to ensure that all major problems in the new system have been solved before the old system is discarded.

4.5 System Support

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

(1) System Maintenance

It aims to fix the errors that occur during the system design and implementation phase. It also tries to avoid the possibilities that the program fix causes the system to behave differently. Therefore, testing must be done to ensure that the program fix will not adversely affect the system operation.

Testing is the same as in the system implementation stage. However another test, regression test should be done. It extrapolates program correct impact, throughput and the response time from before and after results using the test data and current performance.

(2) System Recovery

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

(3) End-User Assistance

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

(4) System Enhancement

After the system is implemented for some time, it should be adapted to the present situation. The objective is to modify the proposed system to respond to the new requirements, technology and maintenance cost.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The proposed system can help to reduce the processing time of each process, such as searching for information, because most process done manually on the existing system can be done by computer on the proposed system. In addition, the proposed system can generate reports to management that cannot be found in the existing system and reduce or eliminate errors found in the existing system. All sections in the company can share the data together so that the problem of data redundancy will be reduced. The proposed system can reduce the number of staff in other sections because the processing time of each process is reduced so that number of employees in the existing system can be reduced too. This can be tangible benefit of the proposed system. The proposed computerized system can help to increase the company's sales revenue because the product can be produced systematically. This can make the customer's satiable rate to increase and result in customer loyalty.

At present, the computer information system is used as the strategy in the way of doing business. So the success in a business will come together with the success in the computer information system.

Table 5.1. illustrates the comparison of time between the proposed system and the existing system.

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

Process	Manual System	Proposed System
Inquiry Process	30 Minutes	30 Seconds
Order Process	30 Minutes	1 Minute
Check Inventory Process	1 Hour	30 Seconds
Report Generation	None	3 Minutes

Descriptions of each degree of achievement of the proposed system are as follows:

(1) Inquiry process: The existing system takes 30 minutes for searching customer document but the proposed system takes only 30 seconds to gather all sales information of each customer.

(2) Order Process: The existing system is manual process that takes 1 minute on order process. The proposed system takes only 5 minutes.

(3) Check Inventory Process: The existing system takes 1 hour to count physical stock raw material. But the proposed system takes only 30 seconds to calculate balance quantity of raw material in stock.

(4) Report Generation: The existing system cannot generate report to management because of it is the manual process. But the proposed system can do it and takes only 3 minutes.

5.2 Recommendations

The proposed system does not support overall functions of the company, because some functions are very complicated and it is not necessary for the computerized system at the beginning.

Nowadays, Internet plays an important role on human life. With the Internet new user can search the information they want and order the product and service by using the variety payment method. Including e-wallet, credit card, smart card and etc. The company treats the Internet as a new channel for selling their product because the Internet can like people around the world and opens 24 hours a days. It is recommended the company to develop the website to take the order electrically from the customer.

APPENDIX A

ENTITY RELATIONSHIP DIAGRAM

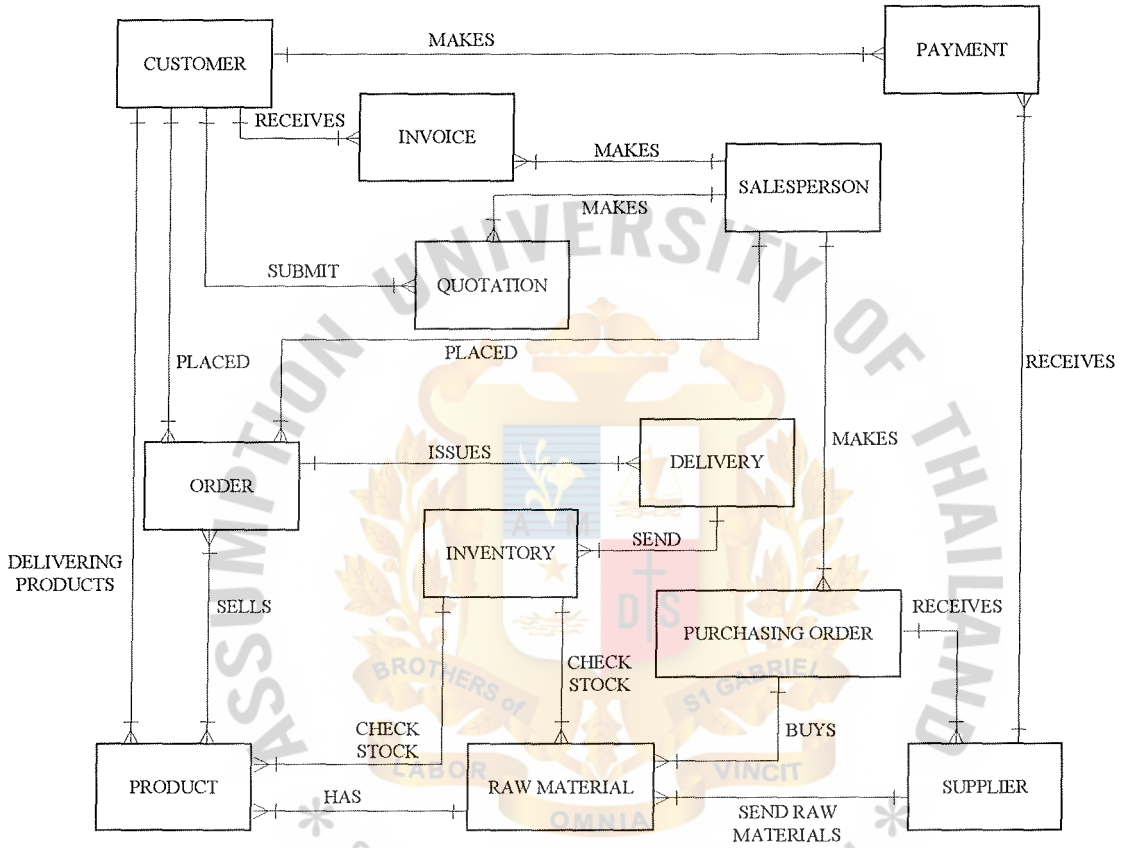

Figure A.1. Context Entity Relationship Diagram.

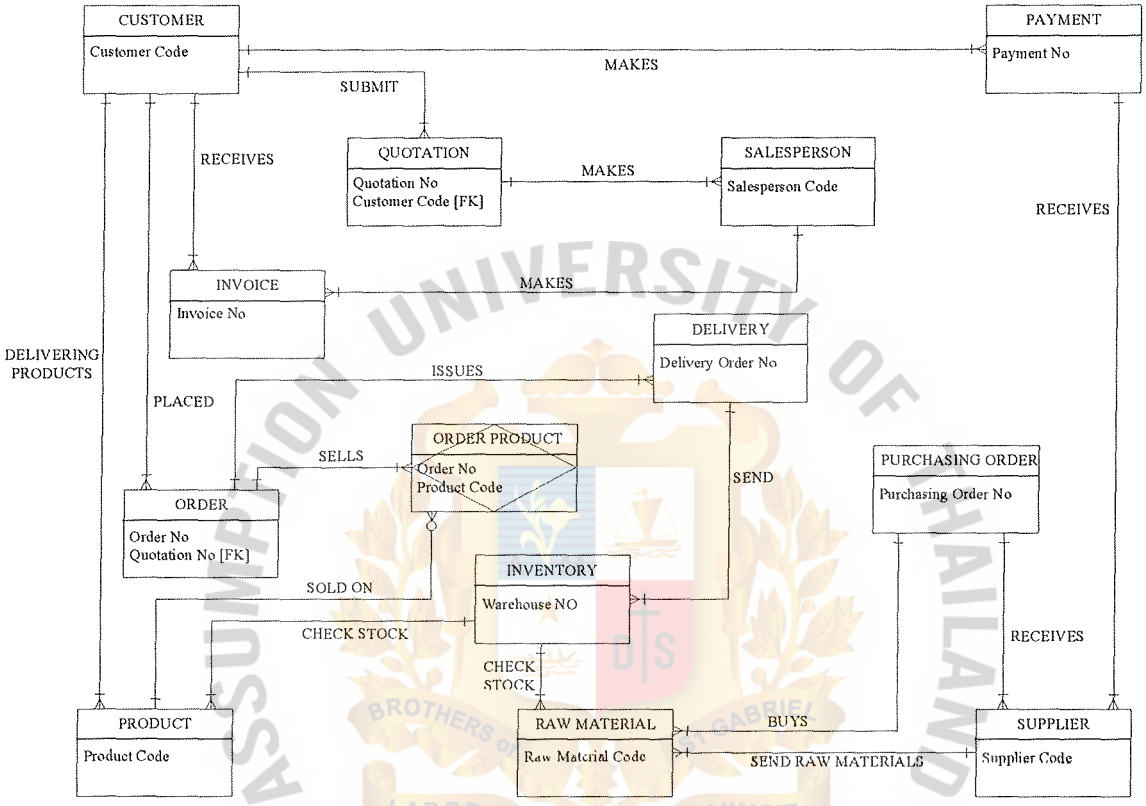

Figure A.2. Key Based Entity Relationship Diagram.

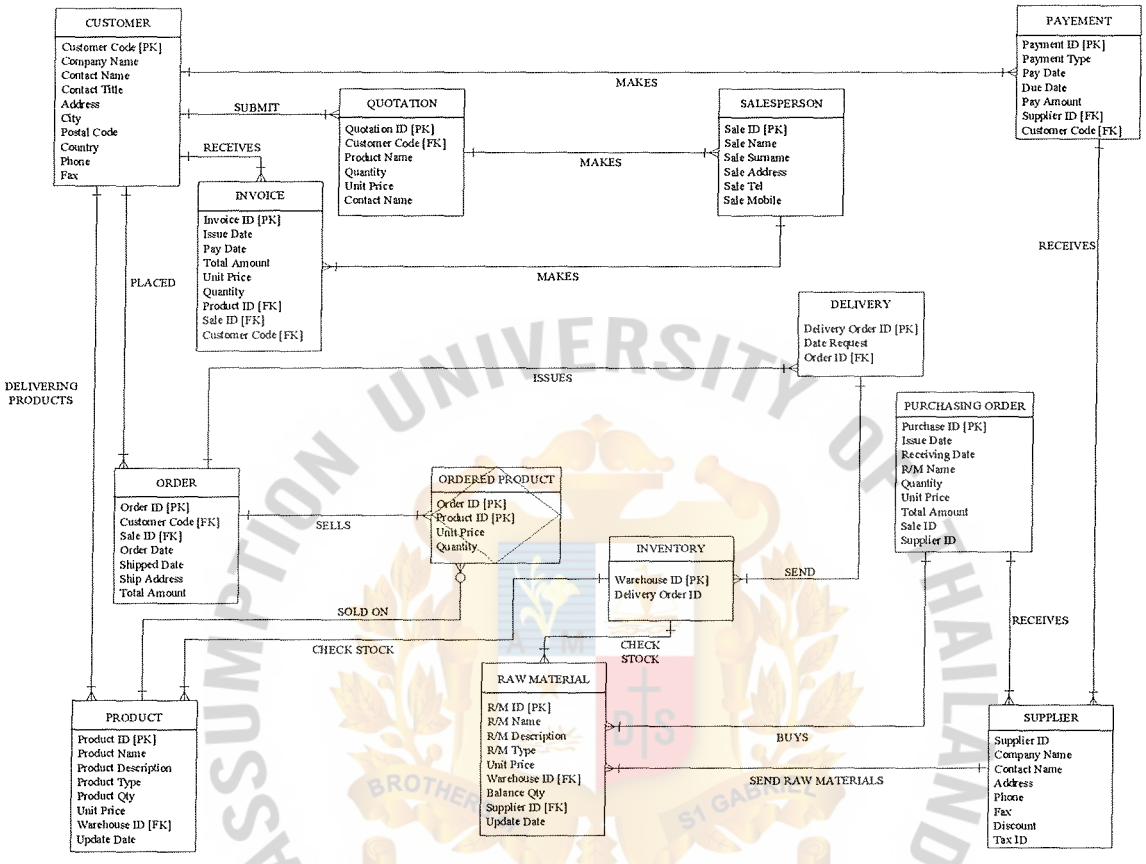

Figure A.3. Fully Attribute Entity Relationship Diagram.

APPENDIX B

DATA FLOW DIAGRAM

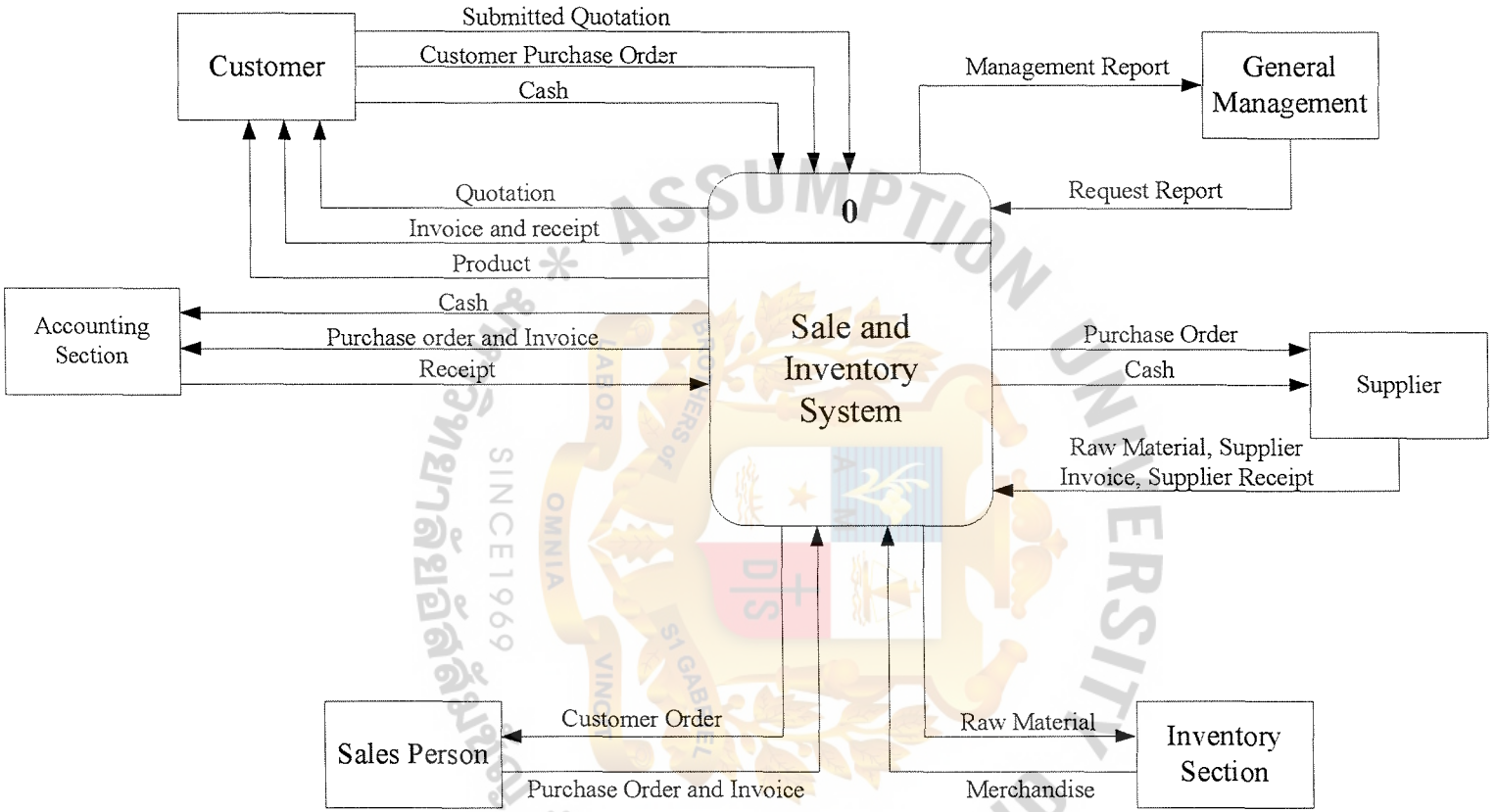

Figure B.1. Context Diagram Data Flow of the Proposed System.

