PERSONNEL MANAGEMENT INFORMATION SYSTEM OF LOIDS NETWORKS SOLUTION THAILAND GROUP OF COMPANIES

by

Ms. Kamolwan Chumchaisri

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

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

March 2001

Sales Order System for Pharmacy Company

by
Ms. Kanlaya Sattomvilai

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Project Title	Sales Order System for Pharmacy Company
Name	Ms. Kanlaya Sattomvilai
Project Advisor	Dr. Ketchayong Skowratananont
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The Graduate School of Assumption University has approved this final report of the three-credit course, CS 6998 System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information Systems.

Approval Committee:

(Dr. Ketchayong Skowratananont)
Advisor

(Prof.Dr. Srisakdi Charmonman)
Chairman

(Air Marshal Dr. Chulit Meesajjee)
Dean and Co-advisor

(Asst.Prof.Dr. Vichit Avatchanakorn)
Member

(Assoc.Prof. Somchai Thayarnyong)
MUA Representative

March 2001

ABSTRACT

This project is a study which aims to develop sales order systems for supporting further growth. The existing information system is a manual based system. The study emphasized on the reduction of duplicated activities and increasing of control over all operations. From the study, it was found that the proposed system should be computerized information system.

As we know that the Internet is coming to everyday life so manual systems can not support all customer needs and not interact with customers. Present business has to support and interact with customers 24 hours a day, 7 days a week. Moreover using a computerized system can reduce many costs such as paper load and duplicate work costs. The system is also easy to manage and control a process of function according to our requirements. It also provides an information system for making decisions because information is an important weapon in the business world. The staff can give more accurate and up-to-date information to the executives with less time and helps to create more executive satisfaction.

MySQL is chosen as the development tool because it is not too expensive and can support the number of transactions. Furthermore it is easy to be used on modification as well as on interface between programs.

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To everybody, especially her parents who have given her the education since the writer was young until now so that she can finish her system development project at this time. Furthermore this system development project requires the cooperation of several persons.

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1.1 Background of the Project

Because of the decline in the economy, many businesses have to reduce cost and increase their competitive advantages. Internet is a channel that can solve these problems. In the present day, Internet becomes a part of our life. Whatever you want to do, you can do on the Internet. You can get many knowledge, entertainment or finding someone to talk to, and shopping.

Prima Pharmacy Co., Ltd. was founded in August 1999. It was located at 30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn. It distributed medicine to both wholesalers and retailers using telephone and facsimile to do sales order system. The business flow starts with receiving orders from customers, then they manually check inventory. If inventory is not available, they will issue purchase orders to suppliers. A manual system costs a lot of paper load and delays time use for checking inventory, so sometimes customers are not satisfied.

Prima Pharmacy considers to diversify from manual system to an on-line system through the supply chain although it has many threats in using on-line systems, e.g. legal, knowledge in medicine used. To reduce those restrictions, Prima Pharmacy decides to do B2B (Business to Business) electronic commerce. The company still has a storefront for the retailing system and uses a computerized system in the part of inventory checking.

1.2 Objectives of the Project

The objectives of this project are:

(1) To study the business process especially in pharmacy industry through a supply chain system.

(2) To increase, analytical skills in both business process and computer system and to practice systematic thinking.

(3) To add another distribution channel for pharmacy industry. On-line system gains customers' convenience in buying product and reduces cost of purchasing.

(4) To increase customer satisfaction by calculating lead-time of medicines for customers so company can gain competitive advantages.

(5) To improve company's performance, effectiveness and efficiency by minimizing delay time in order process.

(6) To build company's image by using new technology. Most customers trust a computer system more than a manual system.

(7) Minimize cost of paper because most documents are in electronic form. Cost of paper includes both order form and purchase order form.

(8) To collect medicine inventory in order to easily retrieve and check stock of available medicines. Furthermore, system can check medicines on delivery and allocate them.

1.3 Scope of the Project

Scope of this project is to develop web page for Prima Pharmacy Co., Ltd. Security system is also to be a part of the scope because the company sold on-line medicine when someone buys it, he must have the authorization. Each hospital has to register with Prima Pharmacy through the Internet. When customers visit Prima

Pharmacy's Web, they have to enter their username and password in order to do the order processing. While customers order, system will check the inventory of ordered medicine in order to see that the medicine(s) is/are available or not. If it is available, system will allocate that product. If it is not available, system will send the purchase order to the suppliers at the end of day. Inventory will be deducted when products have been sent to customers.

1.4 Deliverables

The deliverables for the supply chain system are as follows:

(1) An application that is developed by Perl and PHP programming.

(2) Screen layouts for user interface:

  (a) Web Interface for sales order system.

  (b) Verification page for security system.

  (c) Online stock status.

  (d) Online search engine for medicine product.

(3) Hard copy format

  (a) Product report that shown trade name, generic name and some descriptions.

  (b) Order and purchase order report.

  (c) Stock status report.

1.5 Project Plan

This project covers four months for analysis of existing system one month and a half, analysis of proposed system for one month, and implementation of proposed system for one month and a half. Project plan of Prima Pharmacy Co., Ltd. is shown in Figure 1.1.

No.	Task Name	November/2000				December/2000				January/2001				February/2001			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	I. Analysis of the Existing System																
1	Define the Objective and Scope																
2	Study the Existing System																
3	Identify the Existing Problems																
4	Develop Context Diagram																
5	Develop Data Flow Diagram																
6	Cost and Benefit Analysis																
	II. Analysis and Design of the Proposed System																
7	Web Interface Design																
8	Report Design																
9	Database Design																
10	Network Design																
	III. Implementation of the Proposed System																
11	Coding																
12	Testing																
13	Hardware Installation																
14	Software Installation																
15	Conversion																

Figure 1.1. Project Plan of Sales Order System.

II. THE EXISTING SYSTEM

The existing system is the current system that company would like to analyze in order to design the new system. System analysis will be done thorough system starts from background of the organization, current problems and area of improvements and a computer system (for Prima Pharmacy uses manual system).

2.1 Background of the Organization

Prima Pharmacy Co., Ltd. is a medium size medicine distributor in Thailand. It was founded on August 12, 1999. The head office is located in Bangpoo Industry Estate area, Samutprakarn. The share capital of the company is 30 Million baht. Company's product is medicine. So company sells products only for authorized people such as hospitals and patients who have doctor's prescriptions. Now the company sells products through storefronts for patients who have doctor's descriptions and receive order via telephone and fax for the hospital. In the future, company plans to sell through the Internet supplies that will be sold for hospitals that register with the company. The company's policy is to support customers with quality, price and delivery. The company has about 35 employees that work in four departments. Organization Chart for Prima Pharmacy Co., Ltd. is shown in Figure 2.1.

2.2 Existing Business Function

The company has four main departments as follows:

(1) Sales and Marketing Department: Focus on corporate customers and prepare well-trained sales and marketing teams who can respond to customers needs and wants. The responsibilities are order processing and sales order documents. It also plans in both short-term and long-term plans, and having contingency plans to support when some situations take place.

(2) Purchasing Department: This department takes care of purchasing control and inventory control process. The responsibilities are to check inventory in stock if they do not exist, then place purchase orders to appropriate suppliers and issue purchase order documents to accounting department.

(3) Accounting Department: This department is responsible for sales order documents purchasing order documents, journal ledger, and other financial documents for example; tax and invoice. It also plans for the budget in order to find the way to save cost to company.

(4) Human Resource Administration Department: This department is responsible for employers' fringe benefit, salary and training in order to reduce turn over rate in organization. Furthermore training can increase employers' knowledge and more specialized in their field. It is also responsible for the administration part, for example; customer service.

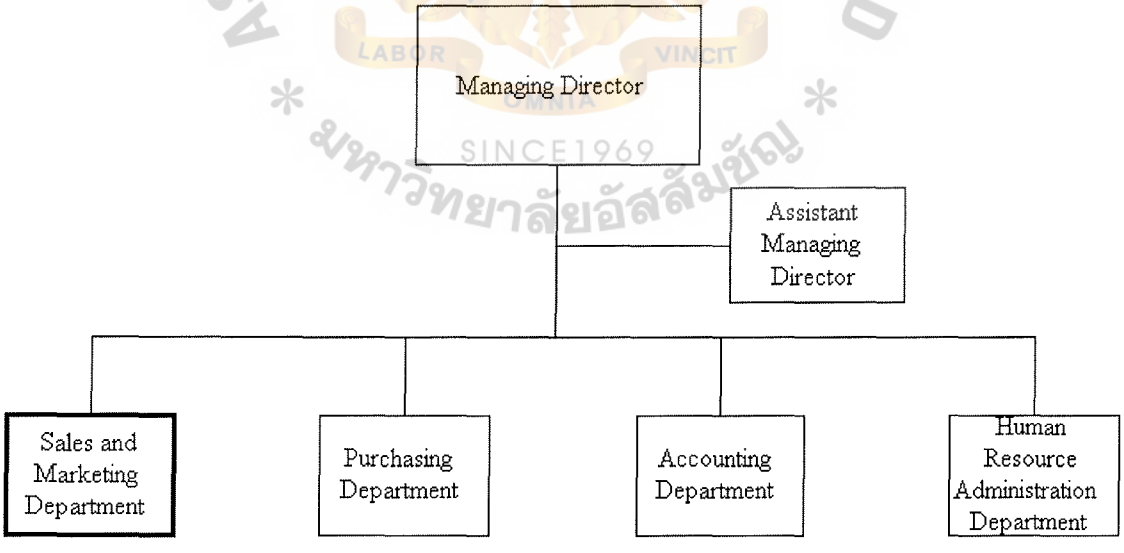

Figure 2.1. Organization Chart of Prima Pharmacy Co., Ltd.

2.3 Current Problems and Area for Improvements

2.3.1 Current Problems

The present company operated by manual system so many problems occur. Problems in company are as follows:

(1) The increase in number of customers and suppliers so when staff retrieves data, it spends much time because no customer and supplier database in computerized system. The result is customers are not satisfied.

(2) The response time for order process is very slow because of the manual system. When checking whether product available takes a lot of time, then customers are not satisfied.

(3) Cost in company that can be separated into two main points.

(a) The loaded paper work because documents are kept in paper form.

(b) Advertisement cost: The medical industry is rapidly growing so company has many competitors. Advertisement is the way that customers order medicines from the company.

2.3.2 Areas of Improvements

Company will change supply chain system into computerized system so areas of improvements are as follows:

(1) Create database for customer profile, supplier profile, and inventory in order to easily retrieve and reduce response time in order system.

(2) Develop Web site for company in order to reduce cost in both paper cost and advertisement cost. Because most documents are in electronic form, customers know company through this Web site.

2.4 Existing System

2.4.1 Existing System Process

Existing system of Prima Pharmacy is manual system and all processes are done manually. The processes are as follows:

Process 1: Customer Process

Customer process is the process that keeps customer profile and check customer credit when they ordered.

Process 2: Order Process

Order process is the process that receives order from customers then issue order report when customer confirms order.

Process 3: Inventory Process

This subsystem is responsible for inventory. When receiving order, staff will check for the product detail then checking for stocks available and update inventory detail when receiving new products or send products to customers.

Process 4: Purchasing Process

This process starts from receiving inventory detail, staff will check suppliers that can supply needed product then issue purchase order to that supplier.

The context data flow diagram of existing system is shown in Appendix A.

III. THE PROPOSED SYSTEM

The proposed system is designed to replace the existing manual system. The proposed computerized system will control all information of all sections, especially the inventory section.

3.1 System Specification

The system specifications for the proposed system are defined as follows:

(1) The staffs are able to view the current stock level of each product from computer.

(2) The staffs take less time to retrieve the required information such as supplier information, customer information, and inventory available.

(3) The proposed system can immediately cut stock when customer confirms order.

(4) The proposed system can identify users' access authority and allow only authorized persons to work on their authorized jobs.

(5) The proposed system can calculate the total amount of the products automatically when users submit order.

(6) The proposed system can show the historical and current quantity of each sold product on each day.

3.2 System Design

3.2.1 Application Architecture

(1) Network architecture

In the proposed system we have to have network in order to communicate both inside and outside the company. In the Client/Server we use the Distributed Database Computing (two-tiered client/server). It is a

database that is stored in more than one physical location. Parts or copies of the database are physically stored in one location and other parts are stored and maintained in other locations.

For the topology of the network architecture, we use the Star Topology. It is the network topology in which all computers are linked by a central host in a manner that passes data from host computer to client computer. This topology has a host so it is easy to manage and share data. The central host computer is very necessary because if it breaks down all of the network can not do the job.

Each computer in the network can not communicate directly because all computers have to communicate through host computer. So, in star topology, the connecting wire, cable, or optical fiber forms central host. Data are passed along the network from host computer to another and can send data to all client computers at the same time. Network configuration of proposed system is shown in Figure 3.1.

(2) Data Architecture

The proposed system uses the Distributed Relational Database System (Distributed RDBMS). It is a type of DBMS that is designed in relational data model. It is a type of logical database that treats data as if they were stored in two-dimensional tables. It can relate data stored in one table to data in another as long as the two tables share a common data element.

In database, we use data replication in order to store all data into all clients. When we want to update, delete, and insert, we do these activities in only one client. Then data are automatically changed.

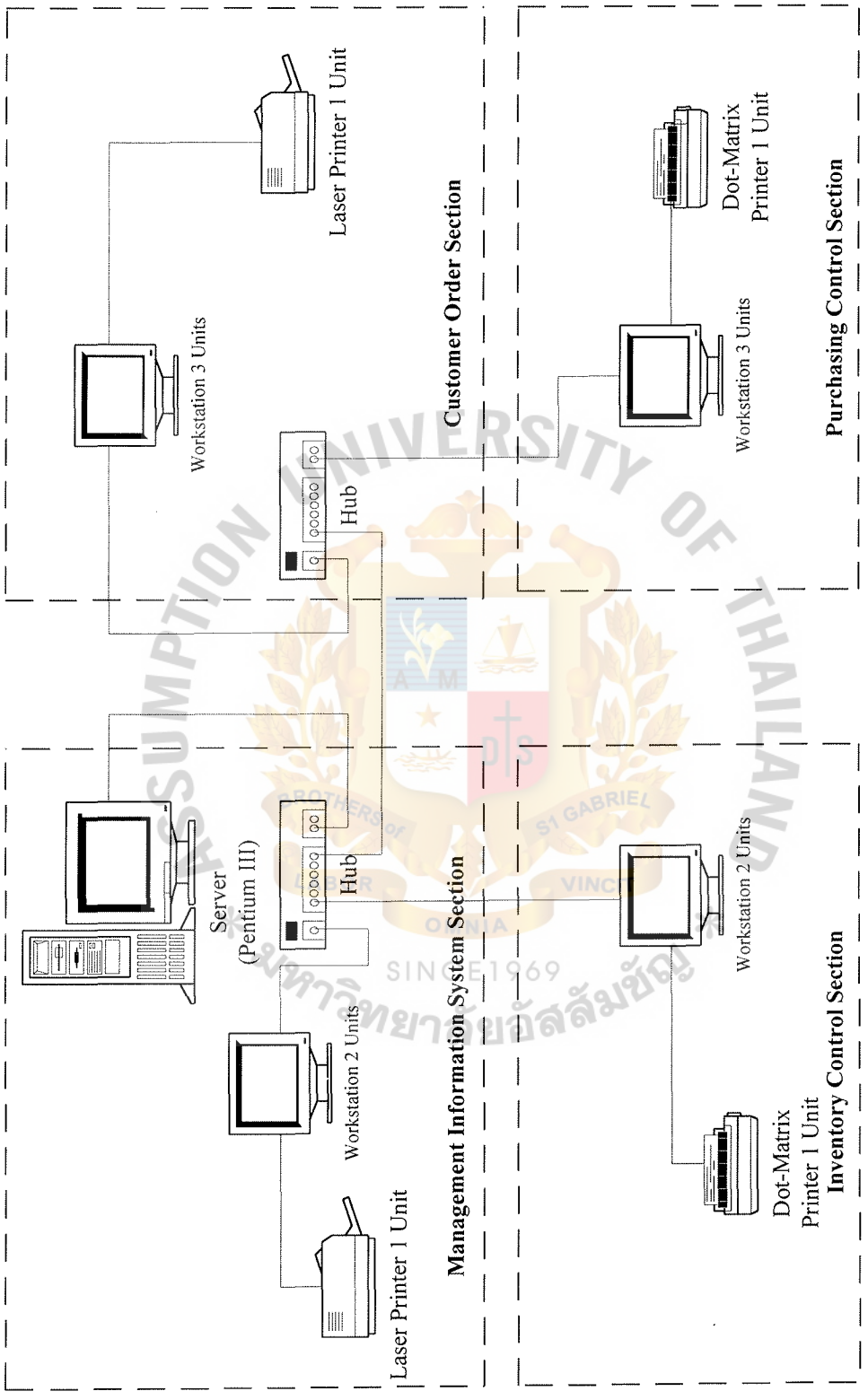

Figure 3.1. Network Configuration of Proposed System.

(3) Interface Architecture

In the proposed system, there are a number of information that need to be processed automatically by a computer. Since some of the information are very sensitive to changes it is important that editing has been made immediately in the system, such as the number of products in stock. Therefore the company will use on-line processing. Data are to be keyed in using keyboard.

(4) Process Architecture

To develop the proposed system, an application in terms of software language and tools will be developed, too. From the Network Architecture, the Two-Tiered Client/Sever is selected; the company will use MySQL for the client-based programming language to connect one or more server database engines. The programming language uses Perl and PHP programming to develop web page to link with MySQL.

3.2.2 Dataflow Diagram of Proposed System

The proposed system uses computerized system to meet user requirements and getting competitive advantages. The processes are as follows:

Process 1: Customer Order

(1) Receive customer profile

(2) Verify customer

(3) Query product

(4) Receive Customer Order

(5) Check credit available

(6) Check product in stock

(7) Confirm customer order

(8) Response out of stock

(9) Issue sales order report

Process 2: Inventory Control

(1) Receive supplier profile

(2) Add new item

(3) Update inventory

(4) Issue inventory report

Process 3: Purchasing Control

(1) Receive purchase order

(2) Select vendor

(3) Place purchase order

(4) Follow up purchase order

(5) Cancel purchase order

(6) Issue purchase order report

Process 4: Management Information System (MIS)

(1) Generate customer order report for manager

(2) Generate inventory control report for manager

(3) Generate purchasing control report for manager

3.2.3 Database Design

Database should be designed to meet Normalization that is a technique for organizing data attributes in the form that is stable, flexible, and adaptive entity. Normalization is a three-step technique that places data model into first normal form, second normal form and third normal form. They are described as follows:

(1) First Normal Form: This phase is to make sure that there is no repeating group in database design.