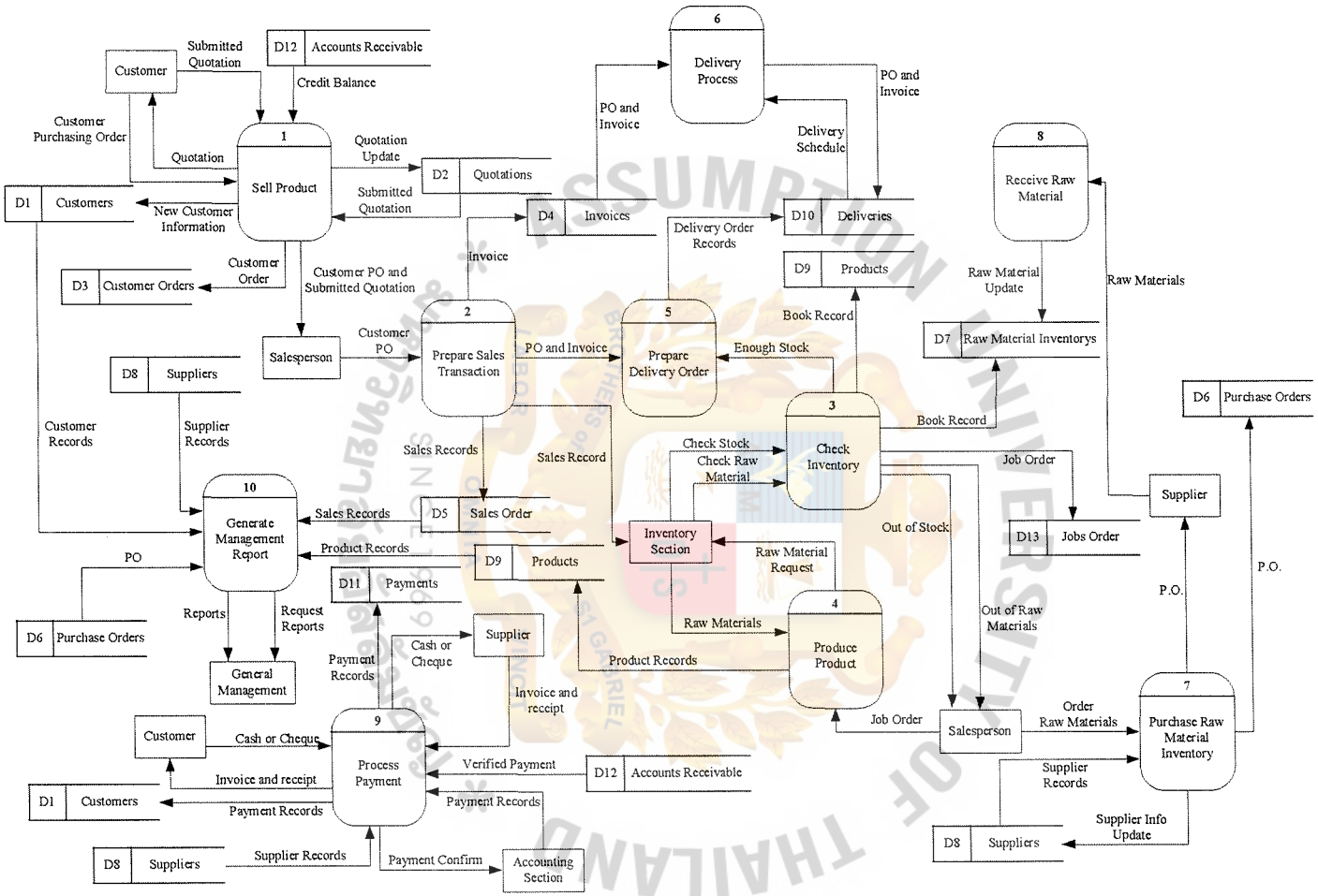

Figure B.2. Level 0 Data Flow Diagram of Sales and Inventory Information System.

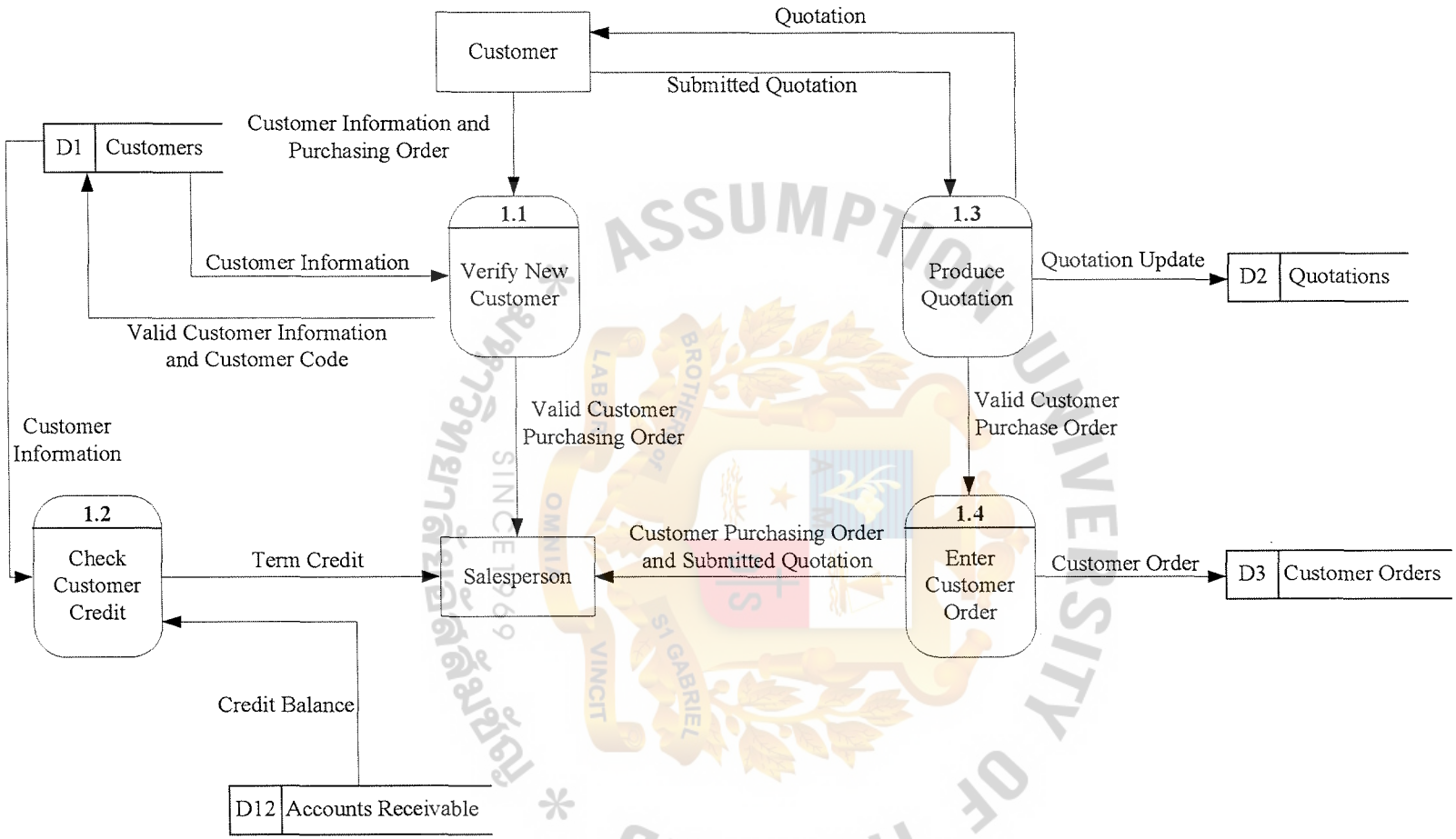

Figure B.3. Data Flow Diagram - Sell Product.

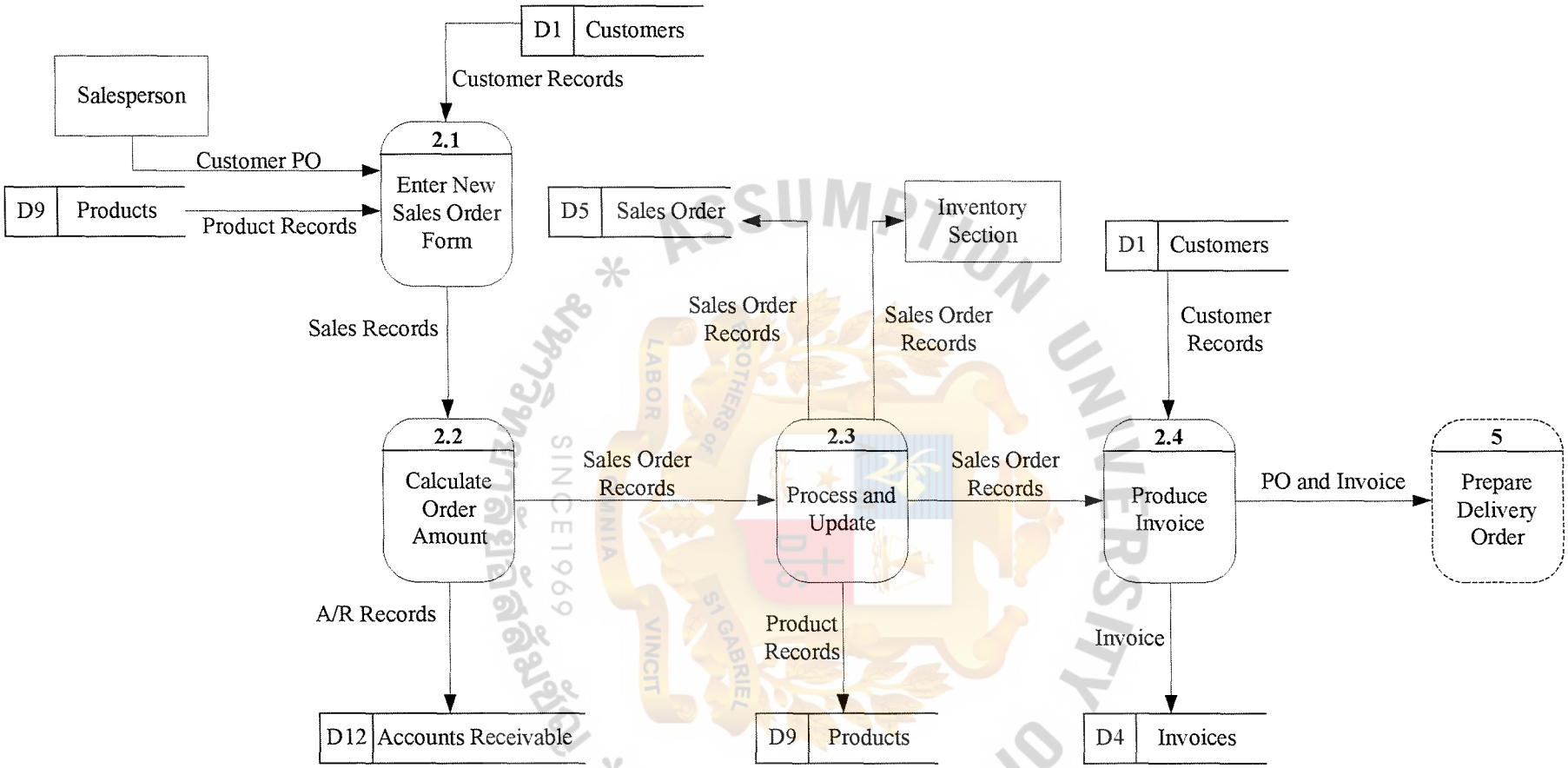

Figure B.4. Data Flow Diagram - Prepare Sales Transaction.

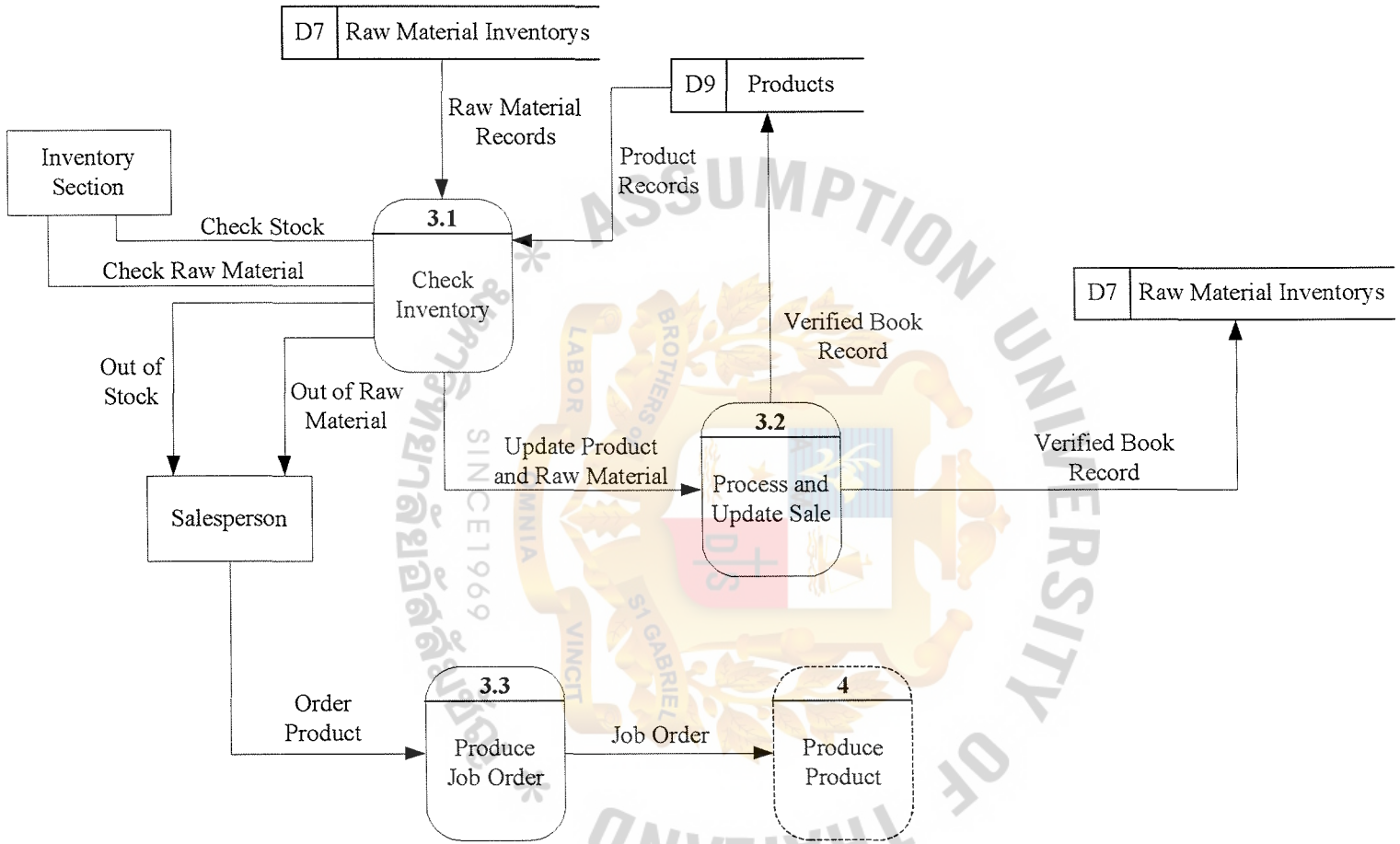

Figure B.5. Data Flow Diagram - Check Inventory.

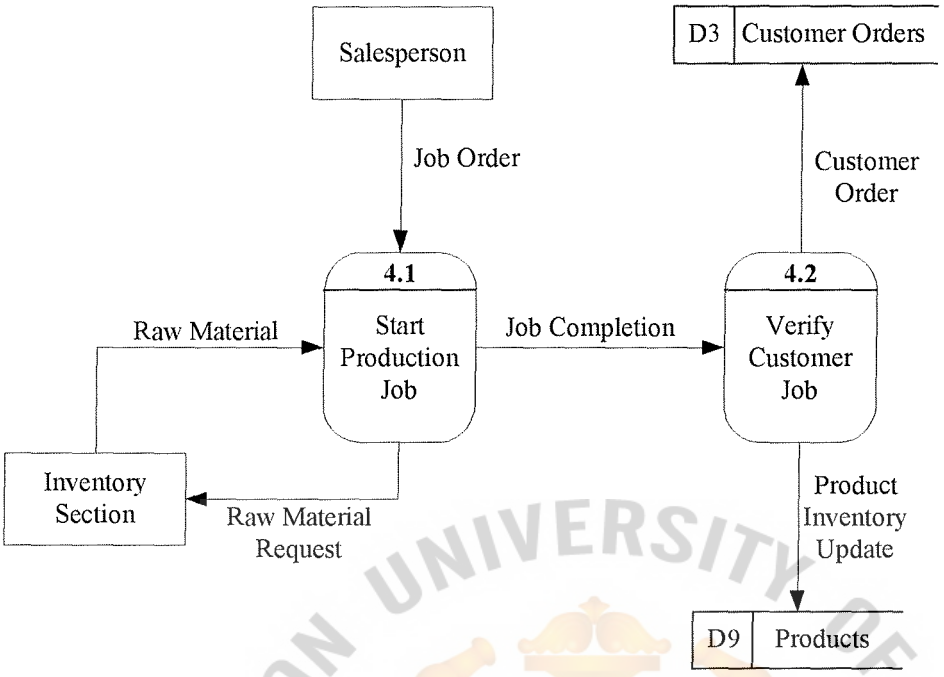

Figure B.6. Data Flow Diagram - Produce Product.

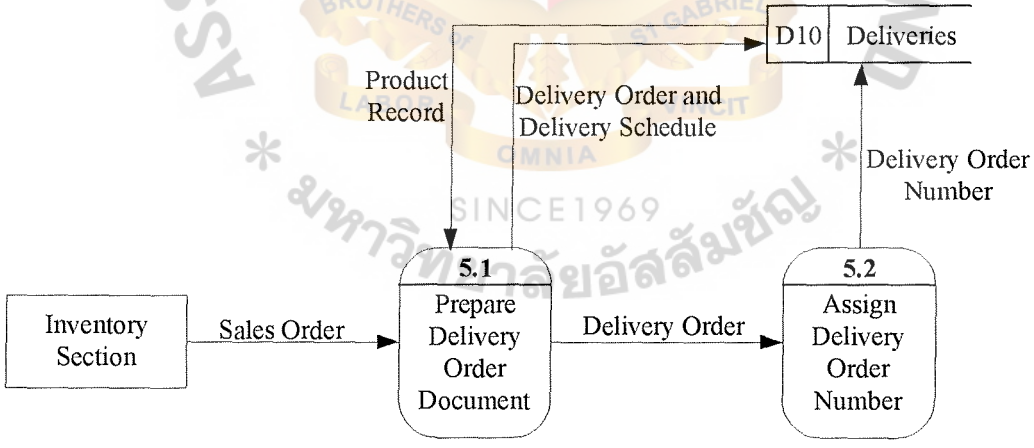

Figure B.7. Data Flow Diagram – Prepare Delivery Order.

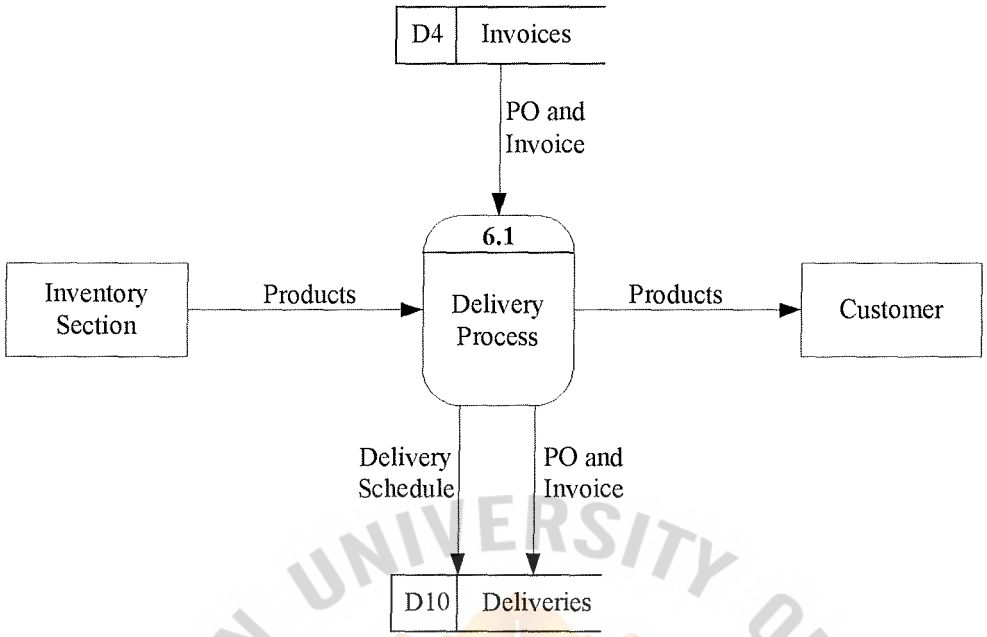

Figure B.8. Data Flow Diagram - Delivery Order.

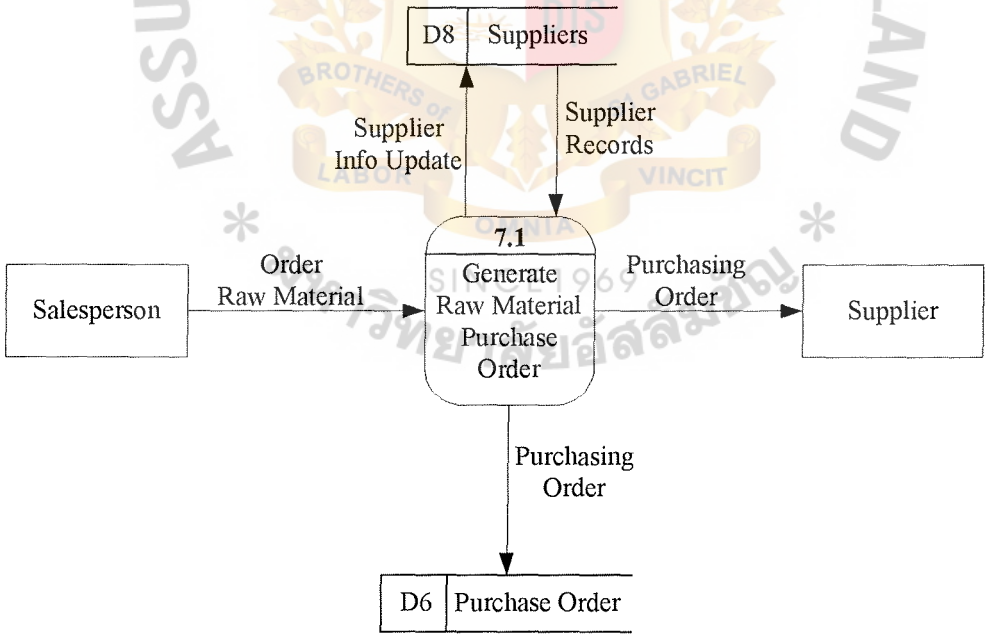

Figure B.9. Data Flow Diagram - Purchase Raw Material Inventory.

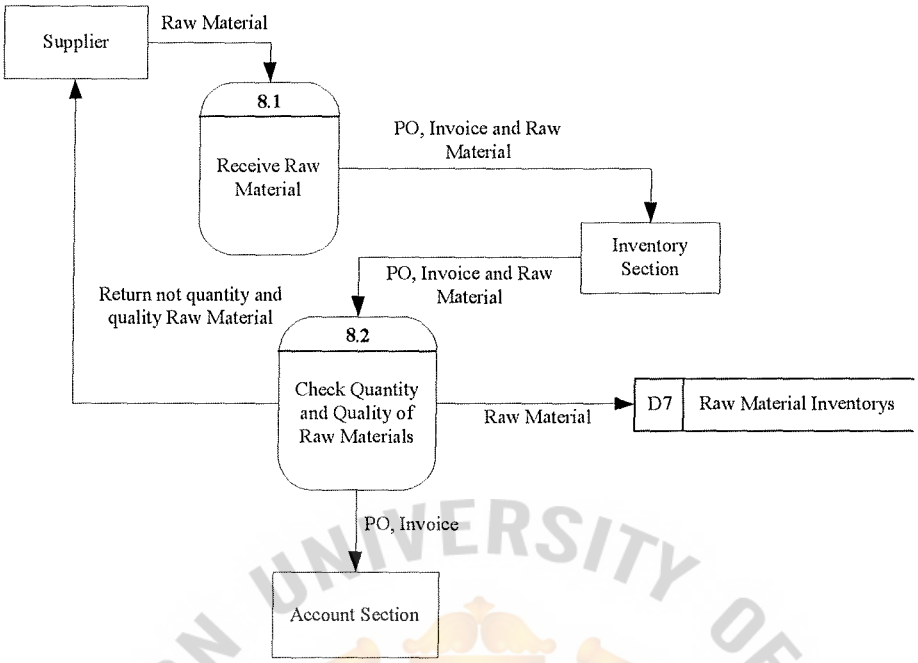

Figure B.10. Data Flow Diagram - Receive Raw Material.

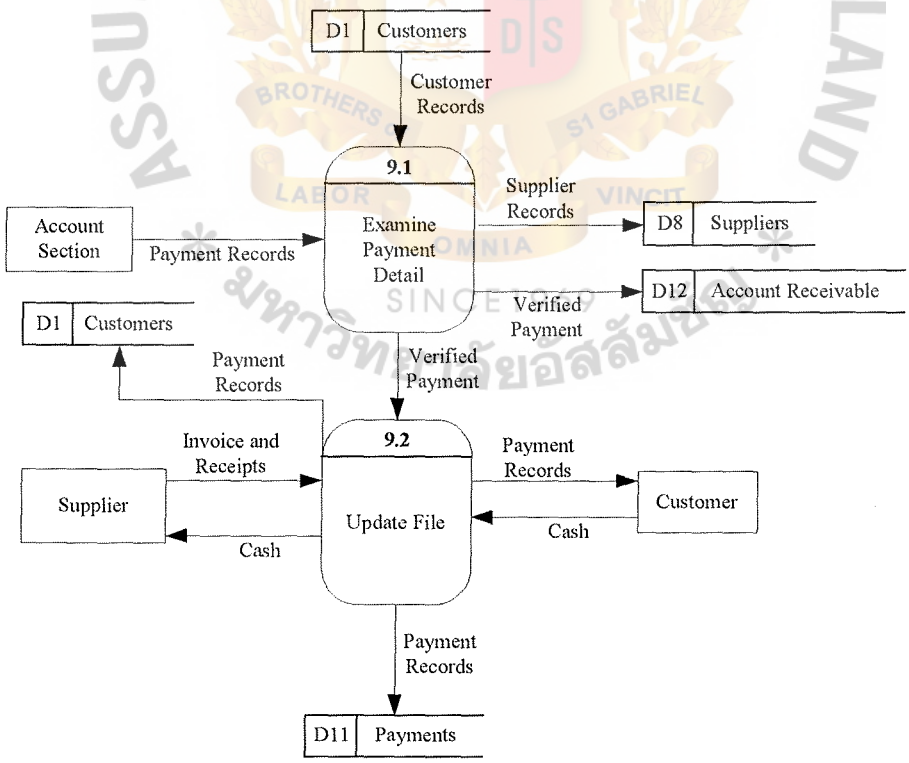

Figure B.11. Data Flow Diagram – Payment.

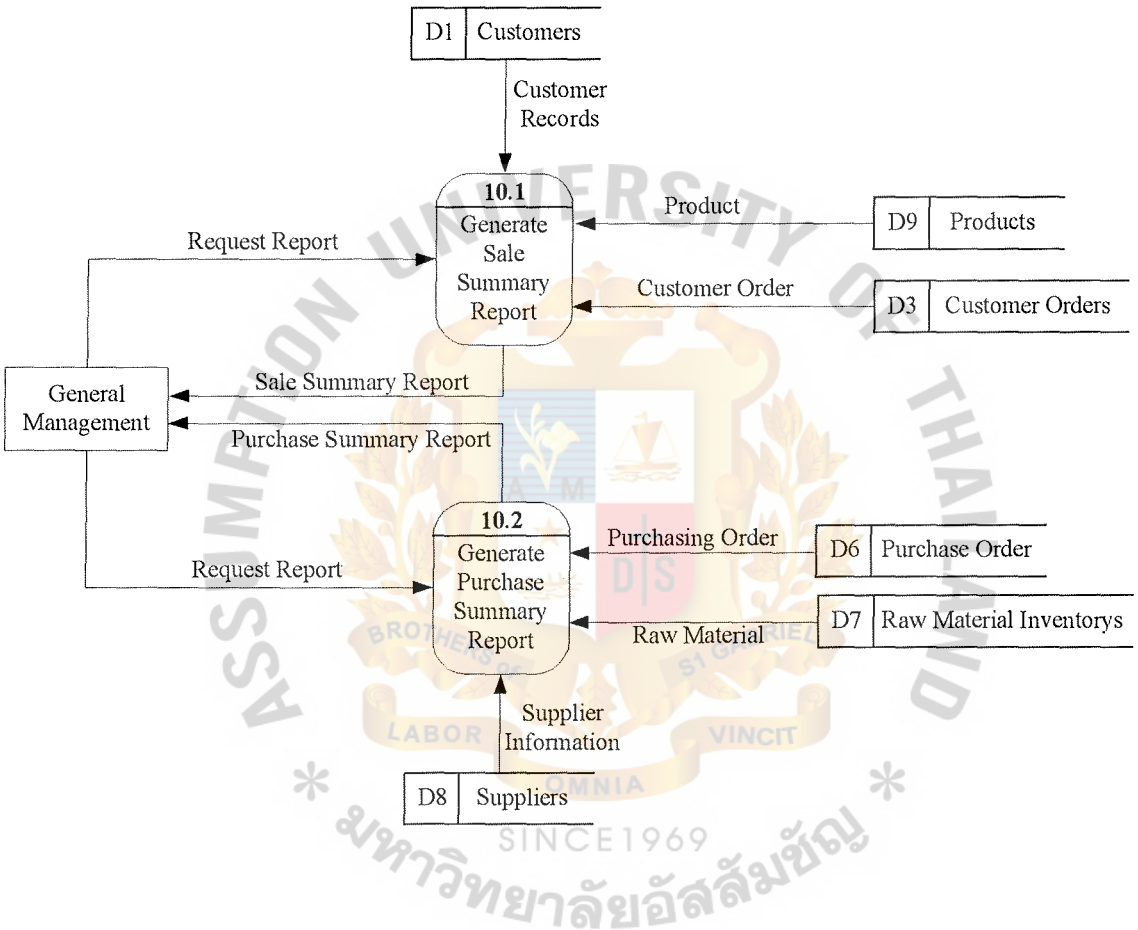

Figure B.12. Data Flow Diagram – Generate Management Report.