(2) Second Normal Form: To be in the second normal form it must be in first normal form with an addition that it is fully functional dependence. All non-key attributes (those that are not primary key) must be fully dependent in the primary key and not just part of it.

(3) Third Normal Form: To be in third normal form it must be in second normal form with an addition that there is no transitive FD. Transitive FD is when an attribute is dependent on a non-key attribute.

After normalizing our logical data model, our logical data model has already mapped in the third normal form. Database design for proposed system is shown in Appendix C and its data dictionary is shown in Appendix D.

3.2.4 Structure Design

This is the top-down hierarchy of modules. The result can be evaluated accordingly to ensure the best modular design for the program.

Structure chart is used to depict a modular design of a program. It shows how the program has been partitioned into smaller, more manageable module, organization of those modules and the communication interfaces between modules. Structure charts of program are shown in Appendix E. There are five structure charts for this program. They are customer profile, order processing, inventory control, purchasing control and management information system.

3.2.5 Input and Output Design

The output designs are shown in Appendix F and interfaces of input designs are shown in Appendix G.

3.3 Hardware and Software Requirement

The proposed specification consists of two parts that are hardware and software specifications.

3.3.1 Hardware Requirement

(1) Web Server 1 set

(a) CPU Intel Pentium III 500 MHz.

(b) SDRAM 128 MB Bus 100 MHz.

(c) Cache memory 512 MB

(d) Hard Disk 8.3 GB Seagate

(e) Medium Tower Case

(f) Disk Drive 1.44 MB

(g) CD ROM 40x

(h) Monitor 17" Super VGA Color-digital

(i) Keyboard 104 keys

(2) Workstation 10 sets

(a) CPU Celeron 450 MHz.

(b) RAM 16 MB

(c) Hard Disk 3.2 GB Seagate

(d) Mini Tower Case

(e) Disk Drive 1.44 MB

(f) CD ROM 32x

(g) Monitor 15" SVGA

(h) Keyboard 104 keys

(3) Printer

(a) Dot-matrix Printer (Epson LQ2170i 2 sets)

(b) Laser Printer (HP LaserJet 2 sets)

(4) Network Peripheral

(a) Hub 8 ports 2 sets

(b) Ethernet LAN card 10/100 Mbps.

3.3.2 Software Requirements

(1) Software specification for Server

(a) Operating System: Micorsoft Windows 98

(b) Web Server: Apache Server 1.3

(c) Application Server: Perl and PHP

(d) Database Server: MySQL

(2) Software specification for Client

(a) Operating System: Microsoft Windows 98

(b) Web browser: Microsoft Internet Explorer 5.0 or higher

(c) Application Software: Macromedia Dreamweaver

3.4 Security and Control

Security and control can be divided into three categories as follows:

3.4.1 Data Security

(1) Backup data everyday in order to prevent loss of data and to make recovery when data are damaged.

(2) Data integrity uses data replication in order to store all data into all clients. When we want to update, delete, and insert, we do these activities in only one client. Then data are automatically changed.

(3) Security logs of all changes made to data items.

3.4.2 Customer Security

(1) Every customer has to enter their username and password before order to prevent the unauthorized people to order.

(2) Staffs have limited in access to all data.

3.5 Cost/Benefit Analysis

3.5.1 Cost Analysis

(1) Cost of Manual System

Table 3.1. Manual System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
Fixed Cost					
Typewriter 5 units @ 9,000	9,000.00	9,000.00	9,000.00	9,000.00	9,000.00
Calculator 7 units @ 2,000	2,800.00	2,800.00	2,800.00	2,800.00	2,800.00
Total Fixed Cost	11,800.00	11,800.00	11,800.00	11,800.00	11,800.00
Opcrating Cost					
Salary Cost:					
Sales and Marketing Manager 1 person @ 25,000	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
Staff :					
Stock officer 6 persons @ 12,000	72,000.00	79,200.00	87,120.00	95,832.00	105,415.20
Customer service officer 3 persons @ 10,000	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
Total monthly salary Cost	127,000.00	139,700.00	153,670.00	169,037.00	185,940.70
Total Annual Salary Cost	1,524,000.00	1,676,400.00	1,844,040.00	2,028,444.00	2,231,288.40
Office Supplies & Miscellaneous Cost:					
Stationary Per Annual	20,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Paper Per Annual	60,000.00	66,000.00	72,600.00	79,860.00	87,846.00
Utility Per Annual	10,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Miscellaneous Per Annual	18,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Total Annual Office Supplies & Miscellaneous Cost	108,000.00	118,800.00	130,680.00	143,748.00	158,122.80
Total Annual Operating Cost	1,632,000.00	1,795,200.00	1,974,720.00	2,172,192.00	2,389,411.20
Total Manual System Cost	1,643,800.00	1,807,000.00	1,986,520.00	2,183,992.00	2,401,211.20

Table 3.2. Five Years Accumulated Manual System Cost, Baht.

Year	Total Manual Cost	Accumulated Cost
1	1,643,800.00	1,649,800.00
2	1,807,000.00	3,450,800.00
3	1,986,520.00	5,437,320.00
4	2,183,992.00	7,621,312.00
5	2,401,211.20	10,022,523.20
Total	10,022,523.20	—

(2) Costs of Computerized System

There are three alternative candidates for proposed system. Each candidate has a different cost. The Candidate matrix is shown in Table 3.3 and Alternative candidate requirement analysis is in Table 3.4. The feasibility analysis matrix in Table 3.5 shows that candidate 1 is chosen as the proposed system. Feasibility analysis for all candidates are as follows:

(a) Candidate 1: Using IBM computer with Pentium III processor that is well accepted by all management and using Microsoft Windows98 as operating system because it is very familiar with user. Using Apache server as web server because it is a common server that is used for the web. Furthermore using MySQL as DBMS because it has not too much cost and is well-known for web development DBMS. Macromedia Dreamweaver is the software tool for developing web page because it has a lot of features that support dynamic web pages.

(b) Candidate 2: Using IBM computer with Pentium III processor that is well accepted by all management and using Microsoft Windows NT as operating system because it has many functions that is used for developing web pages. Using Microsoft Internet Information System

as web server because it is the web server that is a package with Microsoft Windows NT operating system. Furthermore using Oracle 7.0 as DBMS because it has a lot features for the web and it is a good DBMS, but too much cost. Microsoft FrontPage is the software tool for developing web page.

(c) Candidate 3: Using AMD computer with AMD processor that is not widely used and using Linux as operating system, it has a lower cost and more flexible but it is a new operating system so it is not familiar with user. Using Apache server as web server because it is a common server that is used for the web. Furthermore using Microsoft Access 97 as DBMS because it has a lower cost and is familiar with user but it can not manage data as good as the real DBMS; like MySQL or Oracle. EditPlus is the software tool for developing web page because it can self-check for errors from programming and has specific color for each demand so it is easier for programmer but it hard to develop web pages from this software.

Table 3.3. Candidate Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized : A description of the portion of the computerized system.	Inventory control process.	Express package form business software.	Express package form business software.
Benefit: The benefit of each alternative that the company should consider in order to make decision.	To gain competitive advantage and fasten processing.	To support business process.	To support business process.
Servers and Workstations: The needs of server and workstation to support alternatives.	Pentium III 500 MHz., RAM 128 MB for server, Pentium Celeron 500 MHz., RAM 64 MB for client.	Pentium III 500 MHz., RAM 128 MB for server, Pentium Celeron 500 MHz., RAM 64 MB for client.	AMD Athlon 500 MHz., RAM 128 MB for server, AMD K6-3 450 MHz., RAM 64 MB for client.
Software Tools Needed: Tools needed for facilitating each candidate such as computer programming languages.	Internet Explorer Macromedia Dreamweaver Apache server Microsoft Windows 98.	Internet Explorer Microsoft FrontPage Microsoft Internet Information System 2.0 Microsoft WindowsNT.	Netscape Navigator EditPlus Apache server Linux.
Method of Data Processing: An alternative solution to data processing.	Client/Server.	Client/Server.	Client/Server.
Output Devices and Implications: The devices that will be used to show, present as well as document information.	HP LaserJet 6MP with Jetdirect EPSON LQ217i.	HP LaserJet 6MP with Jetdirect EPSON LQ217i.	HP LaserJet 6MP with Jetdirect EPSON LQ217i.
Input Devices with Implications: A device that will be used to enter data into the system in order to store or process.	Keyboard and mouse.	Keyboard and mouse.	Keyboard and mouse.
Storage Devices and Implications: A description of the storage device that will allow information to be retrieved from databases.	MySQL.	Oracle 7.0.	Microsoft Access 97.
Training: A description of the alternative way of training and preparing our personnel for the new system.	To train the actual employees in company.	To train the new employees who have some knowledge.	To train the actual employees in company.
Technical Staff: A description of the alternative way for the company to hire the people who have the knowledge about the new technology.	To hire the new employees who have the knowledge.	Actual employees in company.	To hire the new employees who have the knowledge.

Table 3.4. Alternative Candidate Requirement Analysis.

Characteristic	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized			
- Inventory Control Process	X		
- Express Package		X	X
Benefit			
- Competitive advantage	X		
- Support business process		X	X
Server			
- Pentium III 500 MHz.	X	X	
- AMD Athlon 500 MHz.			X
Workstation			
- Pentium Celeron 500 MHz.	X	X	
- AMD K6-3 450 MHz.			X
Operation System			
- Microsoft Windows 98	X		
- Microsoft WindowsNT		X	
- Linux			X
Software Tools			
- Internet Explorer	X	X	
- Netscape Navigator			X
- Macrmedia Dreamweaver	X		
- Microsoft Frontpage		X	
- EditPlus			X
- Apache server	X		X
- Microsoft Internet Information System		X	
Method of Data Processing			
- Client/Server	X	X	X
Output Devices and Implications			
- HP LaserJet 6 MP	X	X	X
- EPSON LQ217i	X	X	X
Input Devices and Implications			
- Keyboard	X	X	X
- Mouse	X	X	X
Storage Devices and Implications			
- MySQL	X		
- Oracle 7.0		X	
- Microsoft Access 97			X

Table 3.5. Feasibility Analysis Matrix.

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility Functionality: A description of to what degree the candidate would benefits the organization. Political: A description of how well received this solution would be. Usability: A description of users ease of learning and use as well as satisfaction.	30%	The candidate supports all business requirements. IBM well accepted by all management since it is recommended by system development. Windows 98, most familiar compare to Linux, but not flexible. Score: 95	The candidate supports all business requirements. IBM well accepted by all management since it is recommended by system development. Windows NT has more function for Web Development, but users do not get use to it. Score: 100	The candidate supports all business requirements. AMD, not recommended by system development team but has lower price. Linux is the free operating system and more flexibility. Edit Plus is not help too many in developing web pages. Score: 70
Technical Feasibility Technology: A description of the maturity of the technology used in each candidate. Expertise: An assessment of the technical expertise needed to develop, operate, and maintain the candidate system.	30%	Pentium III is widely accepted and supported by various computers. The technical aspect of this candidate has been developed for some times and its has reached its maturity stage. Employees will have the experience supporting the developed system. Score: 90	Pentium III is widely accepted and supported by various computers. The technical aspect of this candidate has been developed for some times and its has reached its maturity stage. Current employees are promoted and trained to support the system, they may not have any on hand experience. Score: 90	AMD is not as widely used compare to Pentium III but its performance is comparable to it. However not as much computer components support it compare to Pentium III. Employees will have the experience supporting the developed system. Score: 75
Economic Feasibility Cost to Develop (Baht): Payback Period: Net Present Value	30%	952,000.00 2 years 1,787,397.88 Score: 95	2,018,500.00 4 years 8 months 176,372.69 Score: 70	911,000.00 1 year 11 months 4,616,568.49 Score: 100
Schedule Feasibility An assessment of how long the solution will take to design and implement.	10%	6 months Score: 90	7 months Score: 80	5 months Score: 100
Ranking	100%	93.00%	86.00%	83.50%

Table 3.6. Computerized System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
Fixed Cost					
Hardware Cost:					
Computer Server Cost	20,000.00	20,000.00	20,000.00	20,000.00	20,000.00
Workstation Cost	52,000.00	52,000.00	52,000.00	52,000.00	52,000.00
Printer Cost	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00
Total Hardware Cost	84,000.00	84,000.00	84,000.00	84,000.00	84,000.00
Maintenance Cost:					
Computer Maintenance	32,000.00	32,000.00	32,000.00	32,000.00	32,000.00
Web Pages Maintenance	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00
Total Maintenance Cost	37,000.00	37,000.00	37,000.00	37,000.00	37,000.00
Software Cost:					
Computer Server Cost	–	–	–	–	–
Network Cost	16,000.00	16,000.00	16,000.00	16,000.00	16,000.00
Software Tool Cost	16,000.00	16,000.00	16,000.00	16,000.00	16,000.00
Total Software Cost	32,000.00	32,000.00	32,000.00	32,000.00	32,000.00
Implementation Cost:					
Advanced Training Cost	49,000.00	–	–	–	–
Basic Training Cost	21,000.00	–	–	–	–
Set up Cost	2,000.00	–	–	–	–
Total Implementation Cost	72,000.00	–	–	–	–
People-Ware Cost:					
System Analyst 1 person @ 30,000 (4 months)	120,000.00	–	–	–	–
Programmer 2 persons @ 20,000 (2 months)	80,000.00	–	–	–	–
IT Specialist 1 person @ 25,000 (4 months)	100,000.00	–	–	–	–
Total People-Ware Cost	300,000.00	–	–	–	–
Total Fixed Cost	525,000.00	153,000.00	153,000.00	153,000.00	153,000.00
Operating Cost					
People-Ware Cost:					
Sales and Marketing Manager 1 person @ 25,000	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
Staff:					
IT Specialist 1 person @ 25,000	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
IT Specialist Assistant 1 person @ 15,000	15,000.00	16,500.00	18,150.00	19,965.00	21,961.50
Stock Officer 2 persons @ 12,000	24,000.00	39,600.00	43,560.00	47,916.00	52,707.60
Customer Service Officer 2 persons @ 10,000	20,000.00	22,000.00	24,200.00	26,620.00	29,282.00
Total Monthly Salary Cost	109,000.00	119,900.00	131,890.00	145,079.00	159,586.90
Total Annual Salary Cost	1,308,000.00	1,438,800.00	1,582,680.00	1,740,948.00	1,915,043.00
Office Supplies & Miscellaneous Cost:					
Stationary 1,000 per month	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
Paper 1,000 per month	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
Utility Cost 1,000 per month	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
Miscellaneous 1,000 per month	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
Annual Office Supplies & Miscellaneous Cost	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Total Operating Cost	1,356,000.00	1,491,600.00	1,640,760.00	1,804,836.00	1,985319.60
Total Computerized System Cost	1,881,000.00	1,644,600.00	1,793,760.00	1,957,836.00	2,138319.60

Table 3.7. Five Years Accumulated Computerized Cost, Baht.

Year	Total Computerized Cost	Accumulated Cost
1	1,881,000.00	1,881,000.00
2	1,644,600.00	3,525,600.00
3	1,793,760.00	5,319,360.00
4	1,957,836.00	7,277,196.00
5	2,138,319.60	9,415,515.60
Total	9,415,515.60	—

3.5.2 Benefit Analysis

Benefit analysis can be divided into two categories, tangible benefits and intangible benefits is shown as follows:

(1) Tangible Benefits: This type of benefit can be measured in value. The proposed system has annual benefits from the following:

(a) Reduction of stationary and paper usage 3,000 baht

(b) Reduction of human labor

– Salary 12,000 baht * 10 persons 1,440,000 baht

– Salary 10,000 baht * 3 persons 360,000 baht

(c) Reduction of duplicate work (700 hours @ 50 baht) 39,000 baht

(d) Reduction of Information Look up (500 hours @ 50 baht) 25,000 baht

Total Tangible Benefits 1,864,000 baht

(2) Intangible Benefits: This type of benefit is difficult or impossible to quantify in value. The proposed system provides the intangible benefits, which are summarized as follows:

(a) Improving customer goodwill. The proposed system provides quick and efficient services for customers. The customers receive goods correctly and quickly. Not only keeping old customer, company can also penetrate to adding new customers.

(b) Up-to-date and accurate information/reports to support decision-making.

(c) Reduce duplicate work so staff can easily work and increase speed of daily operation.

(d) Reducing human error from working such as cutting stock.

3.5.3 Payback Analysis

Payback analysis is a technique for determining if and when an investment will pay for itself. On the other hand, it determines how much time will lapse before accrued benefits overtake accrued and continuing costs. This period of time is called the payback period. The payback period can be calculated as following:

$$P = L + \frac{C}{A}$$

Where P = Payback period

L = Last year of negative cash flow difference

C = Cumulative difference last negative year

A = Absolute value of cumulative difference

The payback period of the proposed system can be calculated as follows:

L = 2 years

C = 8,226.76 baht

A = 536,547.93 baht

$$P = 2 + \frac{8,226.76}{536,547.93}$$

$$P = 2.01 \text{ years}$$

The payback period of the proposed system is 2.01 years. Payback analysis and Payback period for all candidates are shown in Appendix H.

3.5.4 Net Present Value (NPV)

Net Present Value is a sophisticated capital budgeting technique, which is calculated by subtracting the project's initial investment from the present value of cash inflows discounted at a rate to the firm's cost of capital. If NPV is positive, investment is good. Otherwise, the investment is bad. The basic formula for NPV is as follows:

$$NPV = \frac{R}{(1+k)^1} + ... + \frac{R}{(1+k)^n} - PV$$

Where

NPV = Net Present Value

PV = Cost of the new system

R = Annual cash flows (saving)

N = Number of years

K = Annual rate of interest

NPV of proposed system can be calculated as follows:

PV = 7,975,366.48 baht

R = 1,864,000 baht (increase 10% per annual)

N = 5 years

K = 5%

$$NPV = \frac{R}{(1+k)^1} + ... + \frac{R}{(1+k)^n} - PV$$

$$NPV = \frac{1,864,000}{(1+0.05)^1} + \frac{2,050,400}{(1+0.05)^2} + \frac{2,255,400}{(1+0.05)^3} + \frac{2,480,984}{(1+0.05)^4} + \frac{2,729,082}{(1+0.05)^5} - 3,069,300$$

NPV = 1,787,397.88 baht

NPV for proposed system is 1,787,397.88 baht.