APPENDIX C

PROCESS SPECIFICATIONS OF THE PROPOSED SYSTEM

Table C.1. Process Specification of Process Customer Information.

Items	Description
Process Name:	Verify New Customer
Data In:	Customer Information and Purchasing Order
Data Out:	New Customer Information Valid Customer Purchasing Order Customer Code
Process:	(1) If customer's name of customer information is not in customer file, get necessary customer data, customer's name, address, telephone number, etc. and assign new customer code. (2) Record the customer data into corporate Customer Database (3) Send purchasing order to salesperson

Table C.2. Process Specification of Process Check Customer Credit.

Items	Description
Process Name:	Check Customer Credit
Data In:	Customer Records Account Receivables Records
Data Out:	Customer Status
Process:	(1) Find customer's code account receivable with matching number (2) Check credit balance

Table C.3. Process Specification of Process Produce Quotation.

Items	Description
Process Name:	Produce Quotation
Data In:	Customer Purchasing Order Submitted Quotation
Data Out:	Quotation Information
Process:	(1) Create Quotation from customer's Order (2) Record quotation data into corporate Quotation Database

Table C.4. Process Specification of Process Enter Customer.

Items	Description
Process Name:	Enter Customer Order
Data In:	Submitted Quotation from customer Valid Customer purchase order
Data Out:	Customer Order
Process:	(1) When customer sign to submit quotation that the salesperson send it to the customer and return it to the company (2) Select quotation data from Quotation Database and use these data to create customer order and record the customer order data into corporate Customer Order Database

Table C.5. Process Specification of Process Enter New Sales Order Form.

Items	Description
Process Name:	Enter New Sales Order Form
Data In:	Customer Purchasing Order Customer Records Product Records Sales Records
Data Out:	Product Records Sales Records
Process:	(1) There are more sales order transactions in order line (2) Read product name from product record (3) Create sales transaction from next order in order line

Table C.6. Process Specification of Process Calculate Order Amount.

Items	Description
Process Name:	Calculate Order Amount
Data In:	Sales Records
Data Out:	Account Receivables Records Sales Records
Process:	(1) There are more sales orders in order line (2) Calculate price of each order line (3) Calculate line total amount

Table C.7. Process Specification of Process and Update.

Items	Description
Process Name:	Process and Update
Data In:	Sales Records
Data Out:	Product Records Sales Order Records
Process:	(1) There are sales order transactions in order line with product name (2) Write sales order transaction to product

Table C.8. Process Specification of Process Produce Invoice.

Items	Description
Process Name:	Product Invoice
Data In:	Sales Order Records Customer Records
Data Out:	Invoice Records PO
Process:	(1) Create invoice that prepare for delivery process (2) Record the invoice data into corporate Invoice Database

Table C.9. Process Specification of Process Check Inventory.

Items	Description
Process Name:	Check Inventory
Data In:	Product Records Raw Material Records Inventory Check Request
Data Out:	Update Sales
Process:	(1) There are more sales orders in order line (2) Find product number in product with product code in sales order (3) Fine raw material number in raw material with raw material code in inventory request (4) Compare if quantity on hand is greater than quantity order and request

Table C.10. Process Specification of Process and Update Sales.

Items	Description
Process Name:	Process and Update Sales
Data In:	Update Sales
Data Out:	Verified Book Records
Process:	(1) There are more sales orders in order line (2) Subtract booked quantity from total quantity on hand (3) Record the job order data into corporate Job Order Database

Table C.11. Process Specification of Process Produce Job Order.

Items	Description
Process Name:	Produce Job Order
Data In:	Order Product
Data Out:	Job Order
Process:	(1) If quantity order greater than on hand quantity salesperson will make job order to reproduce product (2) Update to product database

Table C.12. Process Specification of Process Produce Job Order.

Items	Description
Process Name:	Produce Job Order
Data In:	Order Product
Data Out:	Job Order
Process:	(3) If quantity order greater than on hand quantity salesperson will make job order to reproduce product (4) Update to product database

Table C.13. Process Specification of Process Start Production Job.

Items	Description
Process Name:	Start Production Job
Data In:	Job Order Raw Material
Data Out:	Job Complete
Process:	(1) Produce product from job order

Table C.14. Process Specification of Process Verify Customer Job.

Items	Description
Process Name:	Verify Customer Job
Data In:	Job Completion Job Order
Data Out:	Product Inventory Update
Process:	(1) Verify Product completion (2) Update data to product database

Table C.15. Process Specification of Process Prepare Delivery Order Document.

Items	Description
Process Name:	Prepare Delivery Order Document
Data In:	Sales Order Product Records
Data Out:	Delivery Order Delivery Order and Delivery Schedule
Process:	(1) Read customer record, product name and sales order transaction (2) Print delivery order and delivery schedule

Table C.16. Process Specification of Process Assign Delivery Order Number.

Items	Description
Process Name:	Assign Delivery Order Number
Data In:	Delivery Order
Data Out:	Delivery Order Number
Process:	(1) Assign delivery order number (2) Record to delivery records

Table C.17. Process Specification of Process Delivery Process.

Items	Description
Process Name:	Delivery Process
Data In:	Delivery Schedule Purchasing Order and Invoice Product
Data Out:	Product Purchasing Order and Invoice
Process:	(1) Read PO and invoice and delivery schedule (2) Get products to send to customer on delivery schedule

Table C.18. Process Specification of Process Generate Raw Material Purchase Order.

Items	Description
Process Name:	Generate Raw Material Purchase Order
Data In:	Order Raw Material Supplier Record
Data Out:	Purchasing Order Supplier Information Update
Process:	(1) Send Purchasing order to supplier (2) Update supplier data to supplier database

Table C.19. Process Specification of Process Receive Raw Material.

Items	Description
Process Name:	Receive Raw Material
Data In:	PO, Invoice and Raw Material
Data Out:	PO, Invoice and Raw Material
Process:	(1) Inventory receives PO, Invoice and Raw Material

Table C.20. Process Specification of Process Check Quantity and Quality Of Raw Materials.

Items	Description
Process Name:	Check Quantity and Quality Of Raw Materials
Data In:	PO, Invoice and Raw Material
Data Out:	Raw Materials PO, Invoice Return not Quantity and Quality Raw Materials
Process:	(1) Inventory checks quantity and quality of products. If it is ok, keep to Accounting Section. (2) If it is not ok, return not quantity and quality products back to suppliers.

Table C.21. Process Specification of Process Examine Payment Detail.

Items	Description
Process Name:	Examine Payment Detail
Data In:	Payment Records Customer Records Verified Payment
Data Out:	Verified Payment
Process:	(1) There are more customers' payment requests. (2) Find record in invoice with matching customer number.

Table C.22. Process Specification of Process Generate Sale Summary Report.

Items	Description
Process Name:	Generate Sale Summary Report
Data In:	Request Report Customer Records Product Records Customer Order Records
Data Out:	Information Records
Process:	(1) Read request report, customer records, customer order records, product records. (2) Produce a new report.

Table C.23. Process Specification of Process Update File.

Items	Description
Process Name:	Update File
Data In:	Verified Payment
Data Out:	Payment Records Invoice and Receipts
Process:	(1) There are customer payment requests, so check payments are cash or cheque. (2) Subtract payment amount from balance due. (3) Update payment records to payment database, customer database, A/R database. (4) Receive money from customers. (5) Send invoice and receipts to customer.

Table C.24. Process Specification of Process Generate Purchase Summary Report.

Items	Description
Process Name:	Generate Purchase Summary Report
Data In:	Request Report Supplier Records Raw Material Records Purchasing Order Records
Data Out:	Information Records
Process:	(1) Read request report, supplier records, purchasing order records, raw material records. (2) Produce a new report

APPENDIX D

DATABASE DESIGN

Table D.1. Structure of Customer Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	CustomerID	Char	5	-	Primary Key
2	CompanyName	Varchar	40	-	Attribute
3	ContactName	Varchar	30	-	Attribute
4	ContactTitle	Varchar	30	-	Attribute
5	Address	Varchar	60	-	Attribute
6	City	Varchar	15	-	Attribute
7	PostalCode	Char	5	-	Attribute
8	Country	Varchar	15	-	Attribute
9	Phone	Varchar	11	-	Attribute
10	Fax	Varchar	11	-	Attribute
11	TaxID	Varchar	20	-	Attribute

Table D.2. Structure of DeliveryOrder Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	DeliveryOrderID	Integer	5	-	Primary Key
2	DateRequest	Datetime	8	-	Attribute
3	OrderID	Integer	5	-	Attribute

Table D.3. Structure of Invoice Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	InvoiceID	Integer	5	-	Primary Key
2	IssueDate	Datetime	8	-	Attribute
3	PayDate	Datetime	8	-	Attribute
4	TotalAmount	Numeric	10	2	Attribute
5	UnitPrice	Numeric	10	2	Attribute
6	Quantity	Integer	8	-	Attribute
7	ProductID	Char	5	-	Attribute
8	SaleID	Char	5	-	Attribute
9	CustomerID	Char	5	-	Attribute

Table D.4. Structure of Inventory Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	WarehouseID	Char	2	-	Primary Key
2	DeliveryOrderID	Integer	5	-	Attribute
3	Status	Char	1	-	Attribute

Table D.5. Structure of OrderProduct Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	OrderID	Integer	5	-	Primary Key
2	ProductID	Char	5	-	Primary Key
3	UnitPrice	Numeric	10	2	Attribute
4	Quantity	Integer	8	-	Attribute

Table D.6. Structure of Order Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	OrderID	Integer	5	-	Primary Key
2	CustomerID	Char	5	-	Attribute
3	SaleID	Char	5	-	Attribute
4	OrderDate	Datetime	8	-	Attribute
5	ShippedDate	Datetime	8	-	Attribute
6	ShipAddress	Varchar	80	-	Attribute
7	TotalAmount	Numeric	10	2	Attribute

Table D.7. Structure of Payment Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	PaymentID	Integer	5	-	Primary Key
2	PaymentType	Char	10	-	Attribute
3	PayDate	Datetime	8	-	Attribute
4	DueDate	Datetime	8	-	Attribute
5	PayAmount	Numeric	10	2	Attribute
6	SupplierID	Char	5	-	Attribute
7	CustomerID	Char	5	-	Attribute

Table D.8. Structure of Product Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	ProductID	Char	5	-	Primary Key
2	ProductName	Varchar	50	-	Attribute
3	ProductDesc	Varchar	50	-	Attribute
4	ProductType	Varchar	20	-	Attribute
5	BalanceQty	Int	8	-	Attribute
6	UnitPrice	Numeric	10	2	Attribute
7	WarehouseID	Char	2	-	Attribute
8	UpdateDate	Datetime	8	-	Attribute

Table D.9. Structure of PurchaseOrder Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	PurchaseID	Integer	5	-	Primary Key
2	IssueDate	Datetime	8	-	Attribute
3	ReceivingDate	Datetime	8	-	Attribute
4	RMName	Varchar	50	-	Attribute
5	Quantity	Int	8	-	Attribute
6	UnitPrice	Numeric	7	2	Attribute
7	TotalAmount	Numeric	10	2	Attribute
8	SaleID	Char	5	-	Attribute
9	SupplierID	Char	5	-	Attribute

Table D.10. Structure of RawMaterial Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	RMID	Char	5	-	Primary Key
2	RMName	Varchar	50	-	Attribute
3	RMDesc	Varchar	50	-	Attribute
4	RMType	Varchar	20	-	Attribute
5	UnitPrice	Numeric	10	2	Attribute
6	WarehouseID	Char	2	-	Attribute
7	BalanceQty	Integer	8	-	Attribute
8	SupplierID	Char	5	-	Attribute
9	UpdateDate	Datetime	8	-	Attribute

Table D.11. Structure of Salesperson Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	SaleID	Char	5	-	Primary Key
2	SaleName	Varchar	30	-	Attribute
3	SaleSurname	Varchar	40	-	Attribute
4	SaleAddress	Varchar	80	-	Attribute
5	SaleTel	Varchar	11	-	Attribute
6	SaleMobile	Varchar	11	-	Attribute

Table D.12. Structure of Supplier Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	SupplierID	Char	5	-	Primary Key
2	CompanyName	Varchar	50	-	Attribute
3	ContactName	Varchar	50	-	Attribute
4	Address	Varchar	50	-	Attribute
5	City	Varchar	15	-	Attribute
6	PostCode	Varchar	5	-	Attribute
7	Country	Varchar	15	-	Attribute
8	Phone	Char	11	-	Attribute
9	Fax	Char	11	-	Attribute
10	Discount	Numeric	6	2	Attribute
11	TaxID	Varchar	20	-	Attribute

Table D.13. Structure of Quotation Table.

No.	Field Name	Field Type	Length	Dec	Key Type
1	QuotationID	Integer	5	-	Primary Key
2	CustomerID	Char	5	-	Attribute
3	ProductName	Varchar	50	-	Attribute
4	Quantity	Integer	8	-	Attribute
5	UnitPrice	Numeric	10	2	Attribute
6	ContactName	Varchar	50	-	Attribute

APPENDIX E

DATA DICTIONARY

Table E.1. Data Dictionary of Sales and Inventory Database.

Field Name	Meaning
Address	Address of the customer and supplier
BalanceQty	The number of products and raw materials which company has
City	City name of the customer
CompanyName	The name of customer company and supplier company
ContactName	Name of the person from the customer and supplier who company contact
ContactTitle	Name of the contact person's position
Country	Country of Customer
CustomerID	Identification number of customer
DateRequest	The date of customer request for received product
DeliveryOrderID	Identification number of delivery order
Discount	The number of discount rate that supplier gives for company
DueDate	The date of the due payment
Fax	Contact number of customer and supplier
InvoiceID	Identification number of invoice
IssueDate	The date when the order is issued
OrderDate	The date the customer orders the product
OrderID	Identification number of order
PayAmount	The number of amount that customers pay and company pays to supplier
PayDate	Date of payment
PayDate	The date of the customer payment
PaymentID	Identification number of payment
PaymentType	The description of the payment type
Phone	Contact number of customer and supplier
PostalCode	Postal Code of Customer
ProductDesc	The description of product
ProductID	Identification number of product
ProductName	The name of product
ProductType	Type of product
PurchaseID	Identification number of purchasing order
Quantity	Amount of product and raw material
ReceivingDate	The date the company received raw material from supplier
RMDesc	The description of the raw material
RMID	Identification number of raw material
RMName	The name of raw material
RMType	Type of raw material
SaleAddress	The Address of the salesperson
SaleID	Identification number of salesperson
SaleMobile	The mobile phone number of salesperson

Table E.1. Data Dictionary of Sales and Inventory Database (Continued).

Field Name	Meaning
SaleName	The name of salesperson
SaleSurname	The surname of salesperson
SaleTel	The telephone number of salesperson
ShipAddress	The address of the product is shipped to the customer
ShippedDate	The date when the product is shipped to the corporate customer
SupplierID	Identification of supplier
TaxID	Identification number of tax
TotalAmount	The number of total amount come from unitprice multiply quantity
TotalAmount	The number of total amount come from unitprice multiply quantity
UnitPrice	The number of product and raw material price
UnitPrice	The number of product price
UpdateDate	The date of the update and insert data
WarehouseID	Identification of warehouse

APPENDIX F

USER INTERFACE DESIGN

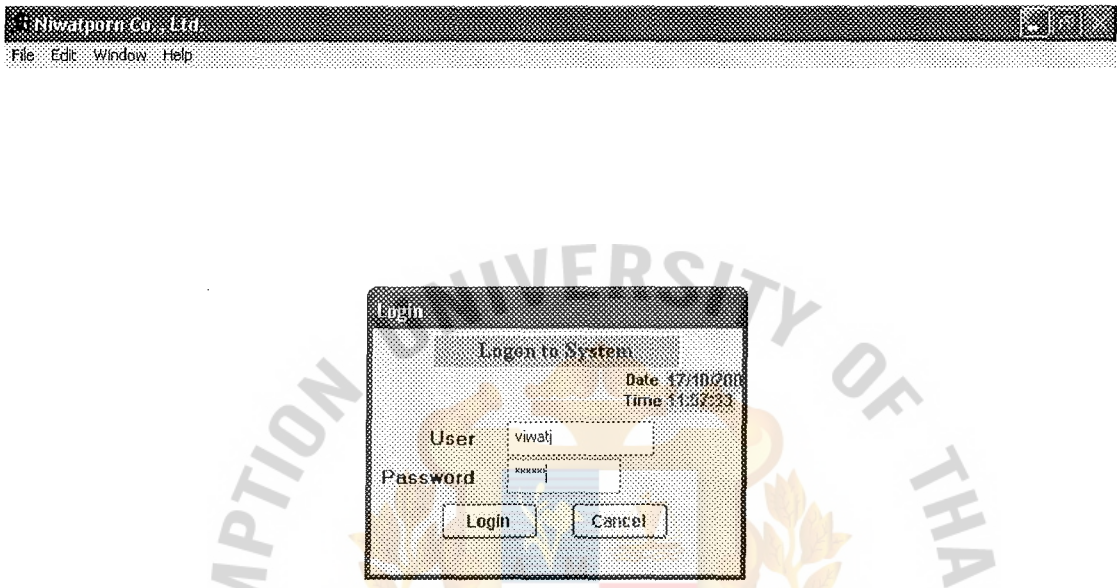

Figure F.1. Login Screen.

Figure F.2. Menu Screen.

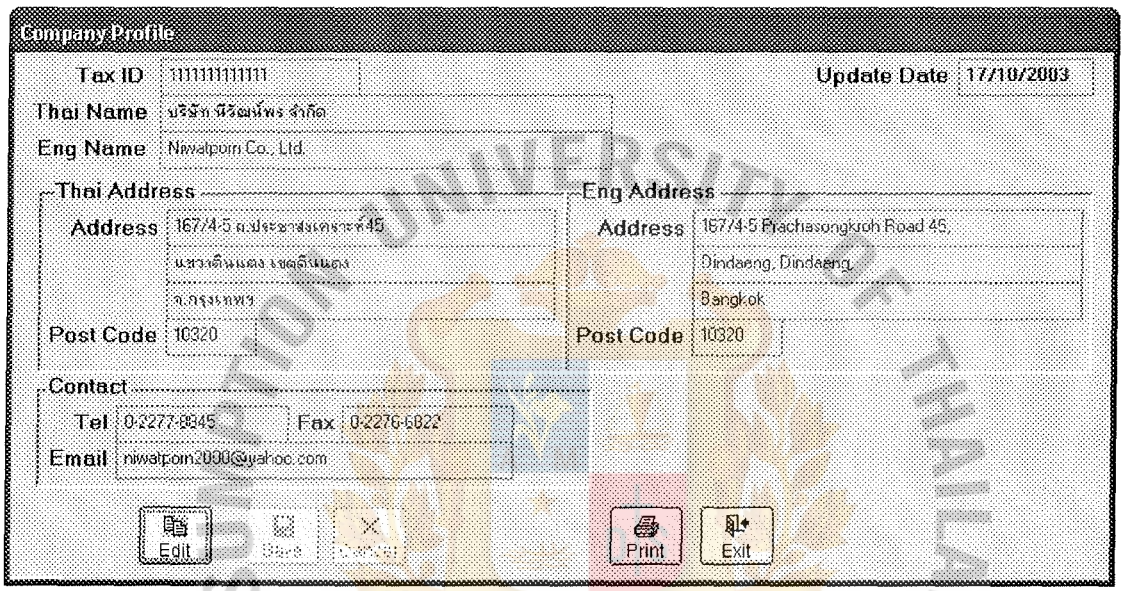

Figure F.3. Data Entry Menu: Company Profile.

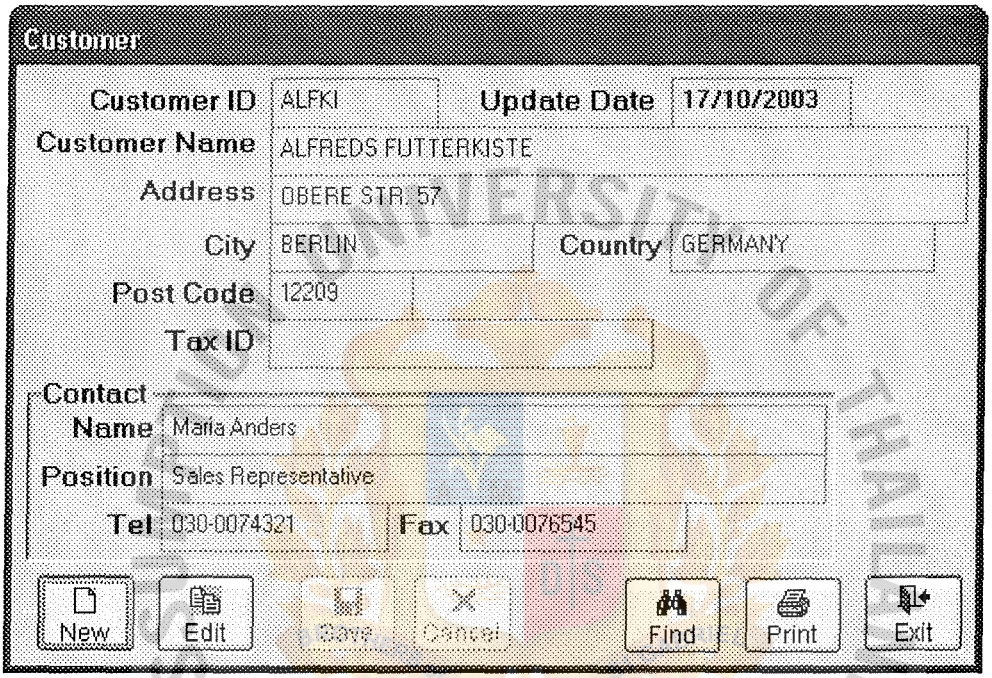

Figure F.4. Data Entry Menu: Customer.

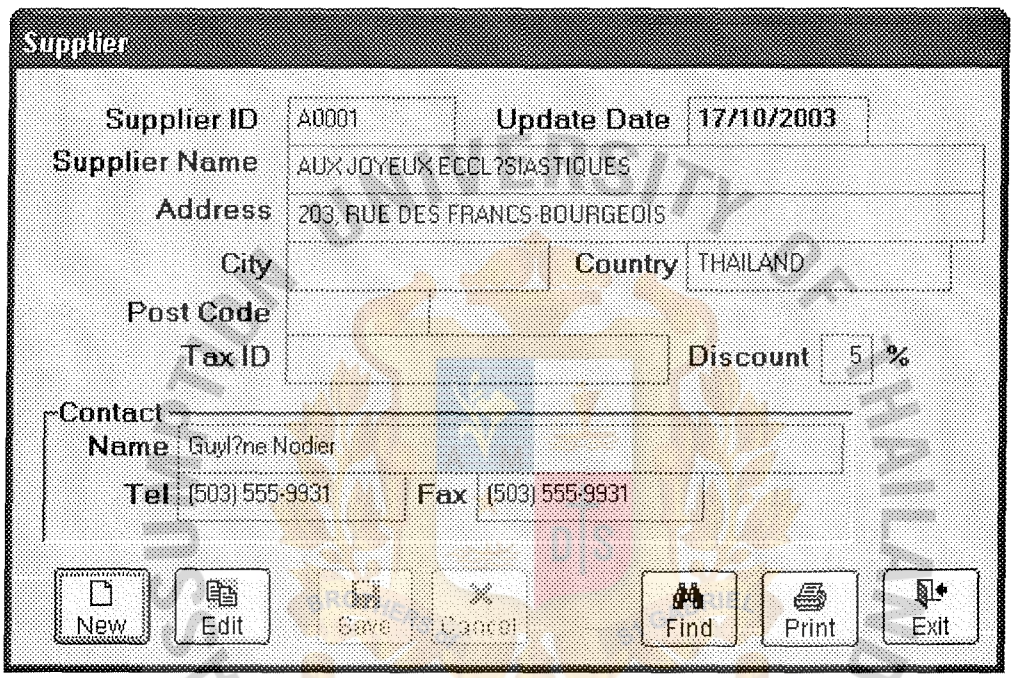

Figure F.5. Data Entry Menu: Supplier.

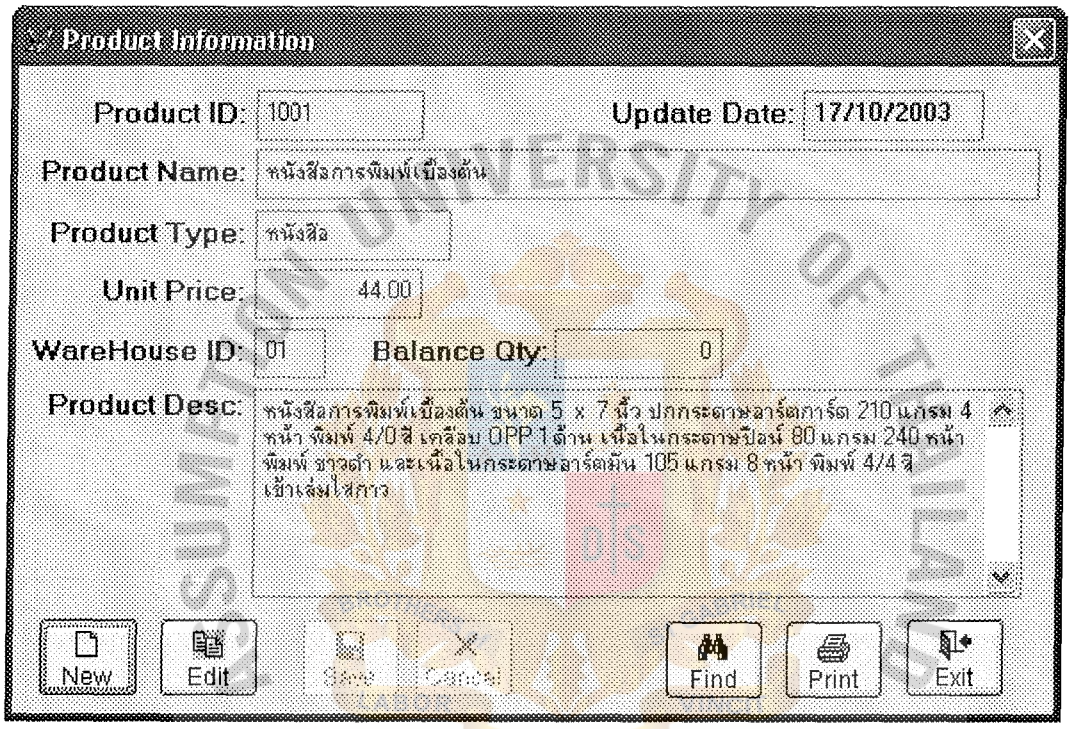

Figure F.6. Data Entry Menu: Product.

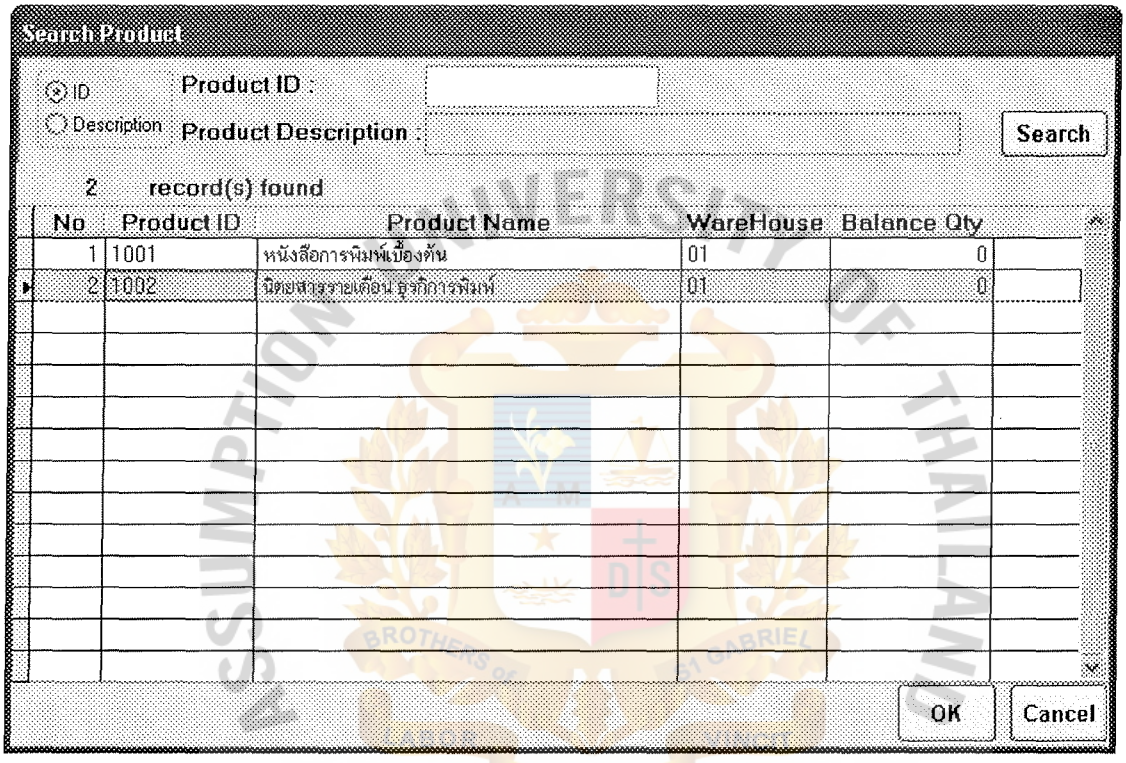

Figure F.7. Data Query Screen: Product Search.

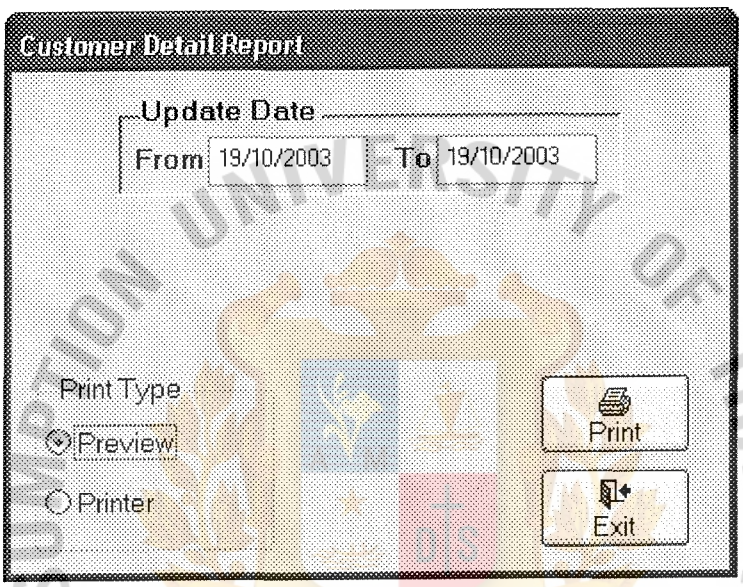

Figure F.8. Report Screen: Customer Detail.