3.5.5 Breakeven Analysis

Breakeven analysis is a technique, which is used to find the period that accumulative cost of current system is equal to accumulate cost of new system. The point that they are equal is called breakeven point. The comparison of the system costs between computerized cost and manual cost is shown in Table 3.8. Breakeven point between current system and proposed system is shown in Figure 3.2.

Table 3.8. The Comparison of the System Costs, Baht.

Year	Accumulated Manual Cost	Accumulated Computerized Cost
1	1,643,800.00	1,881,000.00
2	3,450,800.00	3,525,600.00
3	5,437,320.00	5,319,360.00
4	7,621,312.00	7,277,196.00
5	10,022,523.00	9,415,515.60

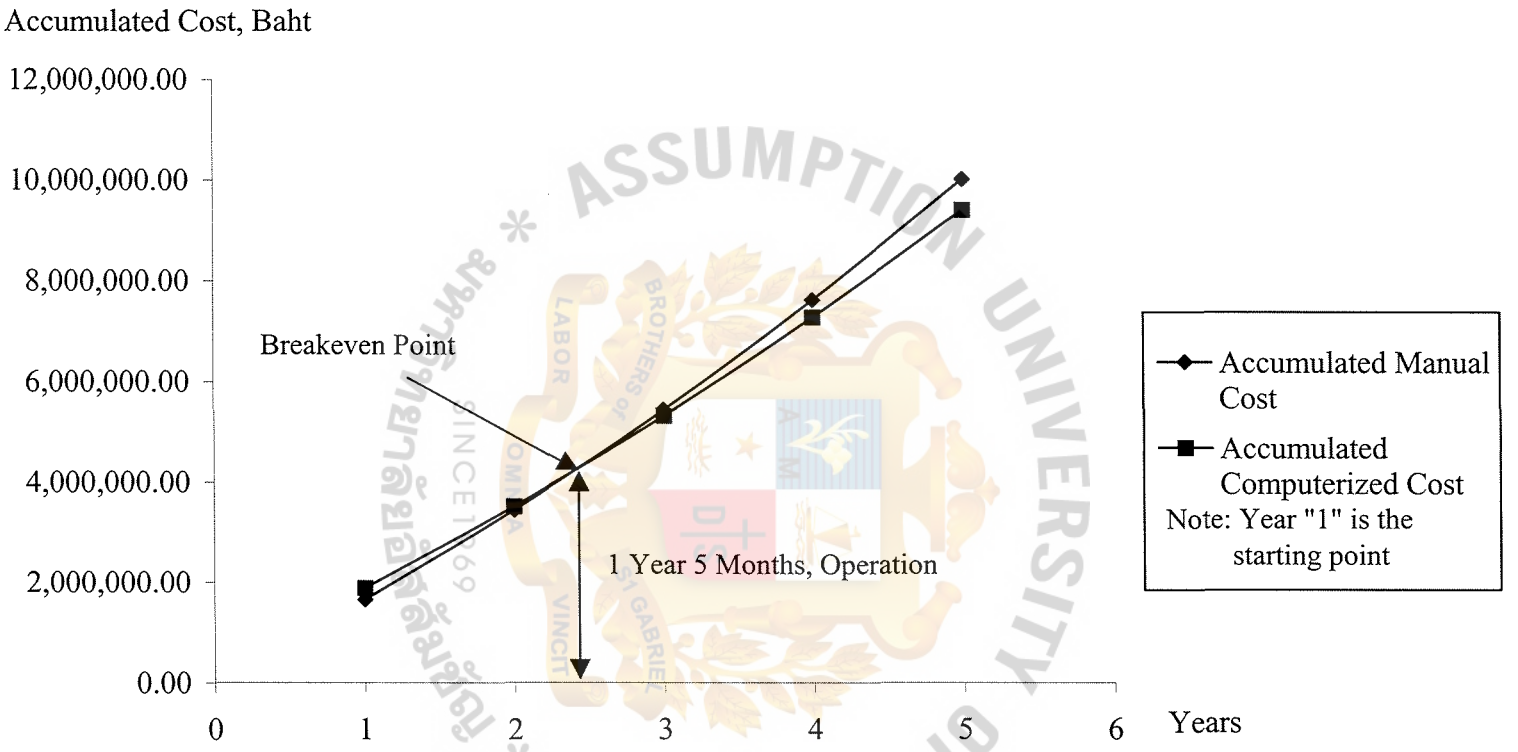

Figure 3.2. Cost Comparison between Manual and Computerized System.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

System implementation is the construction of the new system and the delivery of that system into production (day-to-day operation). The purpose of the system implementation is to build and test a functional system that fulfills business and design requirements and to smoothly convert from the old system to the proposed system. The system implementation activities are testing, training, and conversion.

4.2 Test Plan

The testing system is the final step before the new system will be on production. There are many topics of testing as follows:

4.2.1 Network Testing

(1) Review the network design outline.

(2) Construct and then test new network.

(3) Revise network specification for future reference.

4.2.2 Database Testing

(1) MySQL testing for database server testing.

4.2.3 Program Testing

(1) Conduct system testing to make sure that all programs work properly. If the program does not work correctly or the procedures are not the needed output, the programmer must debug or rewrite the programs and continue testing until they operate correctly and properly.

(2) Update the project repository with revised program documentation for future reference.

(3) Place the new program and reusable components on the software library.

4.2.4 Security and Control Testing

(1) User logging and system authentication.

(2) Access level testing.

4.3 Training

Training involves system operators and users who will use the proposed system either by providing data, receiving information, or actually operating the equipment. The activities are as follows:

(1) Collect documentation that may be useful in developing user documentation and training guide.

(2) Write user documentation manuals that are clearly understood.

(3) Review user training.

4.4 Conversion

Conversion is the step for converting system, from old system to proposed system. It is a significant step. There are many methods for system conversion. This system, uses parallel conversion. Both old and new system will be operated for a while. This is done to ensure that when the proposed system does not correctly work, there is the old system to support operation. Then we have time to solve proposed system's problems. All major problem will be solved before the old system is discarded.

Parallel conversion minimizes the risk of proposed system's problem causing irreparable harm to the business. Although it increases cost of running two systems over the same period and consumes more time with double workload of employees, it is suitable for converting from manual system to computerized system as this system.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In the present business, there are many factors that affect business and those factors change everyday so business should manage a dynamic system in order to survive and be stable.

First of all, the developer should meet customers' need because customers are the Gods. The developer does the same business but increase a new channel to service customers all the time. Customers can order whenever they want and can know their available credits to plan for their financial transactions. To convince the customers, the developer should upgrade himself both in working performance and quality of work.

Computerized system can replace the existing system to work with high performance and more productivity especially in customer order process because it helps manage to solve the problem. The important advantage is providing just in time to support the management in making decisions and planning for the new strategies among many competitors. Moreover, related staff is provided the full training course to operate the computerized system smoothly.

The developer should reduce cost and gain competitive advantages. The proposed system runs on the web; that is the best way to achieve those goals because it is cheaper than having storefronts. Payback period for proposed system is two years and breakeven point is one year and five months that are the appropriate periods to develop a system.

Finally we can conclude that computer information system has the advantage for management in planning, organizing, staffing and controlling. The proposed system is more efficient and effective than the existing system, see Table 5.1.

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

Process	Existing System	Proposed System
Customer Order Process	40 minutes	10 minutes
Inventory Control Process	30 minutes	15 minutes
Purchasing Control Process	45 minutes	15 minutes
Management Information System Process	40 minutes	15 minutes
Total	2 hours 35 minutes	55 minutes

From Table 5.1, the proposed system can save times about one hour and forty minutes. Customer order process can save seventy five percent of time; there are many reasons like no quotation process. Furthermore the existing system operates manually in checking product in stock, customer's profile and credit whereas the proposed system operates in computerized. Inventory control process the proposed system can save fifty percent of time because it easy to add or update inventory by computerized. Moreover it is easy to manage inventory database. Purchasing control process can save sixty six percent of time because of select vendor process, follow up and cancel purchase order process. It is easy to compare and choose the appropriate supplier by computerized system. Management information system process can save sixty three percent of time because the proposed system can generate report for an executive to make decisions. It is more precisely and timely than existing system.

5.2 Recommendations

To enhance the computerization in the work flow. The recommendations are:

5.2.1 Developing System Good Response and More Interactive Technique

For the design work, if customers would like to edit their orders after sending orders, the system can support that request by allowing customers to edit on summary order page and make the new summary order to customers. Furthermore the system

order page and make the new summary order to customers. Furthermore the system should send news to customer via e-mail like mailing news in order that customers can be reminded to think of Prima Pharmacy Co., Ltd. all the time.

5.2.2 Using Tracking System

Tracking system is the system that allows customers to track the status of ordered products. It is valuable in many cases such as when there are errors on ordered products or when customers would like to change addresses of receivers, business can support those problems.

5.2.3 Developing System to WAP

WAP is not new technology but it is the in-trend technology that businesses should consider, because WAP is also the new channel of today business, customers can order products via wireless application. The benefits are gaining business good views and customer satisfactions and increasing efficiency and sales volume.

APPENDIX A

DATA FLOW DIAGRAM

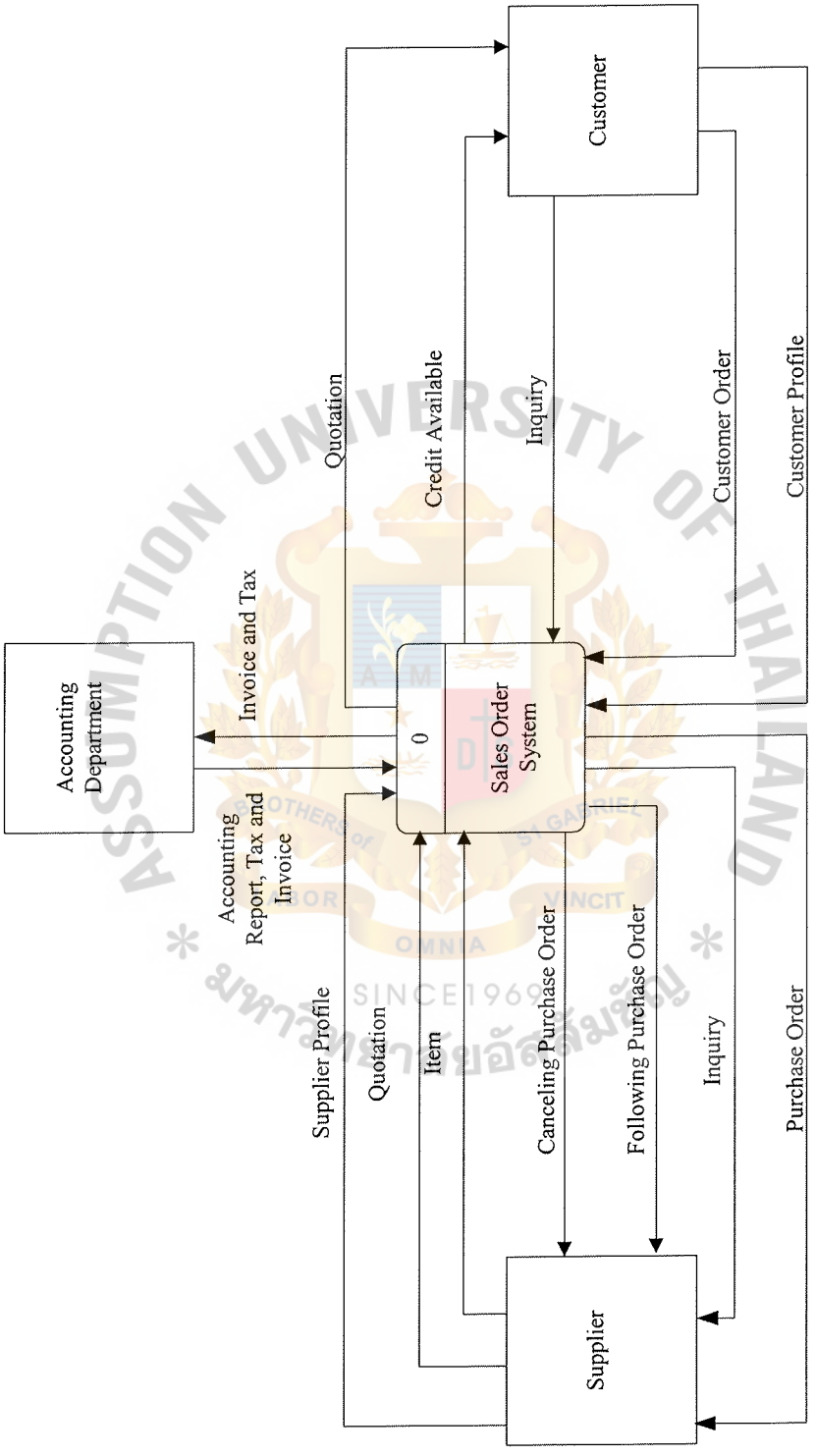

Figure A.1. Context Data Flow Diagram of Existing System.

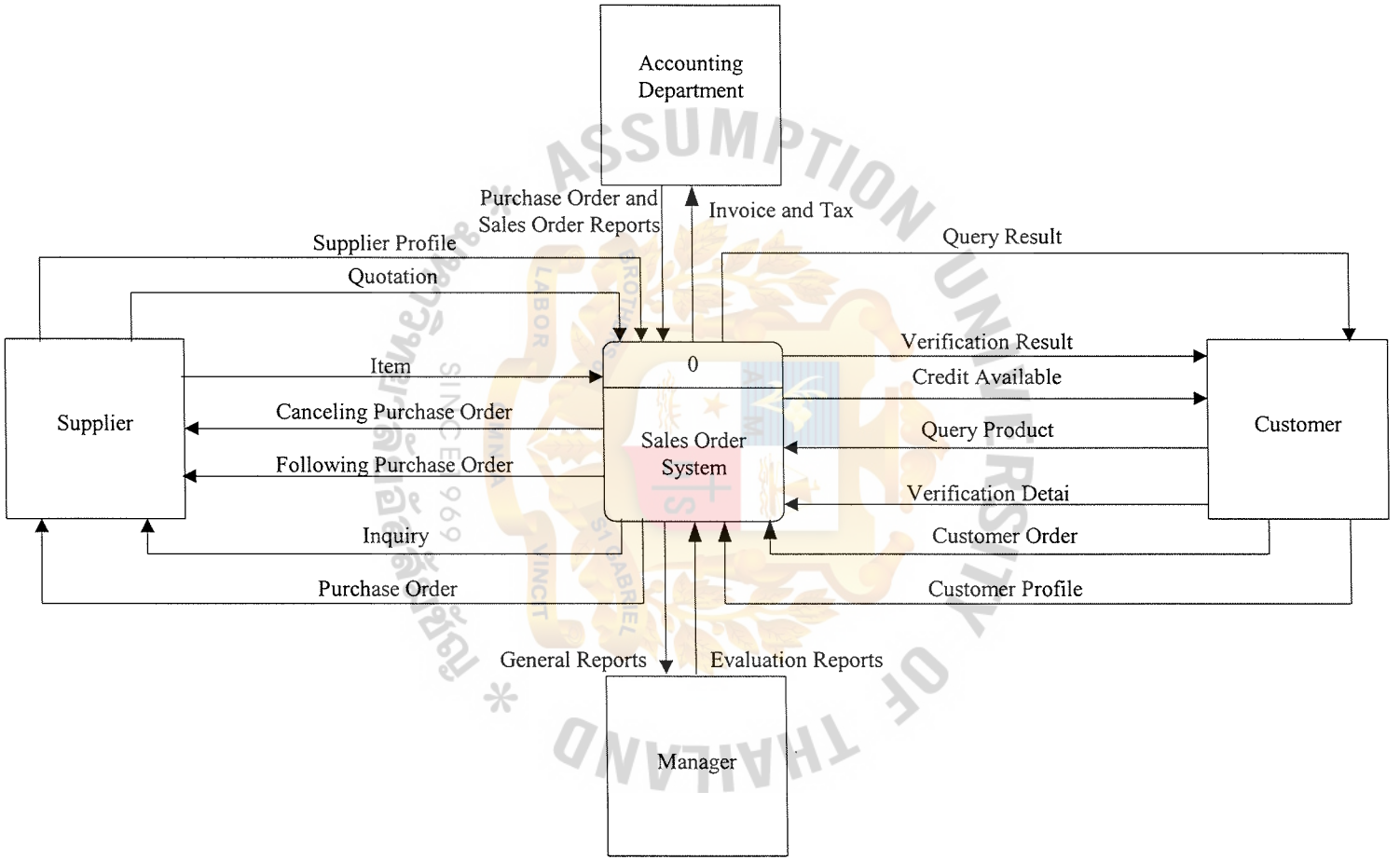

Figure A.2. Context Data Flow Diagram of Proposed System.