APPENDIX G

REPORT DESIGN

NIWATPORN CO., LTD.
Company Profile Report

Print Date : *20/12/2003*
Page : *1*

Compid : 1 **Taxid :** 1111111111111 **Updatedate :** 17/10/2003 11:17:16 AM
Thai Name : บริษัท นิวัฒน์พร จำกัด
Thai Address : 167/4-5 ถ.ประชาสงเคราะห์45 แขวงดินแดง เขตดินแดง จ.กรุงเทพฯ
Eng Name : Niwatporn Co., Ltd.
Eng Address : 167/4-5 Prachasongkroh Road 45, Dindaeng, Dindaeng, Bangkok
Postcode : 10320
Tel : 0-2277-8845 **Fax :** 0-2276-6822
Email : niwatporn2000@yahoo.com

Figure G.1. Company Profile Report.

NIWATPORN CO., LTD.
Customer Detail Report

Print Date : *09/12/2003*
Page : *1*

Customer ID :A0001 **Company Name :**Alfreds Futterkiste
Contact Name : Maria Anders **Contact Title :** Sales Representative
Address : Obere Str. 57
City : Berlin **Country :** Germany
Postal Code : 12209 **Tax ID :**
Phone : 030-0074321 **Fax :**
Update Date : 17/10/2003 09:54:11 PM

Customer ID :A0001 **Company Name :**Alfreds Futterkiste
Contact Name : Maria Anders **Contact Title :** Sales Representative
Address : Obere Str. 57
City : Berlin **Country :** Germany
Postal Code : 12209 **Tax ID :**
Phone : 030-0074321 **Fax :**
Update Date : 17/10/2003 09:54:11 PM

Customer ID :A0002 **Company Name :**Ana Trujillo Emparedados y helados
Contact Name : Ana Trujillo **Contact Title :** Owner
Address : Avda. de la Constituci?n 2222
City : M?xico D.F. **Country :** Mexico
Postal Code : 05021 **Tax ID :**
Phone : (5) 555-4729 **Fax :**
Update Date : 17/10/2003 09:54:11 PM

Customer ID :A0002 **Company Name :**Ana Trujillo Emparedados y helados
Contact Name : Ana Trujillo **Contact Title :** Owner
Address : Avda. de la Constituci?n 2222
City : M?xico D.F. **Country :** Mexico
Postal Code : 05021 **Tax ID :**
Phone : (5) 555-4729 **Fax :**
Update Date : 17/10/2003 09:54:11 PM

Customer ID :A0003 **Company Name :**Antonio Moreno Taquer?a
Contact Name : Antonio Moreno **Contact Title :** Owner
Address : Mataderos 2312
City : M?xico D.F. **Country :** Mexico
Postal Code : 05023 **Tax ID :**
Phone : (5) 555-3932 **Fax :**
Update Date : 17/10/2003 09:54:11 PM

Figure G.2. Customer Detail Report.

NIWATPORN CO., LTD.

Supplier Detail Report

Print Date : *09/12/2003*
Page : *1*

Supplier ID : A0001 **Company Name :** Aux joyeux eccl?siastiques
Contact Name : Guyl?ne Nodier **Discount :** 5.00
Address :203, Rue des Francs-Bourgeois **City :**
Country : Thailand **Post Code :**
Phone : (503) 555-9931 **Fax :** (503) 555-9931
Tax ID : **Update Date :** 17/10/2003 12:21:07 PM

Supplier ID : A0001 **Company Name :** Aux joyeux eccl?siastiques
Contact Name : Guyl?ne Nodier **Discount :** 5.00
Address :203, Rue des Francs-Bourgeois **City :**
Country : Thailand **Post Code :**
Phone : (503) 555-9931 **Fax :** (503) 555-9931
Tax ID : **Update Date :** 17/10/2003 12:21:07 PM

Supplier ID : B0001 **Company Name :** Bigfoot Breweries
Contact Name : Cheryl Saylor **Discount :** 5.00
Address :3400 - 8th Avenue Suite 210 **City :**
Country : Thailand **Post Code :**
Phone : (503) 555-9931 **Fax :**
Tax ID : **Update Date :** 17/10/2003 12:21:07 PM

Supplier ID : B0001 **Company Name :** Bigfoot Breweries
Contact Name : Cheryl Saylor **Discount :** 5.00
Address :3400 - 8th Avenue Suite 210 **City :**
Country : Thailand **Post Code :**
Phone : (503) 555-9931 **Fax :**
Tax ID : **Update Date :** 17/10/2003 12:21:07 PM

Supplier ID : C0001 **Company Name :** Cooperativa de Quesos 'Las Cabras'
Contact Name : Antonio del Valle Saavedra **Discount :** 5.00
Address : Calle del Rosal 4 **City :**
Country : Thailand **Post Code :**
Phone : (98) 598 76 54 **Fax :**
Tax ID : **Update Date :** 17/10/2003 12:21:07 PM

Figure G.3. Supplier Detail Report.

NIWATPORN CO., LTD.

Product Detail Report

Print Date : *20/12/2003*
Page : *1*

Product ID	Product Type	Product Name	Unit Price	Balance Qty
1001	หนังสือ	หนังสือการพิมพ์เบื้องต้น	44.00	0.00
1001	หนังสือ	หนังสือการพิมพ์เบื้องต้น	44.00	0.00
1002	นิตยสาร	นิตยสารรายเดือน ธุรกิการพิมพ์	40.00	0.00
1002	นิตยสาร	นิตยสารรายเดือน ธุรกิการพิมพ์	40.00	0.00

Figure G.4. Product Detail Report.

NIWATPORN CO., LTD.

Raw Material Detail Report

Print Date : *20/12/2003*
Page : *1*

R/M ID	R/M Type	R/M Name	Unit Price	Balance Qty	Supplier
1001	Paper	Art glossy 85 g 24 x 35 TPI	983.00	5.00	B0001
1001	Paper	Art glossy 85 g 24 x 35 TPI	983.00	5.00	B0001
1002	Paper	Art matt 140 g 24 x 35 TPI	1,820.00	10.00	B0002
1002	Paper	Art matt 140 g 24 x 35 TPI	1,820.00	10.00	B0002
2001	Ink	OFFSET PR-1 MAGENTA	250.00	5.00	C0003
2001	Ink	OFFSET PR-1 MAGENTA	250.00	5.00	C0003
2002	Ink	OFFSET PR-3 YELLOW	240.00	5.00	C0003
2002	Ink	OFFSET PR-3 YELLOW	240.00	5.00	C0003
2003	Ink	OFFSET PR-5 CYAN	250.00	5.00	C0003
2003	Ink	OFFSET PR-5 CYAN	250.00	5.00	C0003
2004	Ink	OFFSET PR-8 BLACK	240.00	5.00	C0003
2004	Ink	OFFSET PR-8 BLACK	240.00	5.00	C0003

Figure G.5. Raw Material Detail Report.

NIWATPORN CO., LTD.
Sale Detail Report

Print Date : *20/12/2003*
Page : *1*

Saleid : V0001 **Salename :** Viwat Jiranukul
Saleaddress : 167/4 Prachasongkroh 45 Road
Salemobile : 0-6326-6947 **Saletel :** 0-2277-8845

Figure G.6. Sale Detail Report.

APPENDIX H

COST-BENEFIT ANALYSIS

Table H.1. The Cost of the Existing System, Baht.

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost					
Typewriter 6 units@15,000	90,000	-	-	-	-
Calculator 10 units@2,500	25,000	-	-	-	-
Total Development Cost	115,000	-	-	-	-
Operating Cost					
1. Personnel Cost:					
- General Manager 1 Person @ 30,000 Baht/ Month	360,000	396,000	435,600	479,160	527,076
- Accounting Officers 2 Persons @ 10,000 Baht/Month	288,000	316,800	348,480	383,328	421,660
- Sales Officers 5 Persons @ 15,000 Baht/Month	900,000	990,000	1,089,000	1,197,900	1,317,690
- Inventory Officers 5 Persons @ 10,000 Baht/Month	600,000	660,000	726,000	798,600	878,460
- Temporary Staffs 9 Persons @ 5,000 Baht/Month	540,000	594,000	653,400	718,740	790,614
Total Annual Personnel Cost	2,688,000	2,956,800	3,252,480	3,577,728	3,935,500
2. Office Supplies & Miscellaneous Cost:					
- Stationery 36,000 Baht/Annum	36,000	39,600	43,560	47,916	52,707
- Paper 72,000 Baht/Annum	72,000	79,200	87,120	95,832	105,415
- Utility Cost 36,000 Baht/ Annum	36,000	39,600	43,560	47,916	52,707
- Miscellaneous Cost 30,000 Baht/Annum	30,000	33,000	36,300	39,930	43,923
Total Annual Office Supplies & Miscellaneous Cost	174,000	191,400	210,540	231,594	254,753
Total Annual Operating Cost	2,862,000	3,148,200	3,463,020	3,809,322	4,190,254
Total Annual System Cost	2,977,000	3,148,200	3,460,020	3,809,322	4,190,254

Table H.2. The Cost of the Candidate 1, Baht.

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost					
1. Hardware Cost					
- Computer Server 1 Set @ 300,000	300,000	-	-	-	-
- Workstation Full Option 1 Set @ 45,000	180,000	-	-	-	-
- Dot matrix printer	30,000	-	-	-	-
- Laser Printer	21,000	-	-	-	-
- UPS	100,000	-	-	-	-
- HUB 16 Ports	8,000	-	-	-	-
Total Hardware Cost	639,000	-	-	-	-
2. Software Cost					
- Server Software	50,000	-	-	-	-
- DBMS Development Software	55,000	-	-	-	-
- Client Software	100,000	-	-	-	-
- Development Software Tool	35,000	-	-	-	-
Total Software Costs	240,000	-	-	-	-
3. People-Ware Cost					
- System Analyst 1 Person @ 4 Month @ 30,000 Baht	120,000	-	-	-	-
- Database Specialist 2 Persons @ 4 Month @ 30,000 Baht	240,000	-	-	-	-
- Programmer 2 Persons @ 4 Month @ 25,000 Baht	200,000	-	-	-	-
- Network Specialist 1 Person @ 1 Month @ 25,000 Baht	25,000	-	-	-	-
Total People-Ware Cost	585,000	-	-	-	-
4. Implementation Cost					
- Training Cost					
- Installation Cost	85,000	-	-	-	-
Total Implementation Cost	30,000	-	-	-	-
Total System Development Cost	115,000	-	-	-	-
Operating Cost	1,579,000	-	-	-	-
1. Personnel Cost:					
- General Manager 1 Person @ 30,000 Baht/ Month	360,000	396,000	435,600	479,160	527,076
- Accounting Officers 2 Persons @ 10,000 Baht/Month	240,000	264,000	290,400	319,440	351,384
- Sales Officers 3 Persons @ 15,000 Baht/Month	540,000	594,000	653,400	718,740	790,614
- Inventory Officers 3 Persons @ 10,000 Baht/Month	360,000	396,000	435,600	479,160	527,076
- Temporary Staffs 7 Persons @ 6,000 Baht/Month	504,000	554,400	609,840	670,824	737,906
Total Annual Personnel Cost	2,004,000	2,204,400	2,424,840	2,667,324	2,934,056

Table H.2. The Cost of the Candidate 1, Baht (Continued).

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
2. Office Supplies & Miscellaneous Cost:					
- Stationery 20,000 Baht/Annum	20,000	22,000	24,200	26,620	29,282
- Paper 61,200 Baht/Annum	61,200	67,320	74,052	81,475	89,602
- Utility Cost 36,000 Baht/ Annum	36,000	39,600	43,560	47,916	52,707
- Miscellaneous Cost 24,000 Baht/Annum	24,000	26,400	29,040	31,944	35,138
Total Annual Office Supplies & Miscellaneous Cost	141,200	155,320	170,852	187,937	206,730
3. Maintenance Cost:					
- Server Maintenance Cost 1 Set @ 30,000 Baht /Annum	30,000	33,000	36,300	39,930	43,923
- Workstation Maintenance Cost 4 Set @ 3,200 Baht /Annum	3,200	3,520	3,872	4,260	4,686
Total Maintenance Cost	33,200	36,520	40,172	44,190	48,608
Total Annual Operating Cost	2,178,400	2,396,240	2,635,864	2,899,450	3,189,395
Total Annual System Cost	3,752,400	2,396,240	2,635,864	2,889,450	3,189,395

Table H.3. The Cost of the Candidate 2, Baht.

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost					
1. Hardware Cost					
- Computer Server 1 Set @ 300,000	300,000	-	-	-	-
- Workstation Full Option 1 Set @ 45,000	180,000	-	-	-	-
- Dot matrix printer	30,000	-	-	-	-
- Laser Printer	21,000	-	-	-	-
- UPS	100,000	-	-	-	-
- HUB 16 Ports	8,000	-	-	-	-
Total Hardware Cost	639,000	-	-	-	-
2. Software Cost					
- Server Software	80,000	-	-	-	-
- DBMS Development Software	50,000	-	-	-	-
- Client Software	100,000	-	-	-	-
Total Software Costs	230,000	-	-	-	-
3. People-Ware Cost					
- System Analyst 1 Person @ 4 Month @ 40,000 Baht	160,000	-	-	-	-
- Database Specialist 2 Persons @ 4 Month @ 40,000 Baht	320,000	-	-	-	-
- Programmer 3 Persons @ 4 Month @ 40,000 Baht	400,000	-	-	-	-
- Network Specialist 1 Person @ 1 Month @ 25,000 Baht	25,000	-	-	-	-
Total People-Ware Cost	905,000	-	-	-	-
4. Implementation Cost		-	-	-	-
- Training Cost	160,000				
- Installation Cost	50,000				
Total Implementation Cost	210,000	-	-	-	-
Total System Development Cost	1,984,000	-	-	-	-
		-	-	-	-
Operating Cost		-	-	-	-
1. Personnel Cost:					
- General Manager 1 Person @ 30,000 Baht/ Month	360,000	396,000	435,600	479,160	527,076
- Accounting Officers 2 Persons @ 10,000 Baht/Month	240,000	264,000	290,400	319,440	351,384
- Sales Officers 3 Persons @ 15,000 Baht/Month	540,000	594,000	653,400	718,740	790,614
- Inventory Officers 3 Persons @ 10,000 Baht/Month	360,000	396,000	435,600	479,160	527,076
- Temporary Staffs 7 Persons @ 6,000 Baht/Month	504,000	554,400	609,840	670,824	737,906
Total Annual Personnel Cost	2,004,000	2,204,400	2,424,840	2,667,324	2,934,056

Table H.3. The Cost of the Candidate 2, Baht (Continued).

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
2. Office Supplies & Miscellaneous Cost:					
- Stationery 20,000 Baht/Annum	20,000	22,000	24,200	26,620	29,282
- Paper 61,200 Baht/Annum	61,200	67,320	74,052	81,475	89,602
- Utility Cost 36,000 Baht/ Annum	36,000	39,600	43,560	47,916	52,707
- Miscellaneous Cost 24,000 Baht/Annum	24,000	26,400	29,040	31,944	35,138
Total Annual Office Supplies & Miscellaneous Cost	141,200	155,320	170,852	187,937	206,730
3. Maintenance Cost:					
- Server Maintenance Cost 1 Set @ 40,000 Baht /Annum	40,000	44,000	48,400	53,240	58,564
- Workstation Maintenance Cost 4 Set @ 4,000 Baht /Annum	4,000	4,400	4,840	5,324	5,864
Total Maintenance Cost	44,000	48,400	53,240	58,564	64,420
Total Annual Operating Cost	2,189,200	2,408,120	2,648,932	2,913,825	3,205,206
Total Annual System Cost	4,173,200	2,408,120	2,648,932	2,913,825	3,205,206

Table H.4. The Cost of the Candidate 3, Baht.