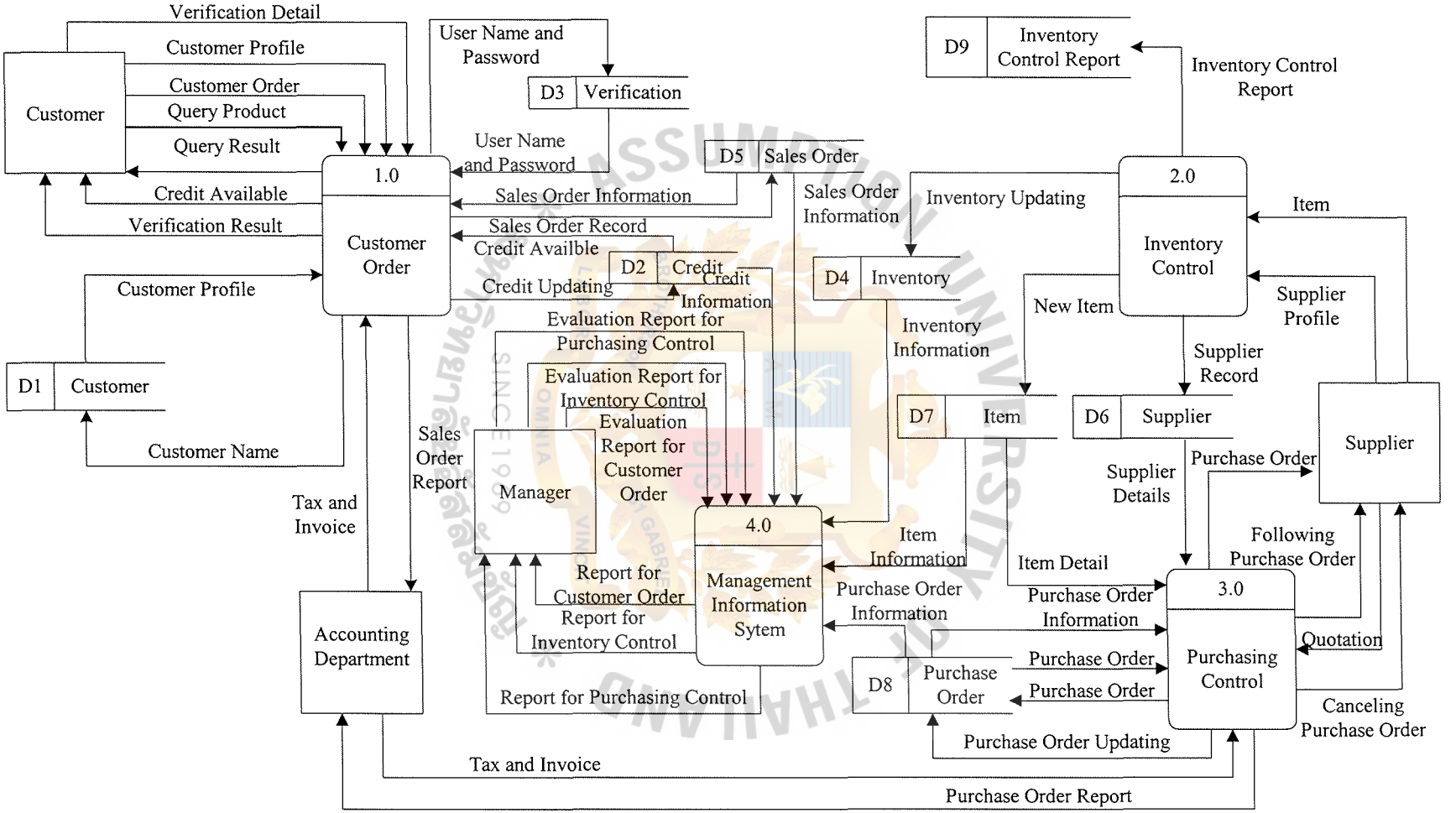

Figure A.3. System Diagram of Sales Order System.

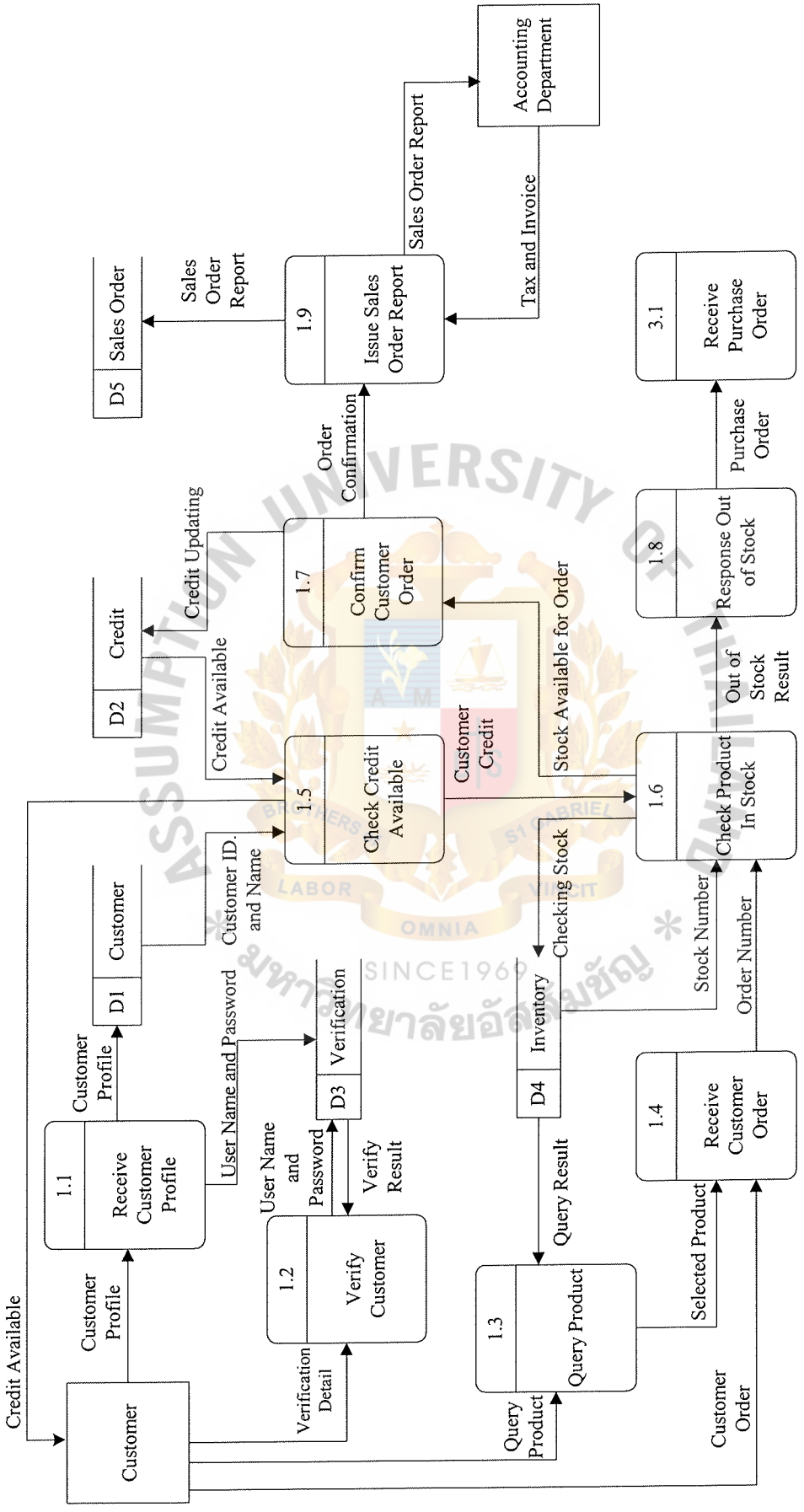

Figure A.4. Data Flow Diagram Level 1Process 1Customer Order.

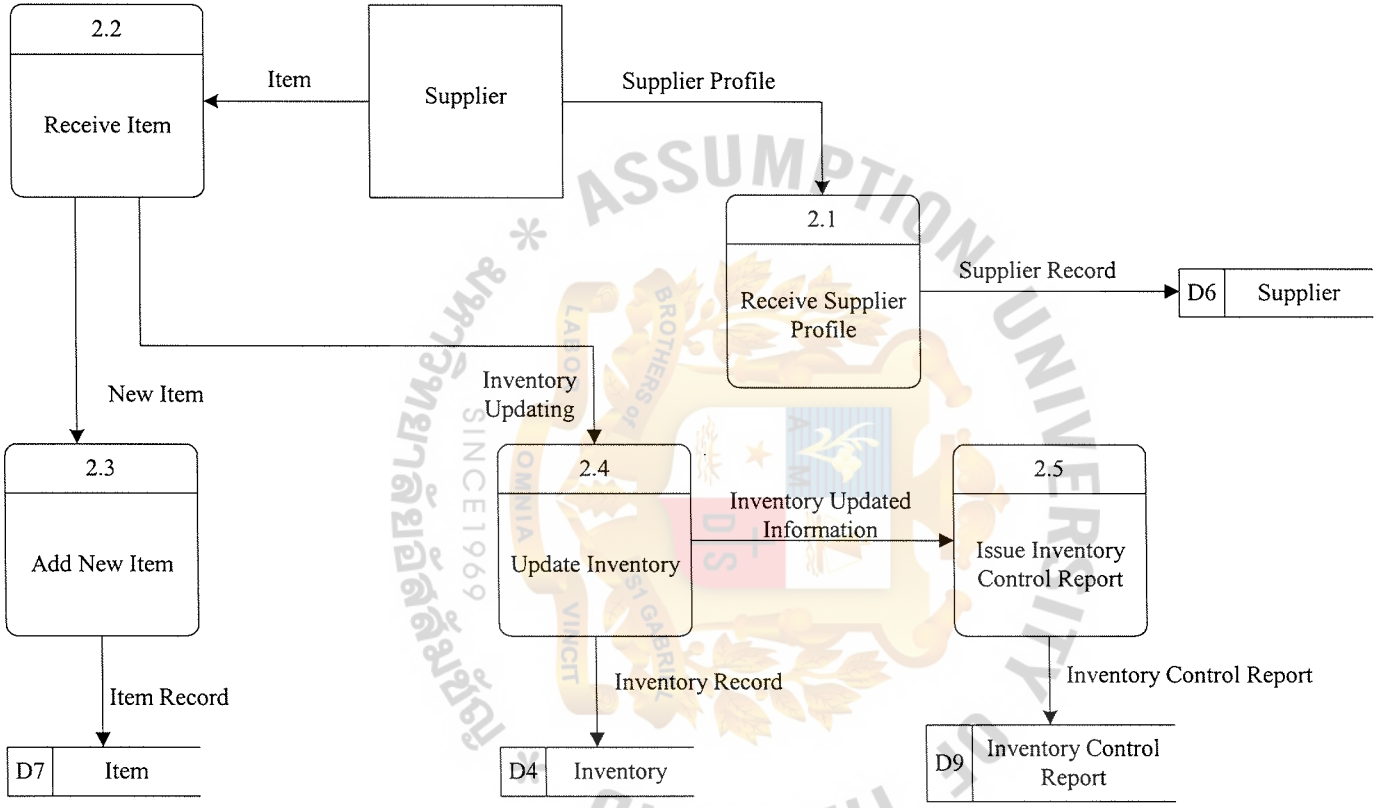

Figure A.5. Data Flow Diagram Level 1 Process 2 Inventory Control.

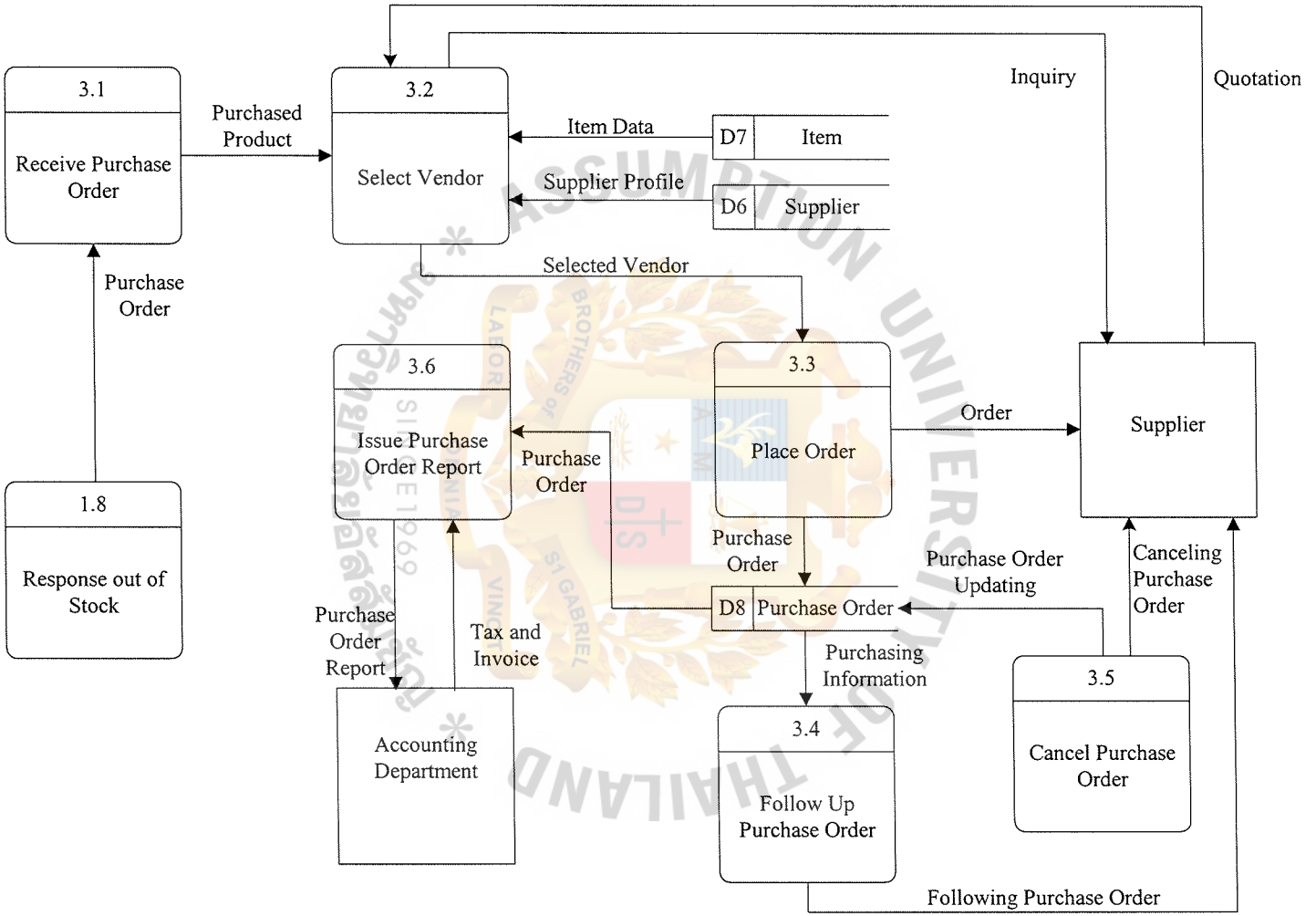

Figure A.6. Data Flow Diagram Level 1 Process 3 Purchasing Control.

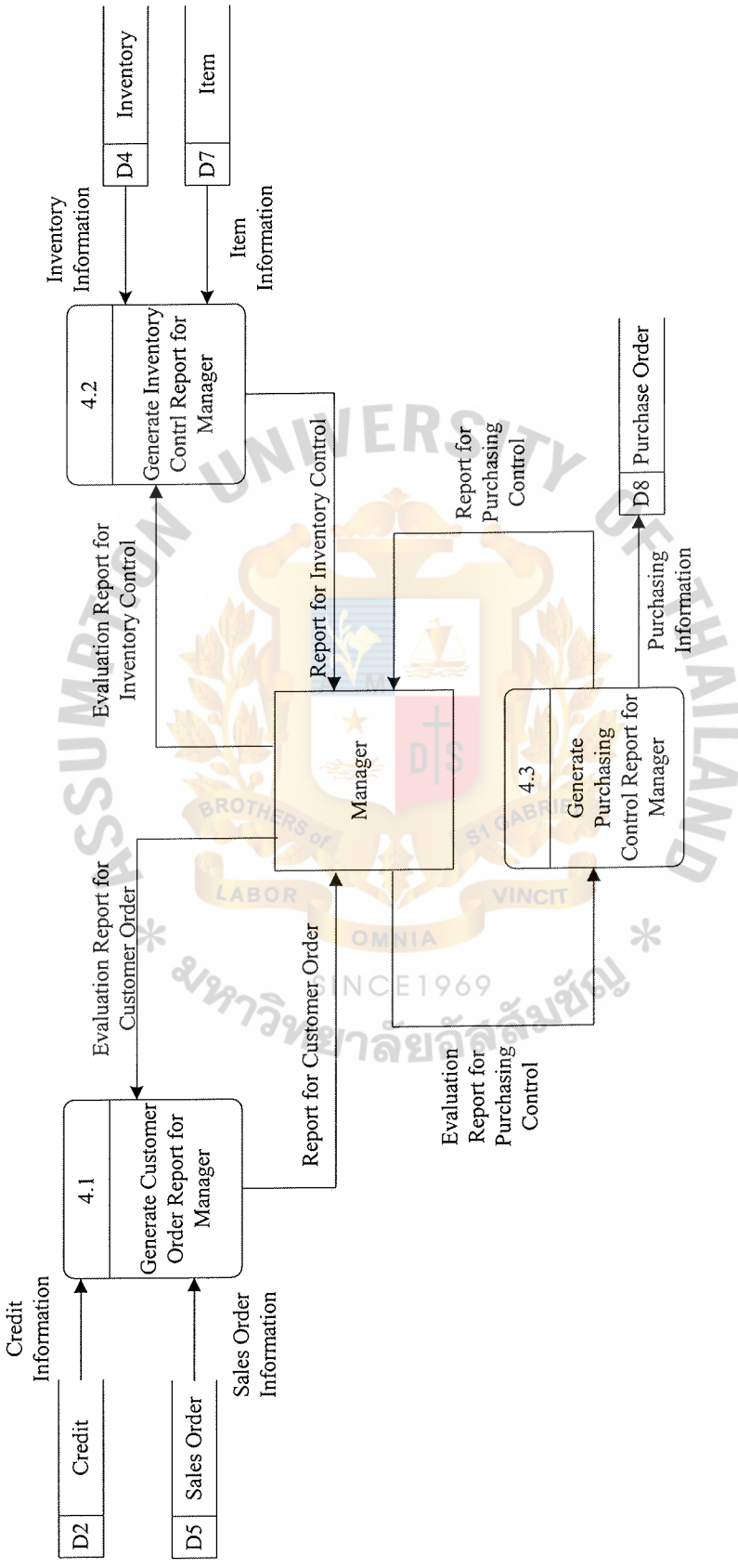

Figure A.7. Data Flow Diagram Level 1 Process 4 Management Information System.

APPENDIX B

PROCESS SPECIFICATION

Table B.1. Process Specification of Process 1.1.

Process Name	Receive Customer Profile
Data In:	Customer Profile
Data Out:	Customer Record
Process:	(1) Get necessary customer data, customer name, address, phone number, etc. and assign new customer ID (2) Record the customer data into customer database
Attachment:	(1) Customer (2) Data Store D1

Table B.2. Process Specification of Process 1.2.

Process Name	Verify Customer
Data In:	Verification Detail Verify Result
Data Out:	Customer User Name Customer Password
Process:	(1) Get customer username and password (2) Compare with the existing detail (3) Send result back to process
Attachment:	(1) Customer (2) Data Store D3

Table B.3. Process Specification of Process 1.3.

Process Name	Query Product
Data In:	Query Product Query Result
Data Out:	Query Command Selected Product
Process:	(1) Receive query from customer (2) Send query command to search for selected product (3) Get result back (4) Send selected product receive customer order process
Attachment:	(1) Customer (2) Data Store D4

Table B.4. Process Specification of Process 1.4.

Process Name	Receive Customer Order
Data In:	Selected Product Customer Order
Data Out:	Order Quantities
Process:	(1) Receive selected product from query product process (2) Get order from customer (3) Send order quantities to check for product in stock
Attachment:	(1) Customer

Table B.5. Process Specification of Process 1.5.

Process Name	Check Credit Available
Data In:	Customer ID. and Name Credit Available
Data Out:	Credit Available
Process:	(1) Read customer identification and name (2) Read credit available of each customer (3) Send credit available to check for product in stock
Attachment:	(1) Data Store D1 (2) Data Store D2

Table B.6. Process Specification of Process 1.6.

Process Name	Check Product in Stock
Data In:	Order Quantities Stock Quantities Credit Available
Data Out:	Stock Available Out of Stock Result
Process:	(1) Receive order quantities from customer order process (2) Check product in stock (3) Confirm customer order if there are products in stock (4) Response out of stock if there is no product in stock
Attachment:	-

Table B.7. Process Specification of Process 1.7.

Process Name	Confirm Customer Order
Data In:	Stock Available for Order
Data Out:	Order Confirmation
Process:	(1) Get stock available for order (2) Send order confirmation to issue sales order report process
Attachment:	-

Table B.8. Process Specification of Process 1.8.

Process Name	Response Out of Stock
Data In:	Out of Stock Result
Data Out:	Purchase Order
Process:	(1) Get out of stock result (2) Send purchase order to purchasing control system
Attachment:	-

Table B.9. Process Specification of Process 1.9.

Process Name	Issue Sales Order Report
Data In:	Order Confirmation Tax and Invoice
Data Out:	Sales Order Report
Process:	(1) Receive order confirmation (2) Issues sales order report to accounting department and sales order data store (3) Receive tax and invoice from accounting department
Attachment:	(1) Accounting Department (2) Data Store D5

Table B.10. Process Specification of Process 2.1.

Process Name	Receive Supplier Profile
Data In:	Supplier Profile
Data Out:	Supplier Record
Process:	(1) Get supplier profile (2) Record to supplier profile data store
Attachment:	(1) Supplier (2) Data Store D6

Table B.11. Process Specification of Process 2.2.

Process Name	Receive Item
Data In:	Item
Data Out:	Supplier Record
Process:	(1) Send new item to add (2) Send new item to update inventory
Attachment:	(1) Supplier

Table B.12. Process Specification of Process 2.3.

Process Name	Add New Item
Data In:	New Item
Data Out:	Item Record
Process:	(1) Get new item from previous process (2) Record item to data store
Attachment:	(1) Data Store D7

Table B.13. Process Specification of Process 2.4.

Process Name	Update Inventory
Data In:	Item Data
Data Out:	Inventory Record
Process:	(1) Get item data from previous process (2) Record inventory to data store
Attachment:	(1) Data Store D4

Table B.14. Process Specification of Process 2.5.

Process Name	Issue Inventory Control Report
Data In:	Inventory Updated Information
Data Out:	Inventory Control Report
Process:	(1) Get inventory updated information (2) Issue inventory control report (3) Send report to data store
Attachment:	(1) Data Store D9

Table B.15. Process Specification of Process 3.1.

Process Name	Receive Purchase Order
Data In:	Purchase Order
Data Out:	Purchased Product
Process:	(1) Receive purchase order from response out of stock process (2) Send purchased product to select vendor process
Attachment:	-

Table B.16. Process Specification of Process 3.2.

Process Name	Select Vendor
Data In:	Purchased Product Item Data Supplier Profile Quotation
Data Out:	Inquiry Selected Vendor
Process:	(1) Get purchased product from receive purchase order process (2) Get item data (3) Get supplier profile (4) Make inquiry to supplier (5) Receive quotation from supplier (6) Send selected vendor to place order process
Attachment:	(1) Supplier (2) Data Store D6 (3) Data Store D7

Table B.17. Process Specification of Process 3.3.

Process Name	Place Order
Data In:	Selected Vendor
Data Out:	Purchase Order Order
Process:	(1) Get selected vendor from select vendor process (2) Place order to supplier (3) Record purchase order to purchase order data store
Attachment:	(1) Supplier (2) Data Store D8

Table B.18. Process Specification of Process 3.4.

Process Name	Follow Up Purchase Order
Data In:	Purchasing Information
Data Out:	Following Purchase Order
Process:	(1) Get purchasing information from purchase order data store (2) Following up purchase order from supplier
Attachment:	(1) Supplier (2) Data Store D8

Table B.19. Process Specification of Process 3.5.

Process Name	Cancel Purchase Order
Data In:	Purchasing Information
Data Out:	Canceling Purchase Order
Process:	(1) Get purchasing information from purchase order data store (2) Cancel purchase order to supplier
Attachment:	(1) Supplier (2) Data Store D8

Table B.20. Process Specification of Process 3.6.

Process Name	Issue Purchase Order Report
Data In:	Purchase Order Invoice and Tax
Data Out:	Purchase Order Report
Process:	(1) Get purchase order from purchase order data store (2) Send purchase order report to accounting department (3) Receive invoice and tax from accounting department
Attachment:	(1) Accounting Department (2) Data Store D8

Table B.21. Process Specification of Process 4.1.

Process Name	Generate Customer Order Report for Manager
Data In:	Credit Information Sales Order Information Evaluation Report for Customer Order
Data Out:	Report for Customer Order
Process:	(1) Get credit information (2) Get sales order information (3) Generate customer order report for manager (4) Receive evaluation report from manager
Attachment:	(1) Manager (2) Data Store D2 (3) Data Store D5

Table B.22. Process Specification of Process 4.2.

Process Name	Generate Inventory Control Report for Manager
Data In:	Inventory Information Item Information Evaluation Report for Inventory Control
Data Out:	Report for Inventory Control
Process:	(1) Get inventory information (2) Get item information (3) Generate inventory control report for manager (4) Receive evaluation report from manager
Attachment:	(1) Manager (2) Data Store D4 (3) Data Store D7

Table B.23. Process Specification of Process 4.3.

Process Name	Generate Purchasing Control Report for Manager
Data In:	Purchasing Information Evaluation Report for Customer Order
Data Out:	Report for Purchasing Control
Process:	(1) Get purchasing information (2) Generate purchasing control report for manager (3) Receive evaluation report from manager
Attachment:	(1) Manager (2) Data Store D8

APPENDIX C

DATABASE DESIGN

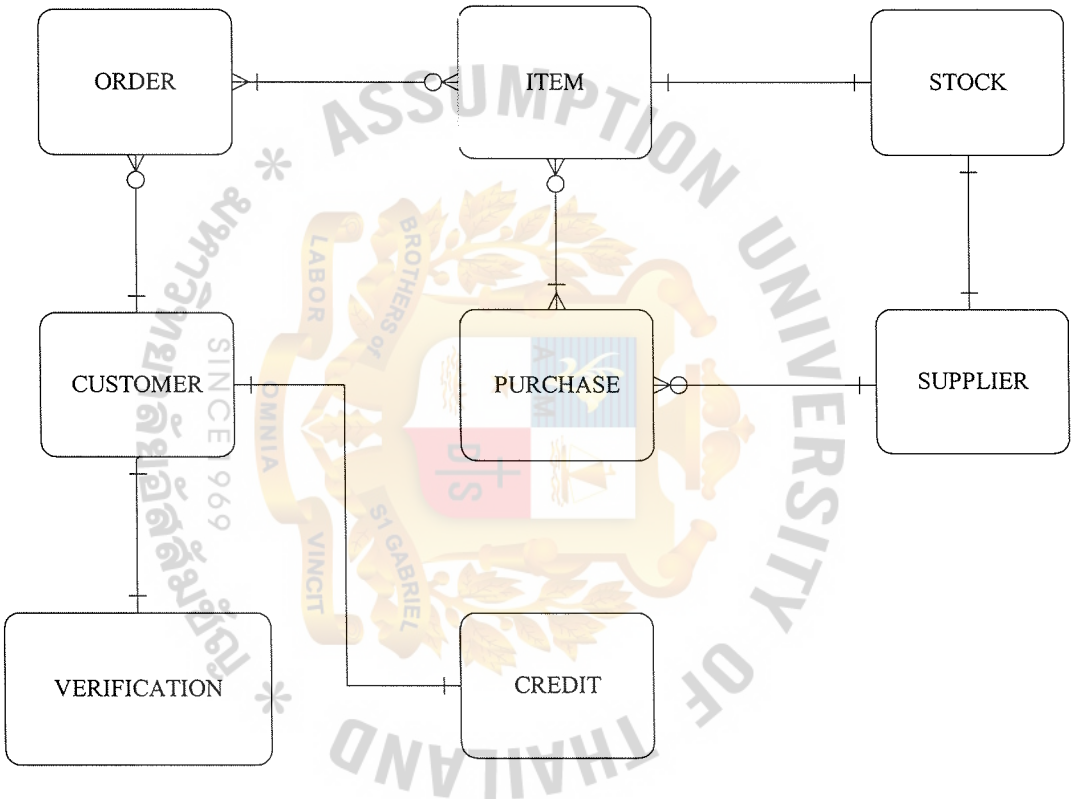

Figure C.1. Context Data Model.

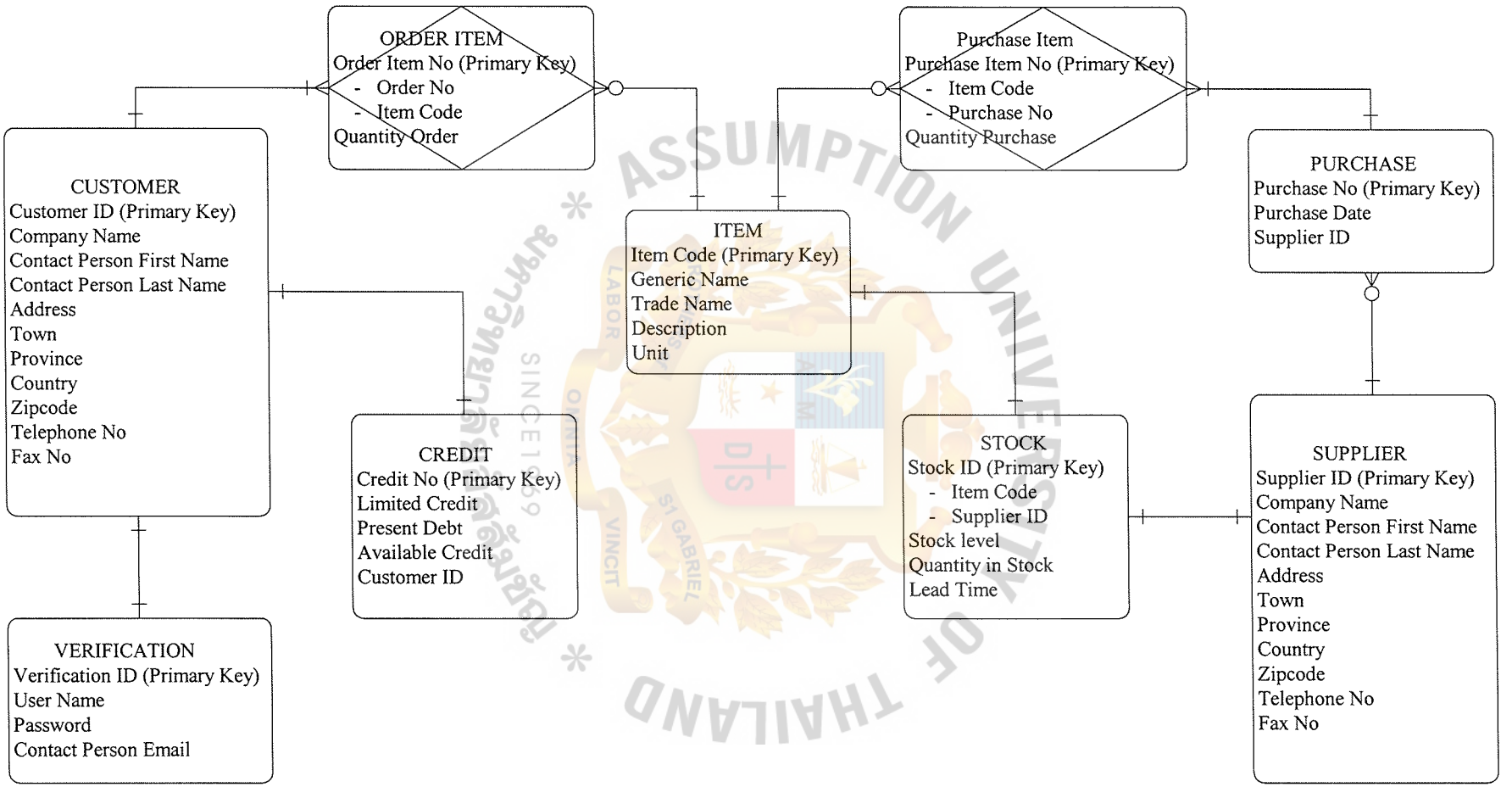

Figure C.2. Fully Attributed Data Model.

APPENDIX D

DATA DICTIONARY

address Data Element

Data element attributes

Storage Type: Char

Length: 20

Null Type: NotNull

Location:

Entity --> customer

Entity --> supplier

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

available_credit Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Location:

Entity --> credit

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

belong to Relationship

Attached Entities:

stock

belong to MIN: 1 MAX: 1

supplier

[has] MIN: 1 MAX: 1

Location:

context

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

belong to Relationship

Attached Entities:

stock

belong to MIN: 1 MAX: 1

item

[has] MIN: 1 MAX: 1

Location:

context

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

bought Relationship

Attached Entities:

item

bought MIN: 0 MAX: many

purchase_item

[bought] MIN: 1 MAX: 1

Location:

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

bought as Relationship

Attached Entities:

purchase

bought as MIN: 1 MAX: many

purchase_item

[bought as] MIN: 1 MAX: 1

Location:

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

buy from Relationship

Attached Entities:

purchase

buy from MIN: 1 MAX: 1

supplier

[sell to] MIN: 0 MAX: many

Location:

context

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

company_name Data Element

Data element attributes

Storage Type: Char

Length: 30

Null Type: NotNull

Location:

Entity --> customer

Entity --> supplier

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

contact_person_email Data Element

Data element attributes

Storage Type: Char

Length: 30

Null Type: NotNull

Location:

Entity --> verification

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

contact_person_firstname Data Element

Data element attributes

Storage Type: Char

Length: 15

Null Type: NotNull

Location:

Entity --> supplier

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

contact_person_lastname Data Element

Data element attributes

Storage Type: Char

Length: 25

Null Type: NotNull

Location:

Entity --> customer

Entity --> supplier

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

contact_preson_firstname Data Element

Data element attributes

Storage Type: Char

Length: 15

Null Type: NotNull

Location:

Entity --> customer

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

country Data Element

Data element attributes

Storage Type: Char

Length: 20

Null Type: NotNull

Location:

Entity --> customer

Entity --> supplier

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

credit Entity

Description:

Credit that available for each customer. If customre has exceeding credit, they will not be allowed to receive credit for buying.

Composition:

credit_no : Char

limited_credit : Integer 4

present_debt : Integer 4

available_credit : Integer 4

cust_id : Integer 4

Primary Key:

Index Name: Generated by VAW

Column(s): credit_no [ASC]

Foreign Key(s):

customer 'has'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

Location:

context

Attached relationships on context:

[has] MIN: 1 MAX: 1

customer

keybase

Attached relationships on keybase:

[has] MIN: 1 MAX: 1

customer

fully

Attached relationships on fully:

[has] MIN: 1 MAX: 1

customer

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

credit_no Data Element

Data element attributes

Storage Type: Char

Length: 5

Null Type: NotNull

Location:

Entity --> credit

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

cust_id Data Element

Data element attributes

Storage Type: Integer 4

Length: 5

Null Type: NotNull

Location:

Entity --> customer

Entity --> credit

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

customer Entity

Description:

Customers who buy medicine from company.They can be government hospital, private hospital, pharmacy, etc.

Composition:

cust_id : Integer 4

company_name : Char

contact_preson_firstname : Char

contact_person_lastname : Char

address : Char

town : Char

province : Char

country : Char

zipcode : Char

telphone_no : Integer 4

fax_no : Integer 4

Primary Key:

Index Name: Generated by VAW

Column(s): cust_id [ASC]

Location:

context

Attached relationships on context:

request MIN: 0 MAX: many

order

has MIN: 1 MAX: 1

verification

has MIN: 1 MAX: 1

credit

keybase

Attached relationships on keybase:

request MIN: 0 MAX: many

order

has MIN: 1 MAX: 1

verification

has MIN: 1 MAX: 1

credit

fully

Attached relationships on fully:

request MIN: 0 MAX: many

order

has MIN: 1 MAX: 1

verification

has MIN: 1 MAX: 1

credit

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

customer_id Data Element

Data element attributes

Storage Type: Integer 4

Length: 5

Null Type: NotNull

Location:

Entity --> order

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

description Data Element

Data element attributes

Storage Type: Char

Length: 100

Null Type: NotNull

Location:

Entity --> item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

fax_no Data Element

Data element attributes

Storage Type: Integer 4

Length: 9

Null Type: NotNull

Location:

Entity --> customer

Entity --> supplier

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

generic_name Data Element

Data element attributes

Storage Type: Char

Length: 10

Null Type: NotNull

Location:

Entity --> item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

has Relationship

Attached Entities:

supplier

has MIN: 1 MAX: 1

stock

[belong to] MIN: 1 MAX: 1

Location:

context

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

has Relationship

Attached Entities:

item

has MIN: 1 MAX: 1

stock

[belong to] MIN: 1 MAX: 1

Location:

context

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

has Relationship

Attached Entities:

customer

has MIN: 1 MAX: 1

verification

[has] MIN: 1 MAX: 1

Location:

context

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

has Relationship

Attached Entities:

customer

has MIN: 1 MAX: 1

credit

[has] MIN: 1 MAX: 1

Location:

context

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

item Entity

Description:

It is the product detail, compose of generic name and trade name.