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost					
1. Hardware Cost					
- Computer Server 1 Set @ 300,000	300,000	-	-	-	-
- Workstation Full Option 1 Set @ 45,000	180,000	-	-	-	-
- Dot matrix printer	30,000	-	-	-	-
- Laser Printer	21,000	-	-	-	-
- UPS	100,000	-	-	-	-
- HUB 16 Ports	8,000	-	-	-	-
Total Hardware Cost	639,000	-	-	-	-
2. Software Cost					
- Server Software	30,000	-	-	-	-
- DBMS Development Software	40,000	-	-	-	-
- Client Software	80,000	-	-	-	-
Total Software Costs	150,000	-	-	-	-
3. People-Ware Cost					
- System Analyst 1 Person @ 4 Month @ 30,000 Baht	120,000	-	-	-	-
- Database Specialist 1 Persons @ 4 Month @ 35,000 Baht	140,000	-	-	-	-
- Programmer 4 Persons @ 4 Month @ 25,000 Baht	400,000	-	-	-	-
- Network Specialist 1 Person @ 1 Month @ 25,000 Baht	25,000	-	-	-	-
Total People-Ware Cost	685,000	-	-	-	-
4. Implementation Cost		-	-	-	-
- Training Cost	80,000				
- Installation Cost	50,000				
Total Implementation Cost	130,000	-	-	-	-
Total System Development Cost	1,604,000	-	-	-	-
		-	-	-	-
Operating Cost		-	-	-	-
1. Personnel Cost:					
- General Manager 1 Person @ 30,000 Baht/ Month	360,000	396,000	435,600	479,160	527,076
- Accounting Officers 2 Persons @ 10,000 Baht/Month	240,000	264,000	290,400	319,440	351,384
- Sales Officers 3 Persons @ 15,000 Baht/Month	540,000	594,000	653,400	718,740	790,614
- Inventory Officers 3 Persons @ 10,000 Baht/Month	360,000	396,000	435,600	479,160	527,076
- Temporary Staffs 7 Persons @ 6,000 Baht/Month	504,000	554,400	609,840	670,824	737,906
Total Annual Personnel Cost	2,004,000	2,204,400	2,424,840	2,667,324	2,934,056

Table H.4. The Cost of the Candidate 3, Baht (Continued).

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
2. Office Supplies & Miscellaneous Cost:					
- Stationery 20,000 Baht/Annum	20,000	22,000	24,200	26,620	29,282
- Paper 61,200 Baht/Annum	61,200	67,320	74,052	81,475	89,602
- Utility Cost 36,000 Baht/ Annum	36,000	39,600	43,560	47,916	52,707
- Miscellaneous Cost 24,000 Baht/Annum	24,000	26,400	29,040	31,944	35,138
Total Annual Office Supplies & Miscellaneous Cost	141,200	155,320	170,852	187,937	206,730
3. Maintenance Cost:					
- Server Maintenance Cost 1 Set @ 40,000 Baht /Annum	30,000	33,000	36,300	39,930	43,923
- Workstation Maintenance Cost 4 Set @ 4,000 Baht /Annum	4,000	4,400	4,840	5,324	5,864
Total Maintenance Cost	34,000	37,400	41,140	45,254	49787
Total Annual Operating Cost	2,179,200	2,397,120	2,636,832	2,900,515	3,190,566
Total Annual System Cost	3,783,200	2,397,120	2,636,832	2,900,515	3,190,566

Table H.5. Payback Period for the Candidate 1, Baht.

Cash flow Description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-1,574,000					
Operation & Maintenance Cost		-2,178,400	-2,396,240	-2,635,864	-2,899,450	-3,189,395
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost (adjusted to present value)	-1,574,000	-1,945,311	-1,909,803	-1,876,735	-1,844,050	-1,808,387
Cumulative time-adjusted costs over lifetime	-1,574,000	-3,519,311	-5,429,114	-7,305,850	-9,149,900	-10,958,287
Benefit derived from operation of New System:	0	2,804,800	3,085,280	3,393,808	3,733,189	4,106,508
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (current of present value)	0	2,504,686	2,458,968	2,416,391	2,374,308	2,328,390
Cumulative time-adjusted benefit over lifetime	0	2,504,686	4,963,655	7,380,046	9,754,354	12,082,744
Cumulative lifetime time-adjusted costs+benefit	-1,574,000	-1,014,625	-465,460	74,196	604,454	1,124,456

Table H.6. Payback Period for the Candidate 2, Baht.

Cash flow Description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-1,984,000					
Operation & Maintenance Cost		-2,189,200	-2,408,120	-2,648,932	-2,913,825	-3,205,208
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost (adjusted to present value)	-1,984,000	-1,954,956	-1,919,272	-1,886,040	-1,853,193	-1,817,353
Cumulative time-adjusted costs over lifetime	-1,984,000	-3,938,956	-5,858,227	-7,744,267	-9,597,460	-11,414,812
Benefit derived from operation of New System:	0	2,804,800	3,085,280	3,393,808	3,733,189	4,106,508
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (current of present value)	0	2,504,686	2,458,968	2,416,391	2,374,308	2,328,390
Cumulative time-adjusted benefit over lifetime	0	2,504,686	4,963,655	7,380,046	9,754,354	12,082,744
Cumulative lifetime time-adjusted costs+benefit	-1,984,000	-1,434,269	-894,573	-364,221	156,894	667,931

Table H.7. Payback Period for the Candidate 3, Baht.

Cash flow Description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-1,604,000					
Operation & Maintenance Cost		-2,179,200	-2,397,120	-2,636,832	-2,900,515	-3,190,567
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost (adjusted to present value)	-1,604,000	-1,946,026	-1,910,505	-1,877,424	-1,844,728	-1,809,051
Cumulative time-adjusted costs over lifetime	-1,604,000	-3,550,026	-5,460,530	-7,337,955	-9,182,682	-10,991,734
Benefit derived from operation of New System	0	2,804,800	3,085,280	3,393,808	3,733,189	4,106,508
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (current of present value)	0	2,504,686	2,458,968	2,416,391	2,374,308	2,328,390
Cumulative time-adjusted benefit over lifetime	0	2,504,686	4,963,655	7,380,046	9,754,354	12,082,744
Cumulative lifetime time-adjusted costs+benefit	-1,604,000	-1,045,339	-496,876	42,091	571,672	1,091,010

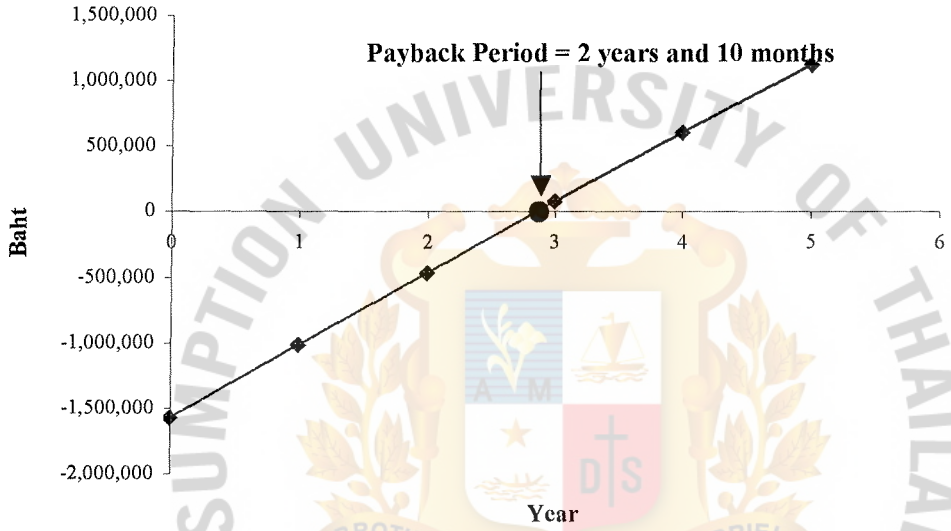

Figure H.1. Payback Period for the Candidate 1.

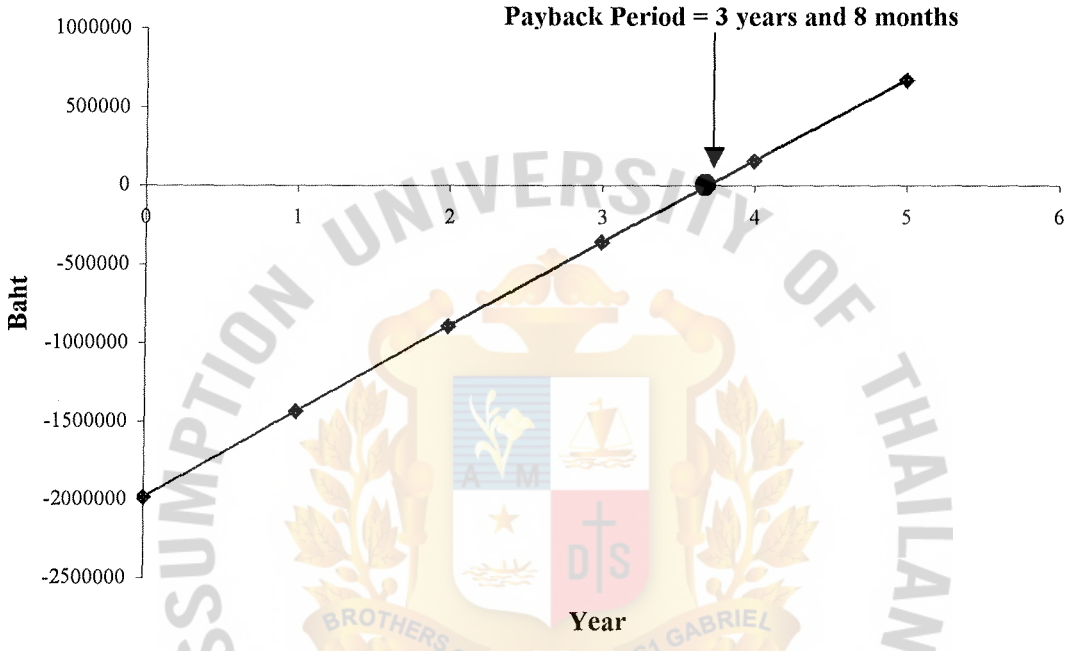

Figure H.2. Payback Period for the Candidate 2.

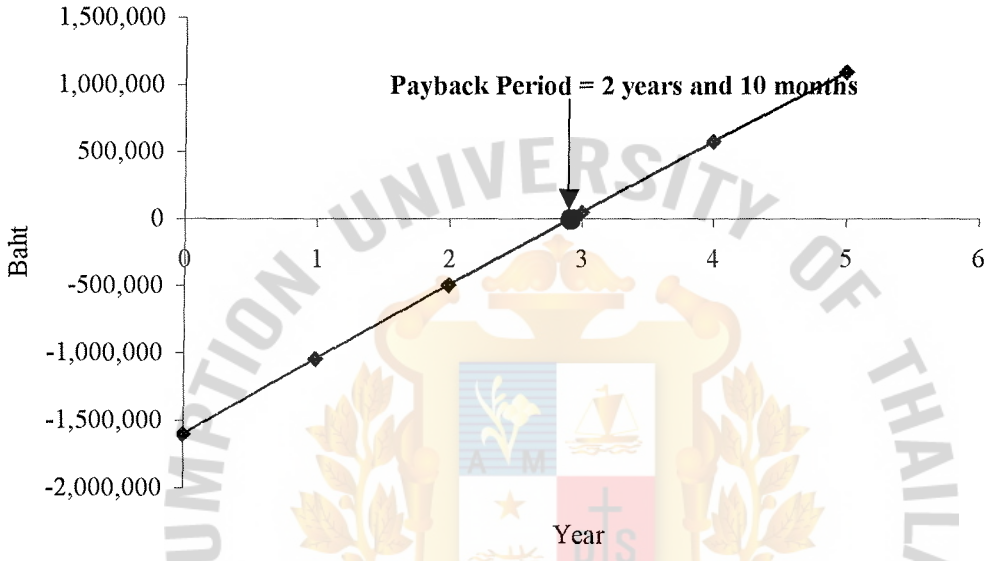

Figure H.3. Payback Period for the Candidate 3.

Table H.8. Net Present Value for the Candidate 1, Baht.

Cash flow Description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Development Cost	-1,574,000						
Operation & Maintenance Cost		-2,178,400	-2,396,240	-2,635,864	-2,899,450	-3,189,395	
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567	
Present Value of Annual Costs	-1,574,000	-1,945,311	-1,909,803	-1,876,735	-1,844,050	-1,808,387	
Total Present Value of lifetime Costs							-10,958,287
Benefit derived from operation of new system:	0	2,804,800	3,085,280	3,393,808	3,733,189	4,106,508	
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567	
Present Value of Annual Benefits	0	2,504,686	2,458,968	2,416,391	2,374,308	2,328,390	
Total Present Value of lifetime Benefits							12,082,744
NET PRESENT VALUE OF THIS ALTERNATIVE							**1,124,456**

Table H.9. Net Present Value for the Candidate 2, Baht.

Cash flow Description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Development Cost	-1,984,000						
Operation & Maintenance Cost		-2,196,400	-2,416,040	-2,657,644	-2,923,408	-3,215,749	
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567	
Present Value of Annual Costs	-1,984,000	-1,961,385	-1,925,584	-1,892,243	-1,859,288	-1,823,330	
Total Present Value of lifetime Costs							-11,445,829
Benefit derived from operation of new system:	0	2,804,800	3,085,280	3,393,808	3,733,189	4,106,508	
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567	
Present Value of Annual Benefits	0	2,504,686	2,458,968	2,416,391	2,374,308	2,328,390	
Total Present Value of lifetime Benefits							12,082,744
NET PRESENT VALUE OF THIS ALTERNATIVE							**636,915**

Table H.10. Net Present Value for the Candidate 3, Baht.