Composition:

item_code : Integer 4

generic_name : Char

trade_name : Char

description : Char

unit : Char

Primary Key:

Index Name: Generated by VAW

Column(s): item_code [ASC]

Foreign Key(s):

order 'sold as'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

purchase 'place requisition'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

Location:

context

Attached relationships on context:

sold MIN: 1 MAX: many

order

[place requisition] MIN: 1 MAX: many

purchase

has MIN: 1 MAX: 1

stock

keybase

Attached relationships on keybase:

has MIN: 1 MAX: 1

stock

sold as MIN: 0 MAX: many

order_item

bought MIN: 0 MAX: many

purchase_item

fully

Attached relationships on fully:

has MIN: 1 MAX: 1

stock

sold as MIN: 0 MAX: many

order_item

sold MIN: 1 MAX: many

order

[place requisition] MIN: 1 MAX: many

purchase

bought MIN: 0 MAX: many

purchase_item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

item_code Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Location:

Entity --> item

Entity --> stock

Associative Entity --> order_item

Associative Entity --> purchase_item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

item_id Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

lead_time Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Location:

Entity --> stock

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

limited_credit Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Location:

Entity --> credit

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

order Entity

Description:

Order from customer, it compose of order number, customer number.

Composition:

order_no : Integer 4

order_date : Date

customer_id : Integer 4

Primary Key:

Index Name: Generated by VAW

Column(s): order_no [ASC]

Foreign Key(s):

customer 'request'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

Location:

context

Attached relationships on context:

request by MIN: 1 MAX: 1

customer

sold as MIN: 0 MAX: many

item

keybase

Attached relationships on keybase:

request by MIN: 1 MAX: 1

customer

sold MIN: 1 MAX: many

order_item

fully

Attached relationships on fully:

request by MIN: 1 MAX: 1

customer

sold MIN: 1 MAX: many

order_item

sold as MIN: 0 MAX: many

item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

order_date Data Element

Data element attributes

Storage Type: Date

Length: 10

Null Type: NotNull

Location:

Entity --> order

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

order_item Associative Entity

Description:

It is the detail about product that to be ordered. It composes of quantity ordered, item code, etc.

Composition:

order_no : Integer 4

item_code : Integer 4

qty_order : Integer 4

Primary Key:

Index Name: Generated by VAW

Column(s): item_code [ASC]

order_no [ASC]

Foreign Key(s):

item 'sold as'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

order 'sold'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

Location:

keybase

Attached relationships on keybase:

[sold] MIN: 1 MAX: 1

order

[sold as] MIN: 1 MAX: 1

item

fully

Attached relationships on fully:

[sold] MIN: 1 MAX: 1

order

[sold as] MIN: 1 MAX: 1

item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

order_no Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Location:

Entity --> order

Associative Entity --> order_item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

passwd Data Element

Data element attributes

Storage Type: Integer 4

Length: 4

Null Type: NotNull

Location:

Entity --> verification

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

place requisition Relationship

Attached Entities:

purchase

place requisition MIN: 0 MAX: many

item

[place requisition] MIN: 1 MAX: many

Location:

context

fully

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

present_debt Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Location:

Entity --> credit

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

province Data Element

Data element attributes

Storage Type: Char

Length: 20

Null Type: NotNull

Location:

Entity --> customer

Entity --> supplier

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

purchase Entity

Description:

Purchase is the purchase order that will be sent to appropriate suppliers.

Composition:

purchase_no : Integer 4

purchase_date : Date

supplier_id : Integer 4

Primary Key:

Index Name: Generated by VAW

Column(s): purchase_no [ASC]

Foreign Key(s):

supplier 'sell to'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

Location:

context

Attached relationships on context:

buy from MIN: 1 MAX: 1

supplier

place requisition MIN: 0 MAX:

many

item

keybase

Attached relationships on keybase:

buy from MIN: 1 MAX: 1

supplier

bought as MIN: 1 MAX:

many

purchase_item

fully

Attached relationships on fully:

buy from MIN: 1 MAX: 1

supplier

bought as MIN: 1 MAX: many

purchase_item

place requisition MIN: 0 MAX: many

item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

purchase_date Data Element

Data element attributes

Storage Type: Date

Length: 10

Null Type: NotNull

Location:

Entity --> purchase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

purchase_item Associative Entity

Description:

It is the details of product that to be purchased. It composes of item code, quantity purchase, etc.

Composition:

item_code : Integer 4

qty_purchase : Integer 4

purchase_no : Integer 4

Primary Key:

Index Name: Generated by VAW

Column(s): item_code [ASC]

purchase_no [ASC]

Foreign Key(s):

purchase 'bought as'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

item 'bought'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

Location:

keybase

Attached relationships on keybase:

[bought as] MIN: 1 MAX: 1

purchase

[bought] MIN: 1 MAX: 1

item

fully

Attached relationships on fully:

[bought as] MIN: 1 MAX: 1

purchase

[bought] MIN: 1 MAX: 1

item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

purchase_no Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Location:

Entity --> purchase

Associative Entity --> purchase_item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

qty_in_stock Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Location:

Entity --> stock

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

qty_order Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Location:

Associative Entity --> order_item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

qty_purchase Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Location:

Associative Entity --> purchase_item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

request Relationship

Attached Entities:

customer

request MIN: 0 MAX: many

order

[request by] MIN: 1 MAX: 1

Location:

context

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

request by Relationship

Attached Entities:

order

request by MIN: 1 MAX: 1

customer

[request] MIN: 0 MAX: many

Location:

context

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

sell to Relationship

Attached Entities:

supplier

sell to MIN: 0 MAX: many

purchase

[buy from] MIN: 1 MAX: 1

Location:

context

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

sold Relationship

Attached Entities:

item

sold MIN: 1 MAX: many

order

[sold as] MIN: 0 MAX: many

Location:

context

fully

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

sold Relationship

Attached Entities:

order

sold MIN: 1 MAX: many

order_item

[sold] MIN: 1 MAX: 1

Location:

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

sold as Relationship

Attached Entities:

order

sold as MIN: 0 MAX: many

item

[sold] MIN: 1 MAX: many

Location:

context

fully

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

sold as Relationship

Attached Entities:

item

sold as MIN: 0 MAX: many

order_item

[sold as] MIN: 1 MAX: 1

Location:

fully

keybase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

stock Entity

Description:

Stock is the product in stock that available for customer.

Composition:

item_code : Integer 4

supplier_id : Integer 4

stock_level : Integer 4

qty_in_stock : Integer 4

lead_time : Integer 4

Primary Key:

Index Name: Generated by VAW

Column(s): item_code [ASC]

supplier_id [ASC]

Foreign Key(s):

item 'has'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

supplier 'has'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

Location:

context

Attached relationships on context:

belong to MIN: 1 MAX: 1

supplier

belong to MIN: 1 MAX: 1

item

keybase

Attached relationships on keybase:

belong to MIN: 1 MAX: 1

supplier

belong to MIN: 1 MAX: 1

item

fully

Attached relationships on fully:

belong to MIN: 1 MAX: 1

supplier

belong to MIN: 1 MAX: 1

item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

stock_level Data Element

Data element attributes

Storage Type: Integer 4

Length: 7

Null Type: NotNull

Location:

Entity --> stock

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

supplier Entity

Description:

Suppliers who supplier medicine. They can be in both local and international

suppliers.

Composition:

supplier_id : Integer 4

company_name : Char

contact_person_firstname : Char

contact_person_lastname : Char

address : Char

town : Char

province : Char

country : Char

zipcode : Char

telephone_no : Integer 4

fax_no : Integer 4

Primary Key:

Index Name: Generated by VAW

Column(s): supplier_id [ASC]

Location:

context

Attached relationships on context:

sell to MIN: 0 MAX: many

purchase

has MIN: 1 MAX: 1

stock

keybase

Attached relationships on keybase:

sell to MIN: 0 MAX: many

purchase

has MIN: 1 MAX: 1

stock

fully

Attached relationships on fully:

sell to MIN: 0 MAX: many

purchase

has MIN: 1 MAX: 1

stock

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

supplier_id Data Element

Data element attributes

Storage Type: Integer 4

Length: 5

Null Type: NotNull

Location:

Entity --> supplier

Entity --> stock

Entity --> purchase

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

telephone_no Data Element

Data element attributes

Storage Type: Integer 4

Length: 9

Null Type: NotNull

Location:

Entity --> supplier

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

town Data Element

Data element attributes

Storage Type: Char

Length: 20

Null Type: NotNull

Location:

Entity --> customer

Entity --> supplier

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

trade_name Data Element

Data element attributes

Storage Type: Char

Length: 10

Null Type: NotNull

Location:

Entity --> item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

unit Data Element

Data element attributes

Storage Type: Char

Length: 10

Null Type: NotNull

Location:

Entity --> item

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

username Data Element

Data element attributes

Storage Type: Char

Length: 15

Null Type: NotNull

Location:

Entity --> verification

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

verification Entity

Description:

It is the verification detail that give the authorized people to come to online order.

Composition:

verify_id : Char

username : Char

passwd : Integer 4

contact_person_email : Char

Primary Key:

Index Name: Generated by VAW

Column(s): verify_id [ASC]

Foreign Key(s):

customer 'has'

On Delete Restrict

On Update Restrict

On Insert of Child Row Restrict

Location:

context

Attached relationships on context:

[has] MIN: 1 MAX: 1

customer

keybase

Attached relationships on keybase:

[has] MIN: 1 MAX: 1

customer

fully

Attached relationships on fully:

[has] MIN: 1 MAX: 1

customer

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

verify_id Data Element

Data element attributes

Storage Type: Char

Length: 5

Null Type: NotNull

Location:

Entity --> verification

Date Last Altered: 23/7/00 Date Created: 23/7/00

---

zipcode Data Element

Data element attributes

Storage Type: Char

Length: 20

Null Type: NotNull

Location:

Entity --> customer

Entity --> supplier

Date Last Altered: 23/7/00 Date Created: 23/7/00

APPENDIX E

STRUCTURE DESIGN

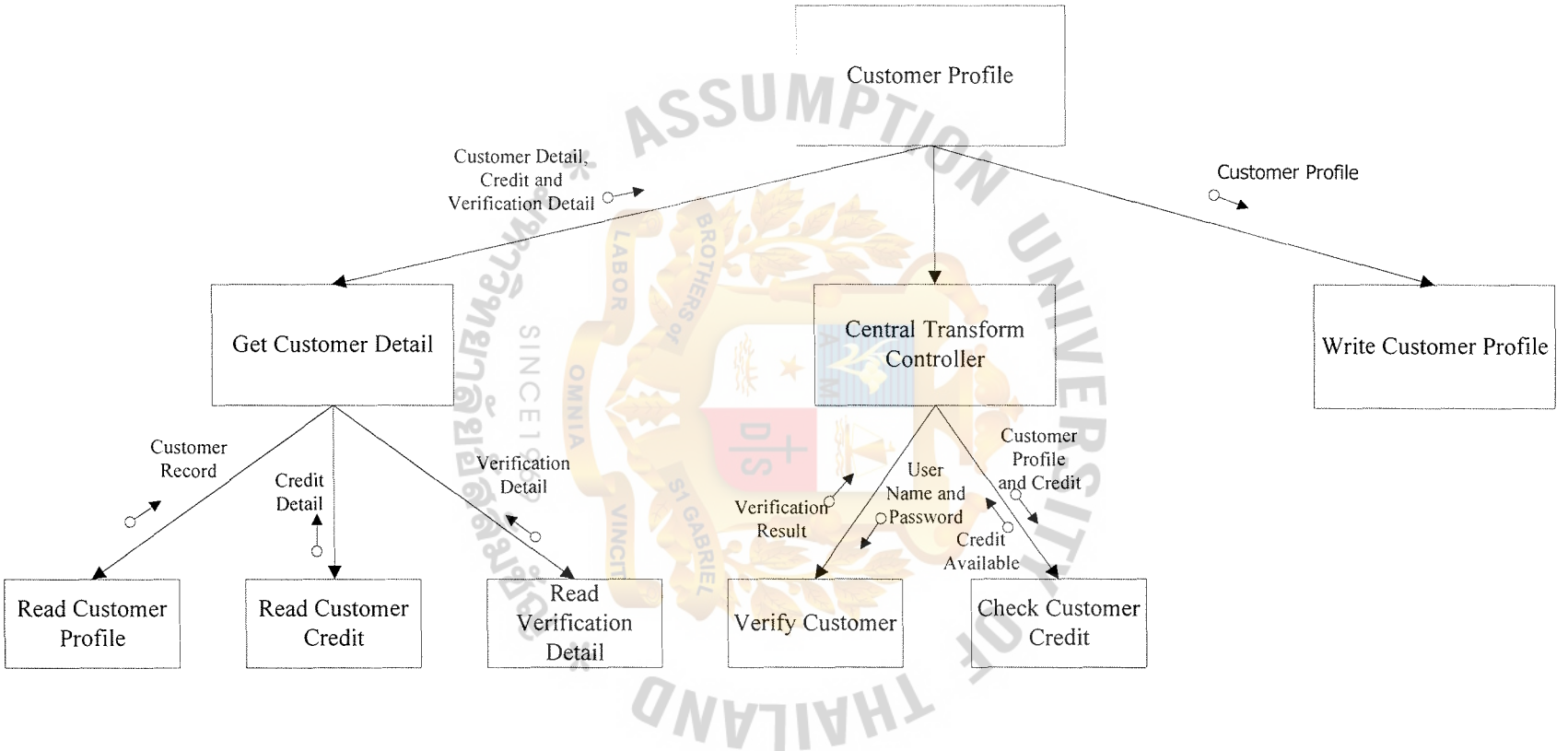

Figure E.1. Structure Chart for Customer Profile.

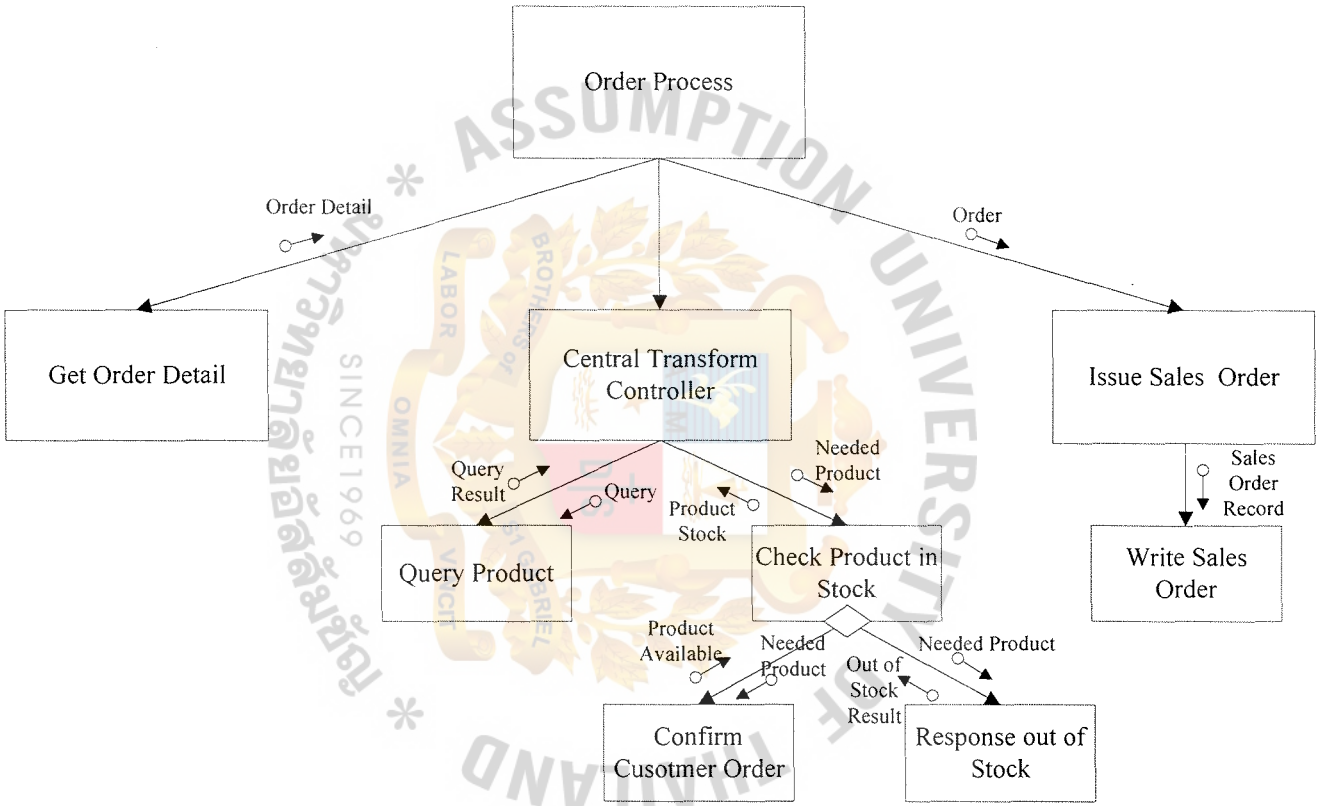

Figure E.2. Structure Chart for Order Process.

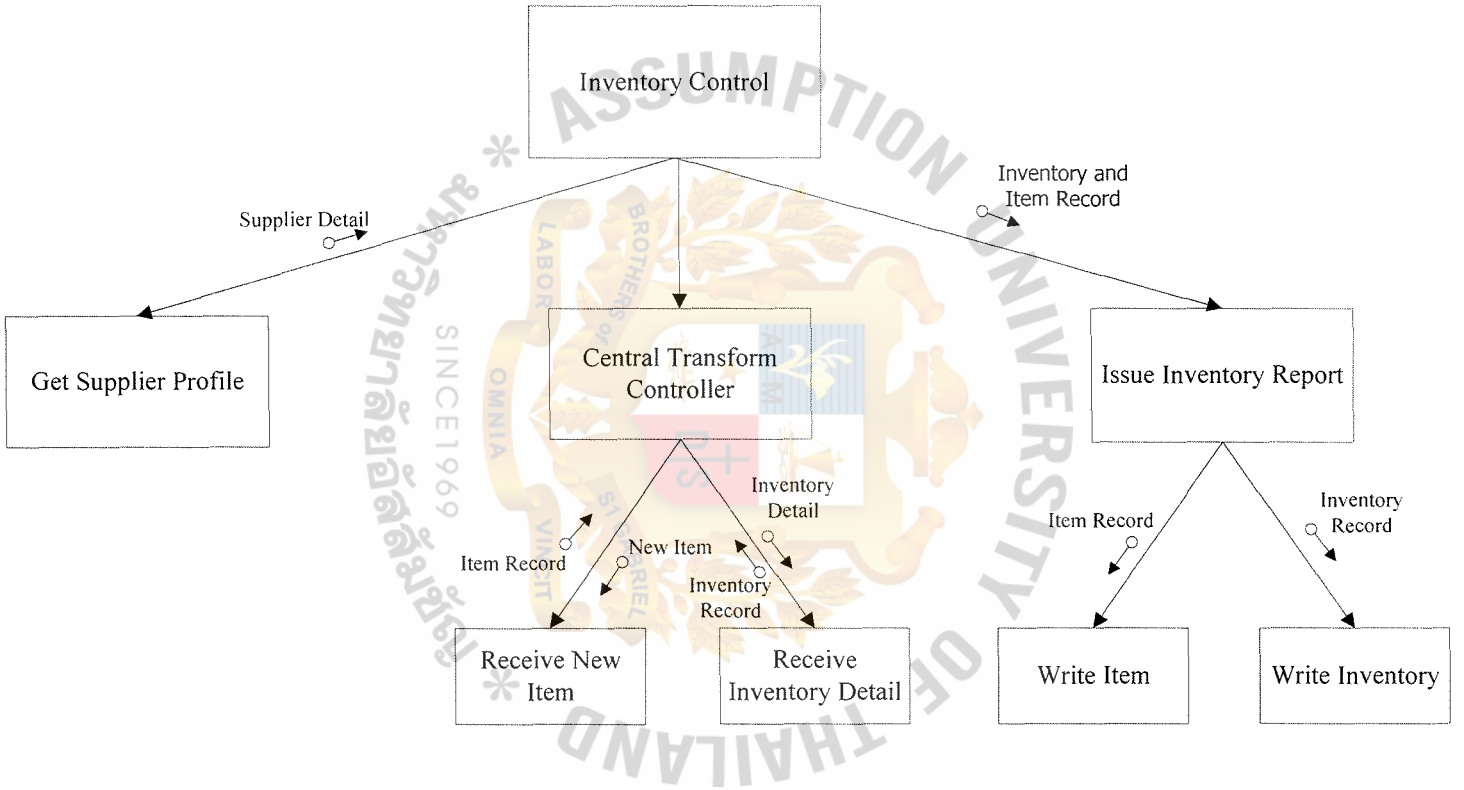

Figure E.3. Structure Chart for Inventory Control.

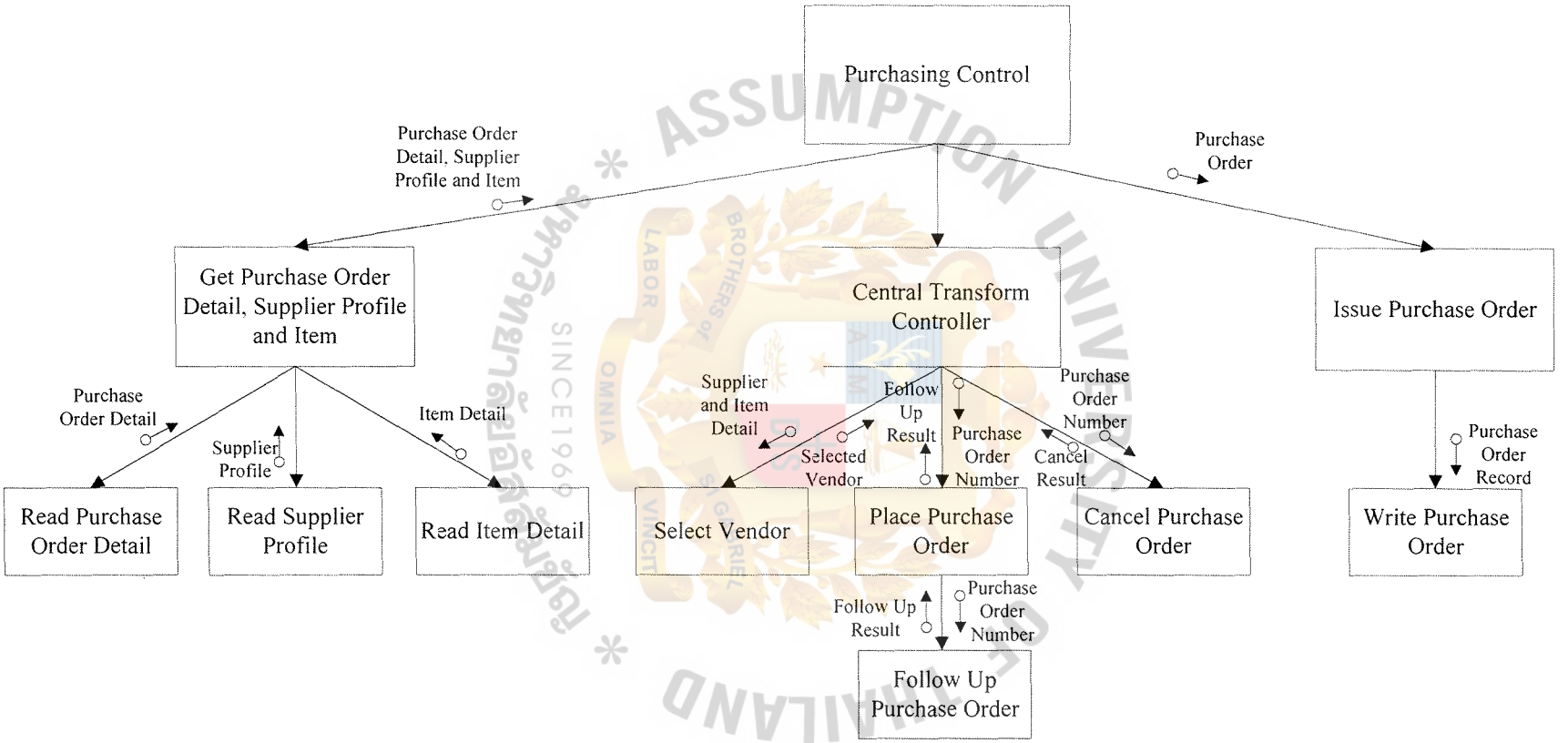

Figure E.4. Structure Chart for Purchasing Control.

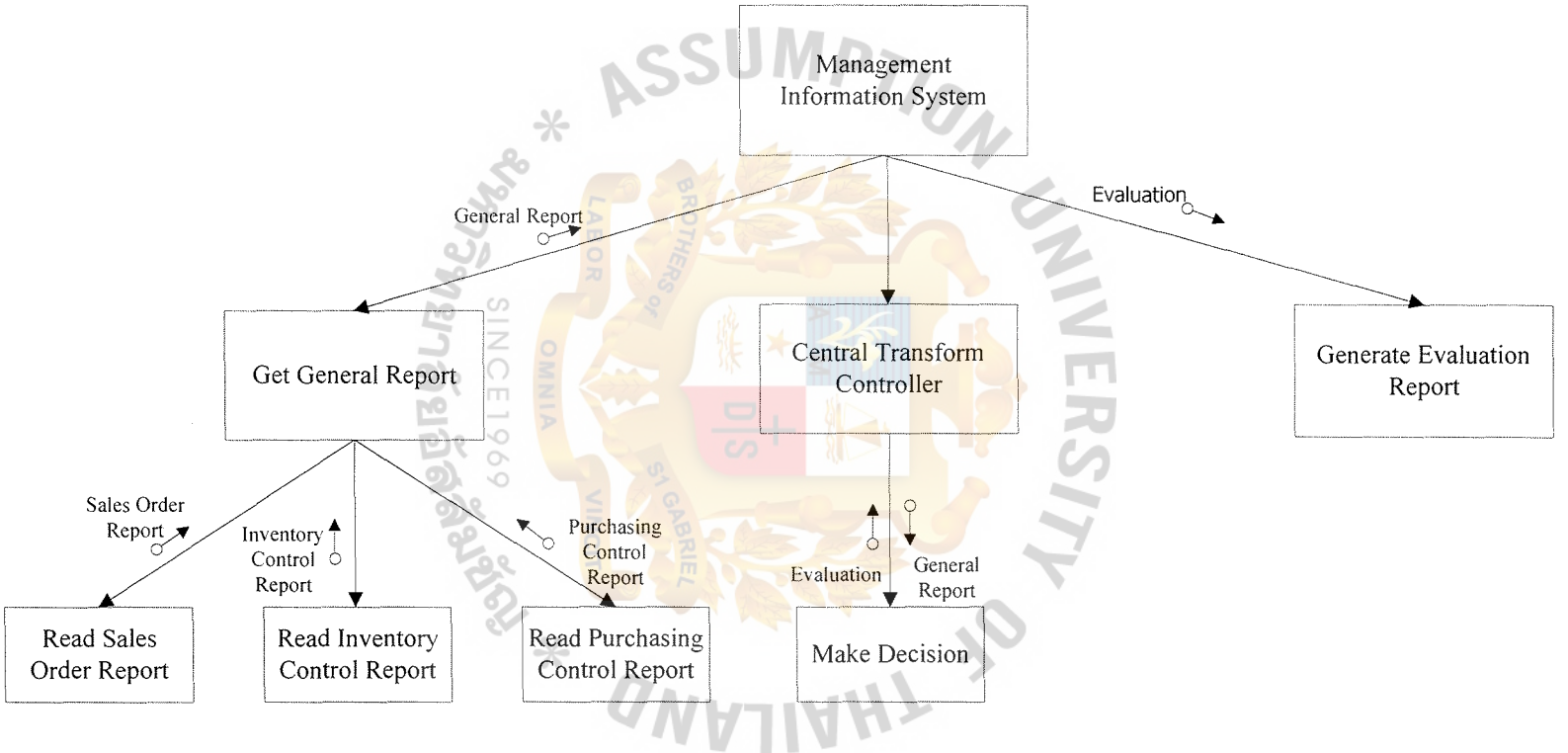

Figure E.5. Structure Chart for Management Information System.

APPENDIX F

REPORT DESIGN

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn
Sales Order Report

Product Code	Description	Net Sales		Pending Order		Total	
		Quantity	Amount	Quantity	Amount	Quantity	Amount

Figure F.1. Sales Order Report.

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn
Summary Sale

Staff Code:
Date Reported:

From: D-M-Y To: D-M-Y

Date Sold (D-M-Y)	Product Name	Customer Name	Quantity	Price per unit	Remark

Figure F.2. Monthly Sales Order Report.

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn
Customer Profile

Staff Code:
Date Reported:

Customer Code	Name	Address	Last Sale (D-M-Y)	Remark

Figure F.3. Customer Profile Report.

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn
Customer Credit Analyzing Report

Staff Code:
Date Reported:

Custormer Code	Name	Credit Available (Baht)	Total Number of Using Credit	Total Number of Credit Unavailable	Remark

Figure F.4. Customer Credit Report.

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn
Supplier Profile

Staff Code:
Date Reported:

Supplier Code	Name	Address	Product	Remark

Figure F.5. Supplier Profile Report.

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn
Product Report

Staff Code:
Date Reported:

Product Code	Trade Name	Generic Name	Unit	Price per unit (Baht)	Supplier Code	Remark

Figure F.6. Product Report.

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn
Inventory Report

Staff Code:
Date Reported:

Product Code	Unit	Quantity (Unit)	Allocated (Unit)	Date Arrival (D-M-Y)	Remark

Figure F.7. Inventory Report.

Delivery Order

Prima Pharmacy Co.,Ltd.
30/204 Preakasɛ Road. Tambol BangPoo Amphur Muang Samutprakarn

Shipment to:

Item	Quantity	Unit	Description	Amount (Baht)
			Total Amount	

Delivery Order no.	Truck no.	Delivered by:	Received by:

Figure F.8. Delivery Order Report.

Purchase Order

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn

To:

Item	Description	Unit	Quantity
		Total	

Purchase Order no.	Purchased by:	Received by:

Figure F.9. Purchasing Report.

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn
Customer Monthly Credit Report

Staff Code:
Date Reported:

Month: Dec/2000

Customer Code	Name	Total Credit (Baht)	Due Date (D-M-Y)	Total Number of Using Credit	Remark

Figure F.10. Monthly Customer Credit Report.

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn
Customer Credit Analyzing Report

Staff Code:
Date Reported:

Customer Code	Name	Credit Available (Baht)	Total Number of Using Credit	Total Number of Credit	Remark

Figure F.11. Customer Credit Analyzing Report.

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn
Inventory Control Analyzing Report

Staff Code:
Date Reported:

Product Code	Unit	Quantity (Unit)	Allocated (Unit)	Stock Level (Unit)	Lead Time (Day)	Date Arrival (D-M-Y)	Remark

Figure F.12. Inventory Control Analyzing Report.

Prima Pharmacy Co.,Ltd.
30/204 Preakasa Road. Tambol BangPoo Amphur Muang Samutprakarn
Purchasing Control Analyzing Report

Staff Code:
Date Reported:

Product Code	Trade Name	Generic Name	Price per unit (Baht)	Supplier Name	Supplier Area	Remark

Figure F.13. Purchasing Control Analyzing Report.

APPENDIX G

WEB INTERFACE DESIGN

Figure G.1. Home Page of Prima Pharmacy Co., Ltd.

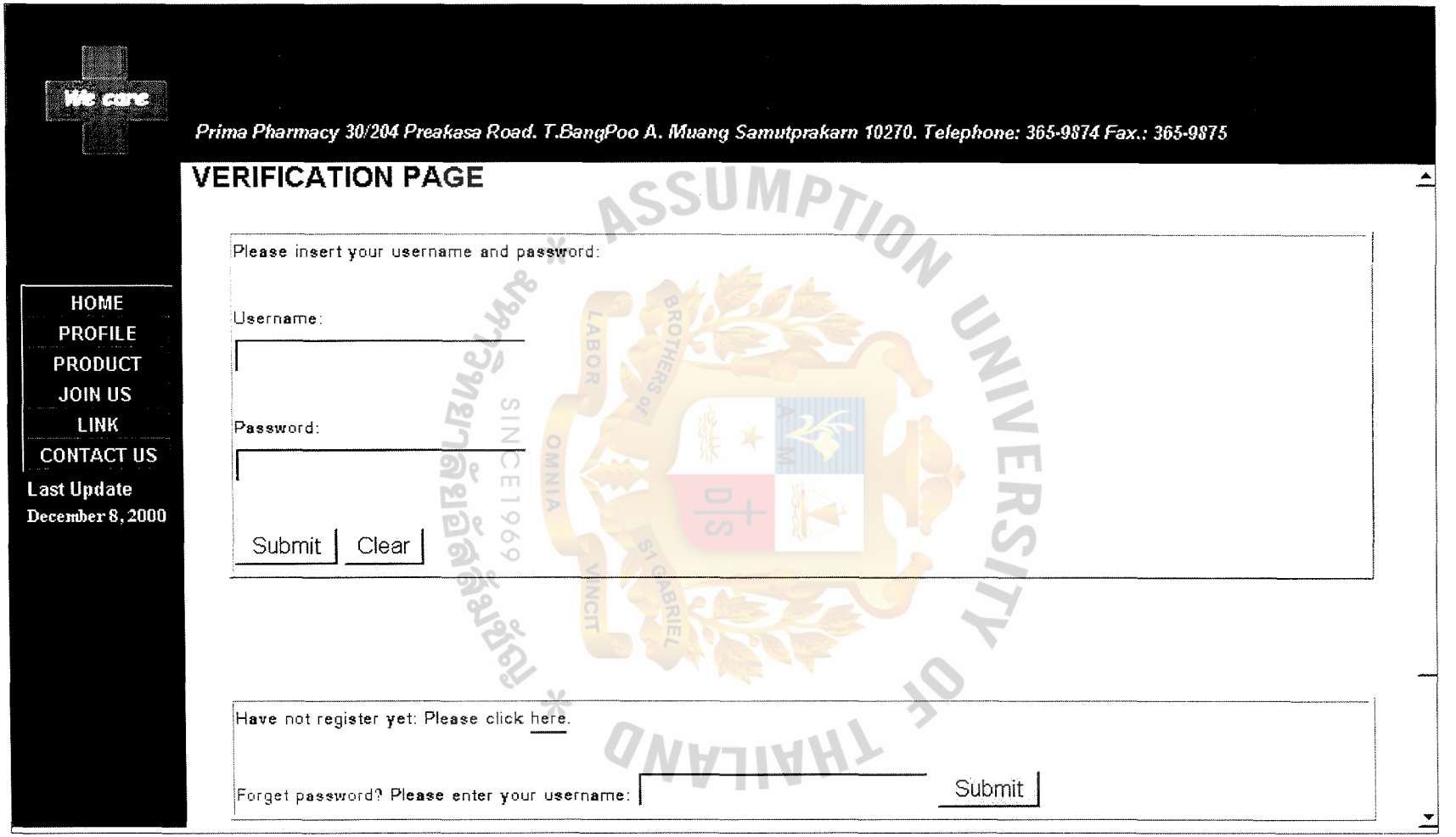

Figure G.2. Verification Page.