Cash flow Description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Development Cost	-1,604,000						
Operation & Maintenance Cost		-2,179,200	-2,397,120	-2,636,832	-2,900,515	-3,190,567	
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567	
Present Value of Annual Costs	-1,604,000	-1,946,026	-1,910,505	-1,877,424	-1,844,728	-1,809,051	
Total Present Value of lifetime Costs							-10,991,734
Benefit derived from operation of new system:	0	2,804,800	3,085,280	3,393,808	3,733,189	4,106,508	
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567	
Present Value of Annual Benefits	0	2,504,686	2,458,968	2,416,391	2,374,308	2,328,390	
Total Present Value of lifetime Benefits							12,082,744
NET PRESENT VALUE OF THIS ALTERNATIVE							**1,091,010**

APPENDIX I

STRUCTURE DESIGN

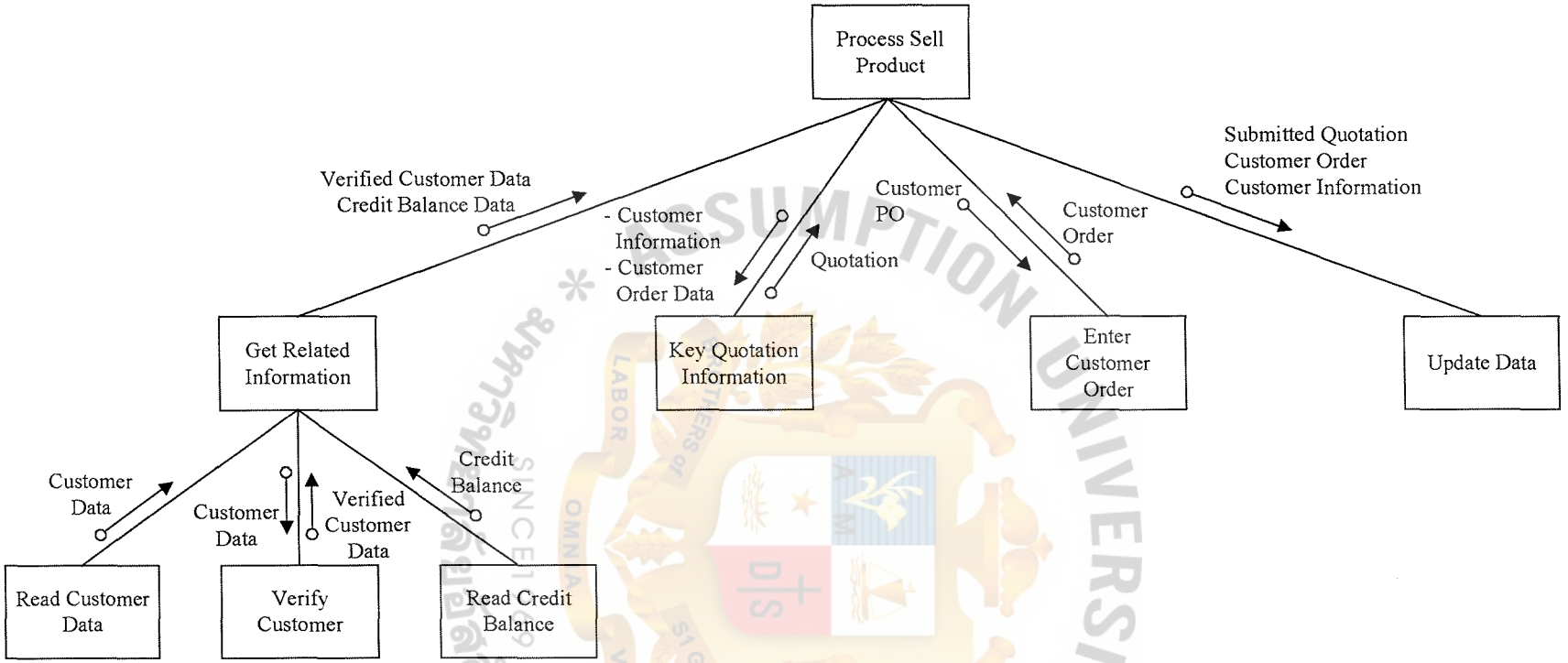

Figure I.1. Structure Chart of Sell Product.

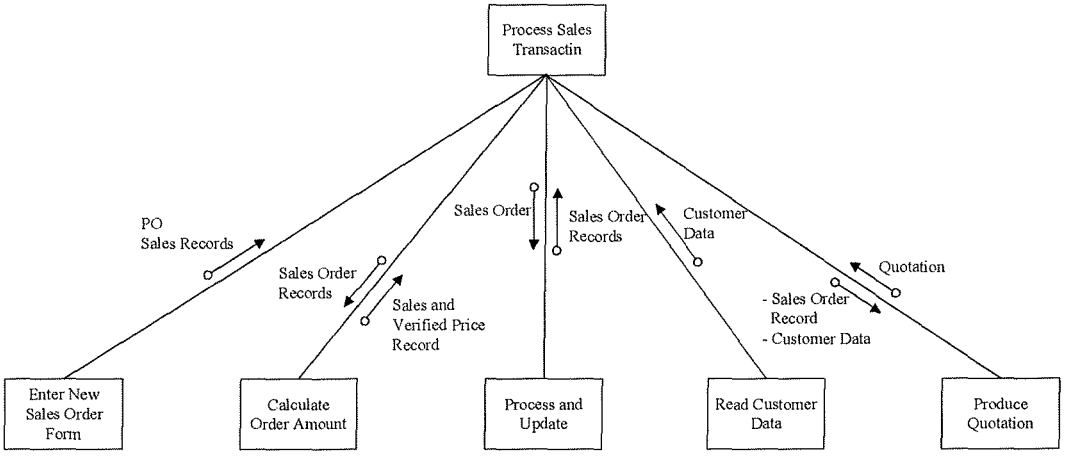

Figure I.2. Structure Chart of Sales Transaction.

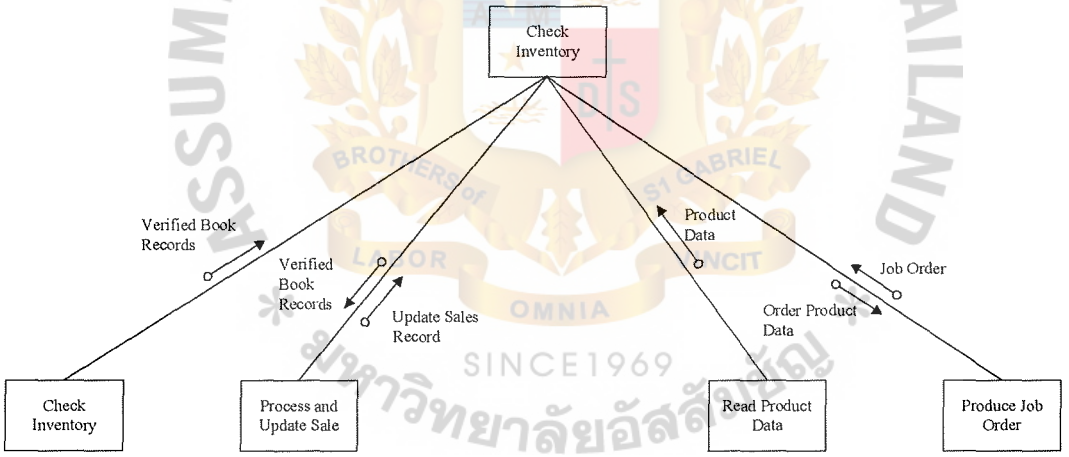

Figure I.3. Structure Chart of Check Inventory.

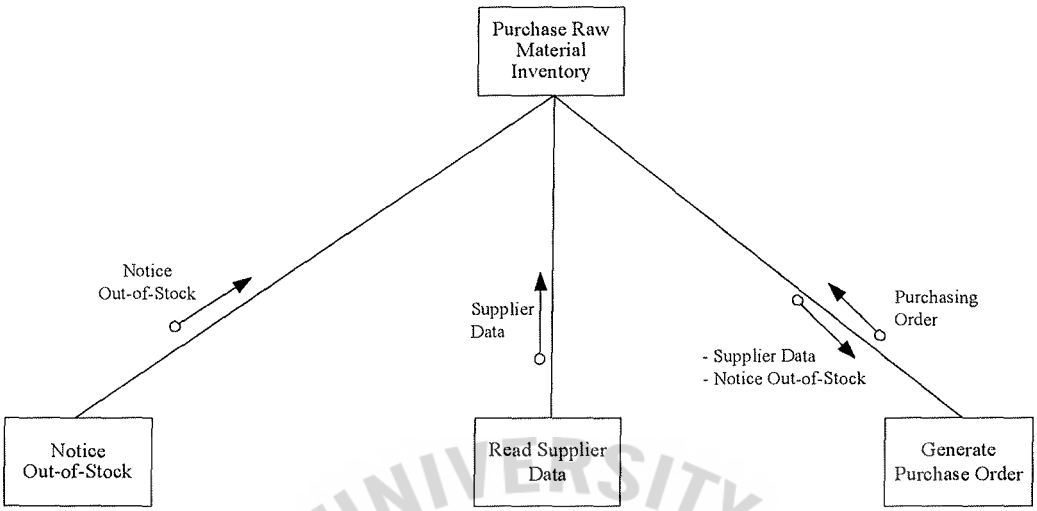

Figure I.4. Structure Chart of Purchase Raw Material Inventory.

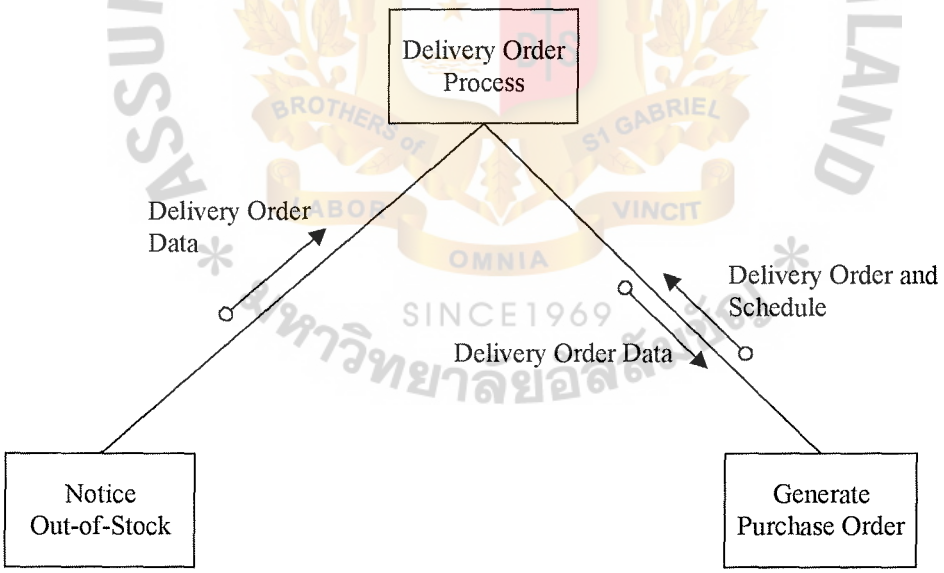

Figure I.5. Structure Chart of Delivery Order.

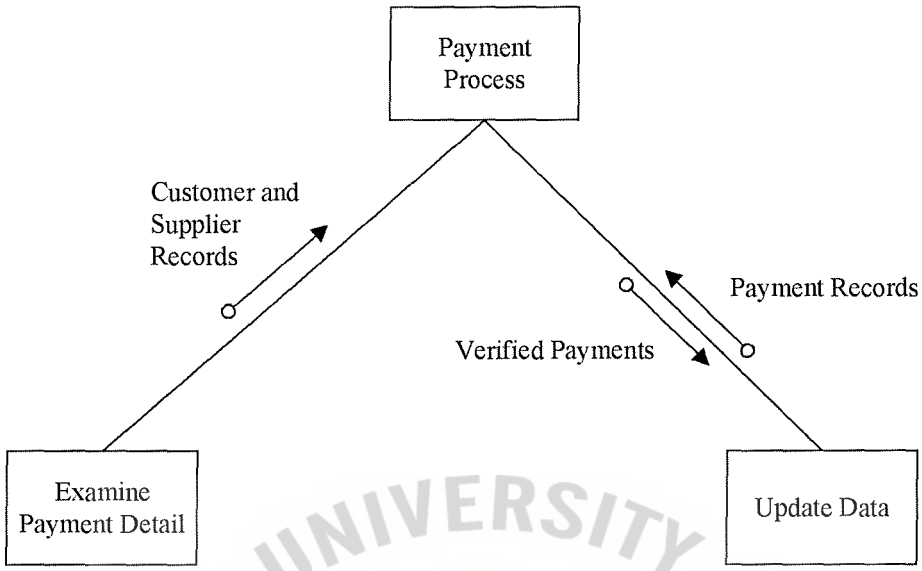

Figure I.6. Structure Chart of Payment.

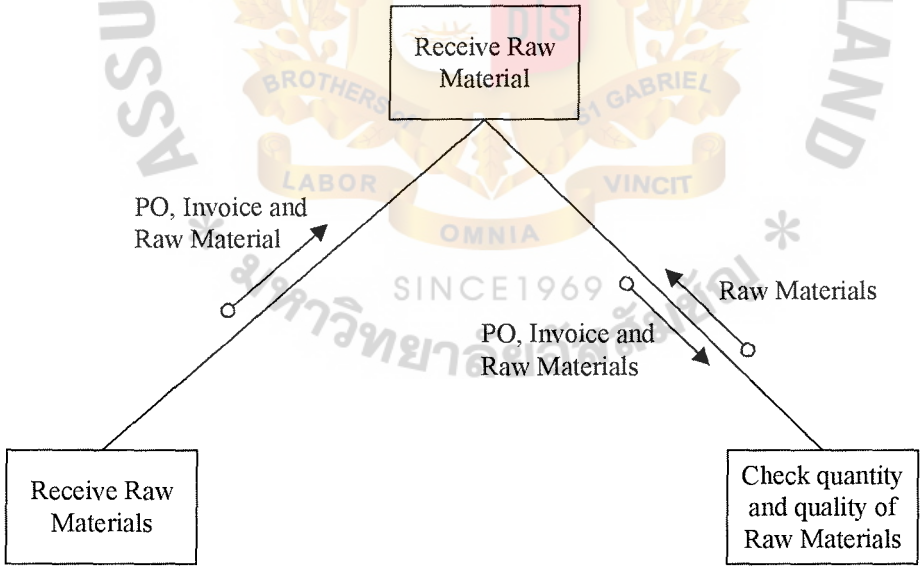

Figure I.7. Structure Chart of Receive Raw Material.

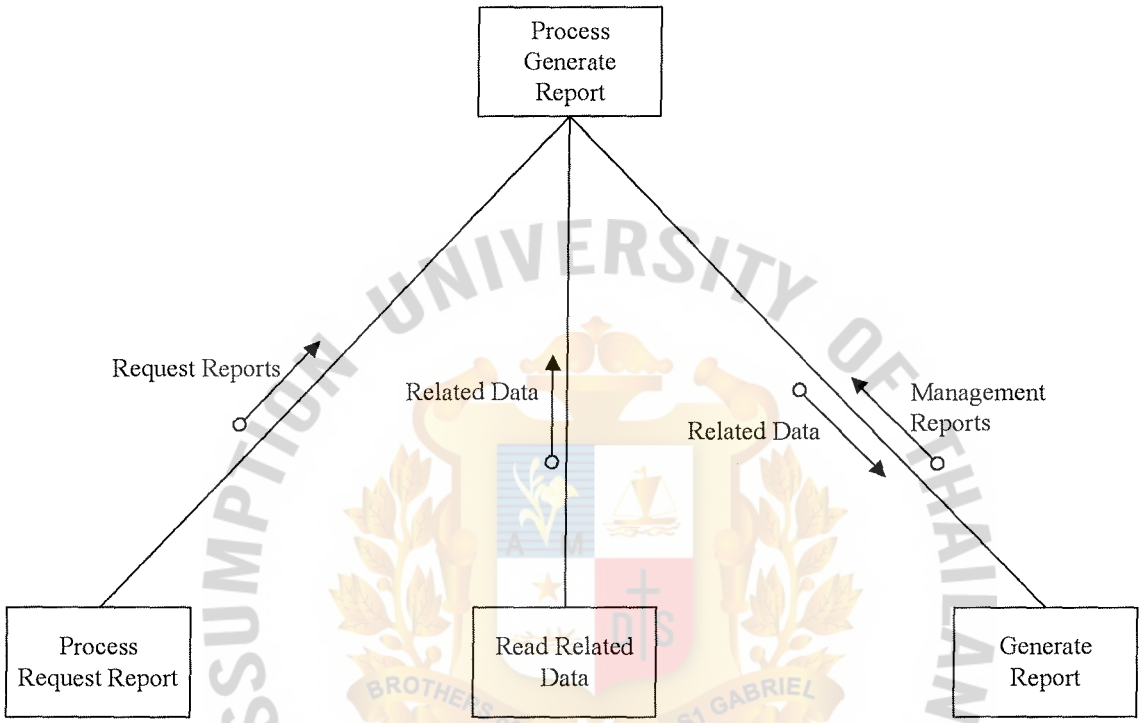

Figure I.8. Structure Chart of Generate Report.

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