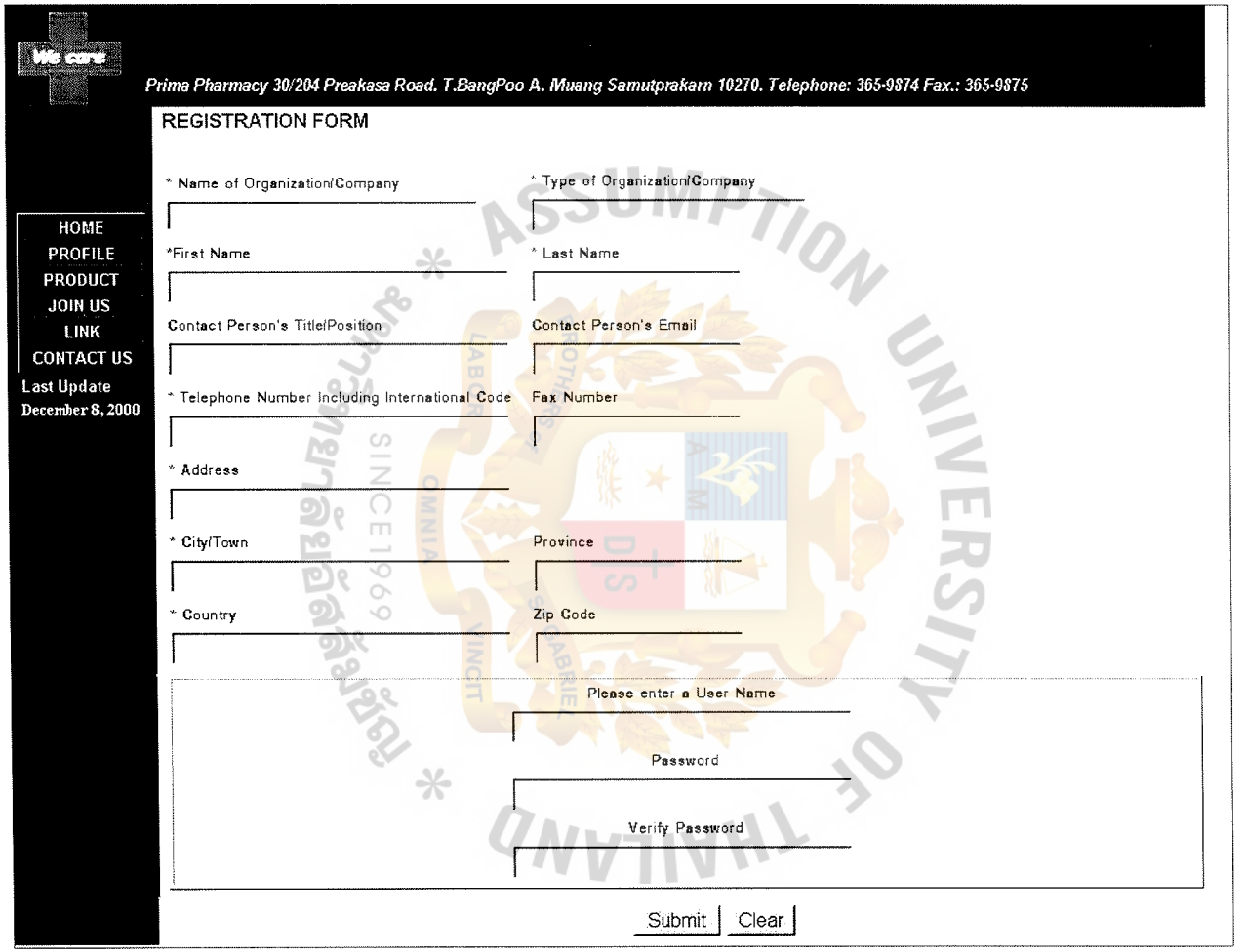

Figure G.3. Registration Page.

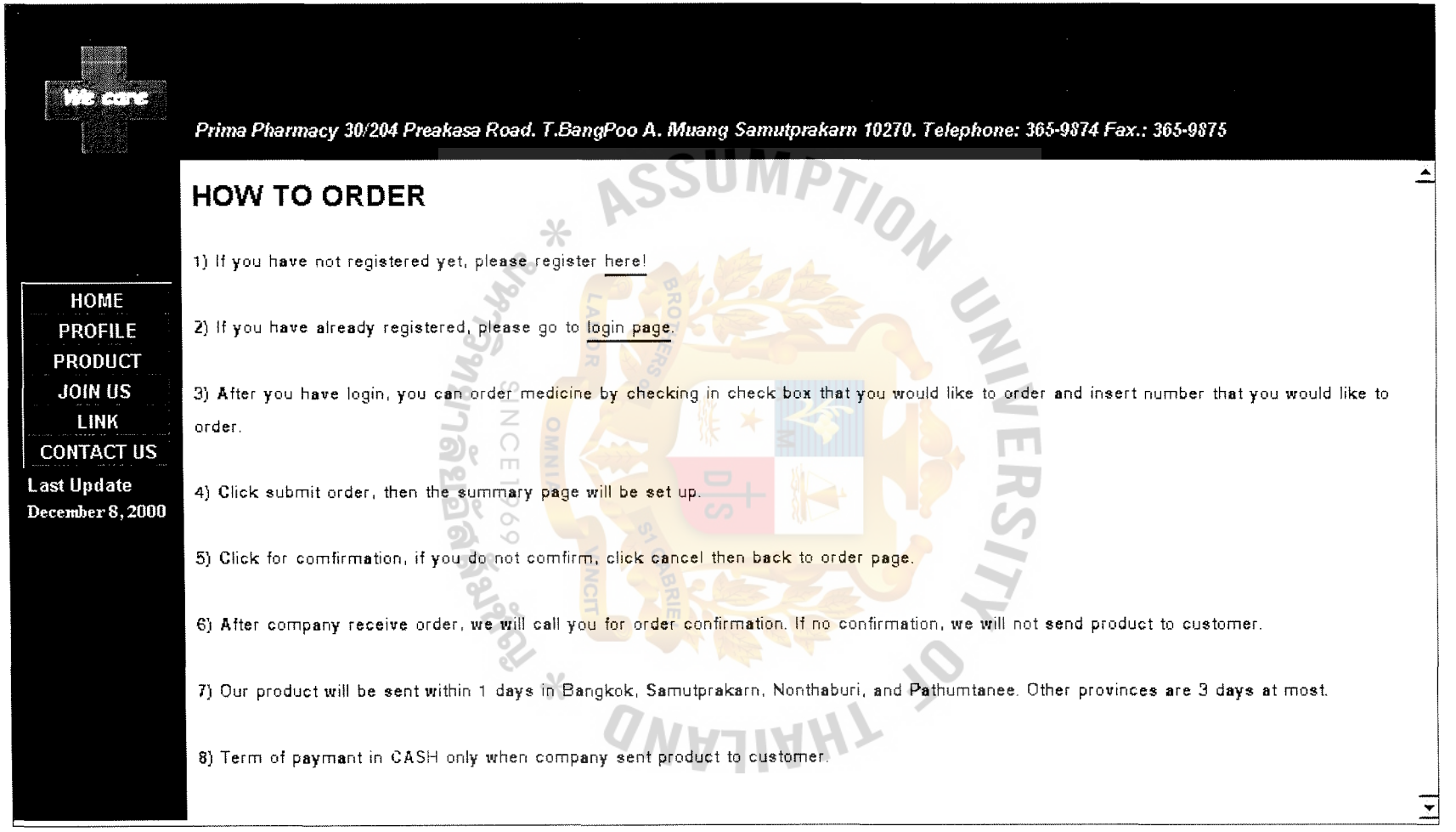

Figure G.4. Join Us Page (Order and Shipment Agreement).

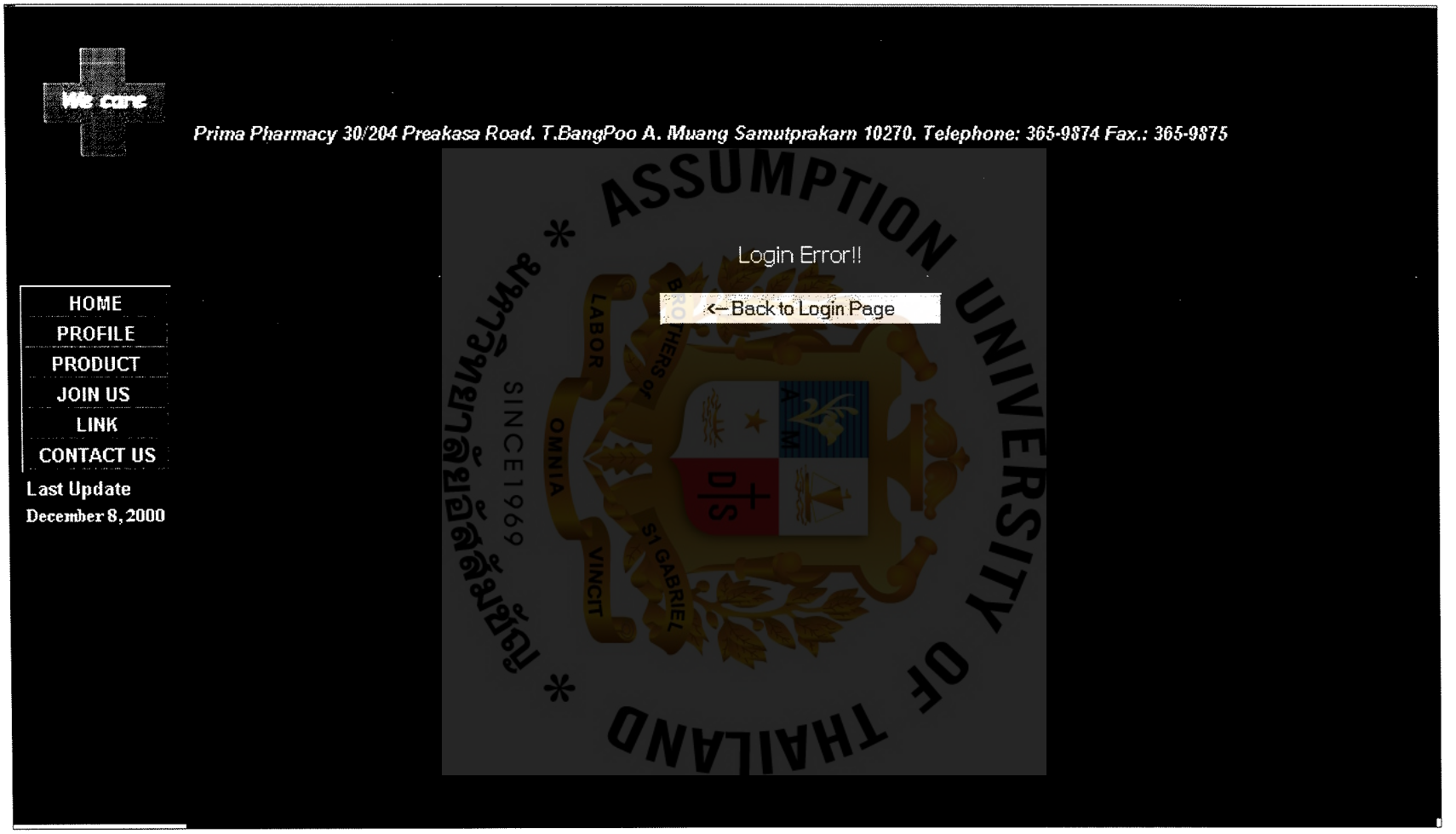

Figure G.5. Login Error Page.

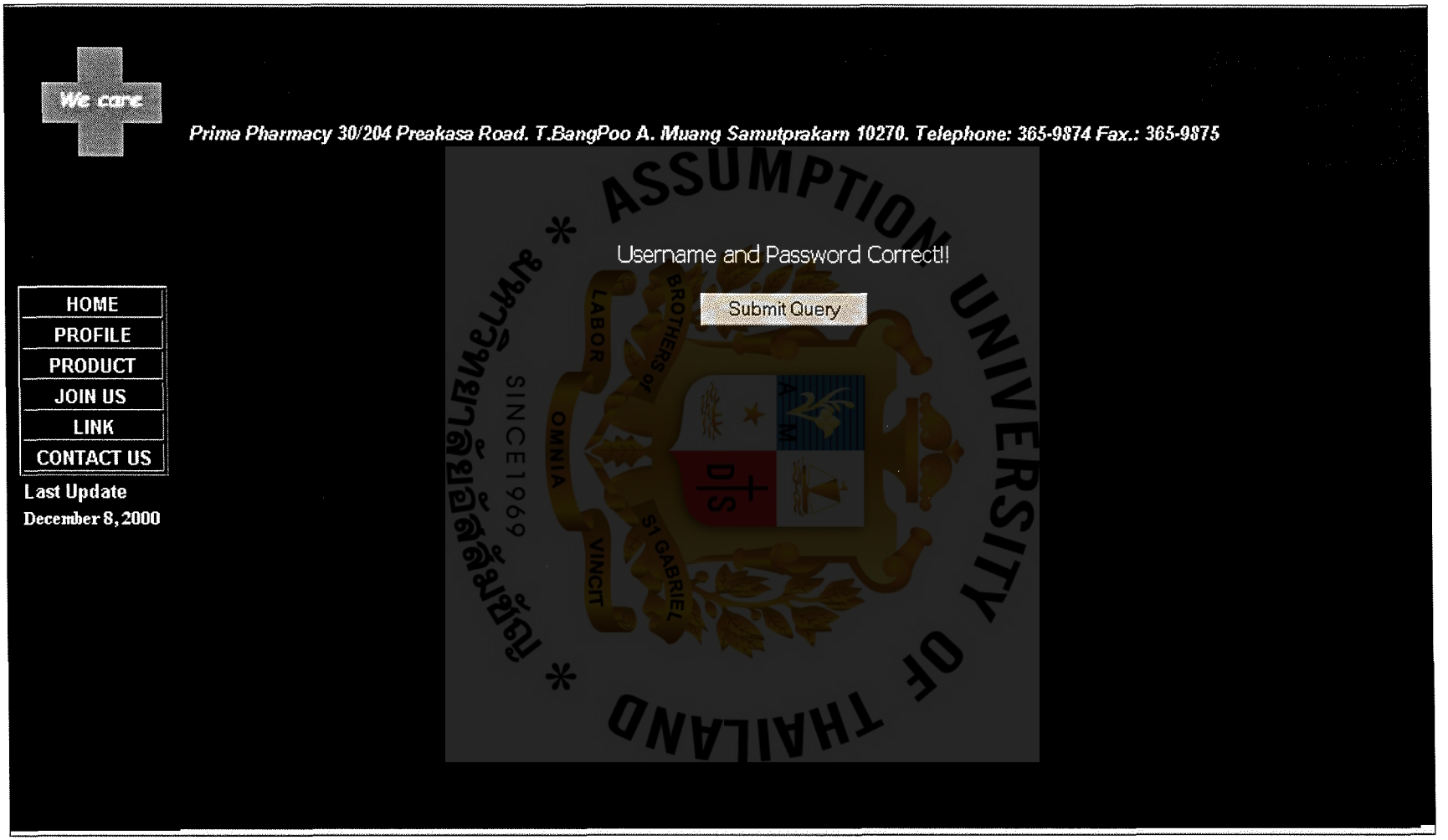

Figure G.6. Login Correct Page.

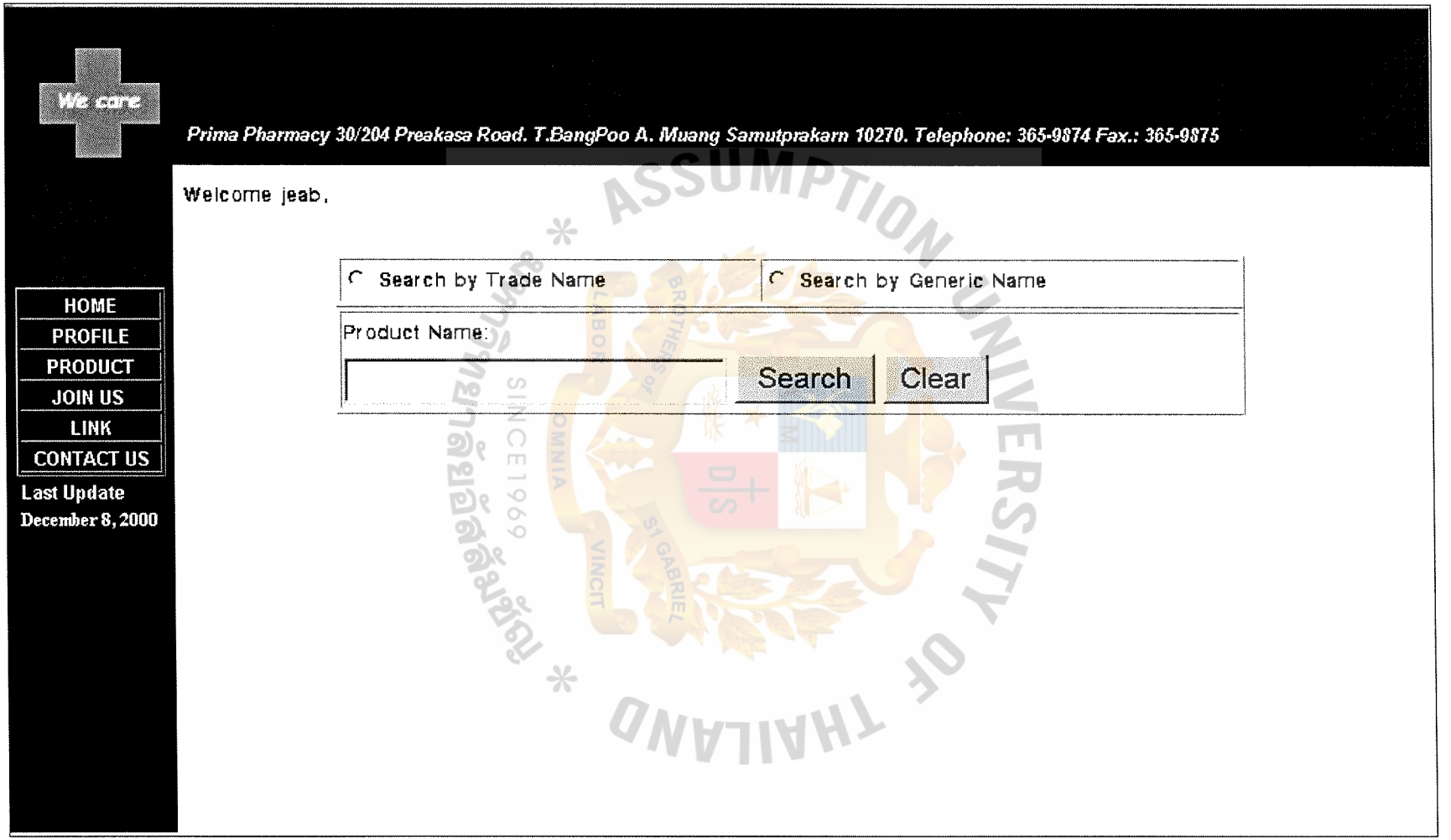

Figure G.7. Search Product Page.

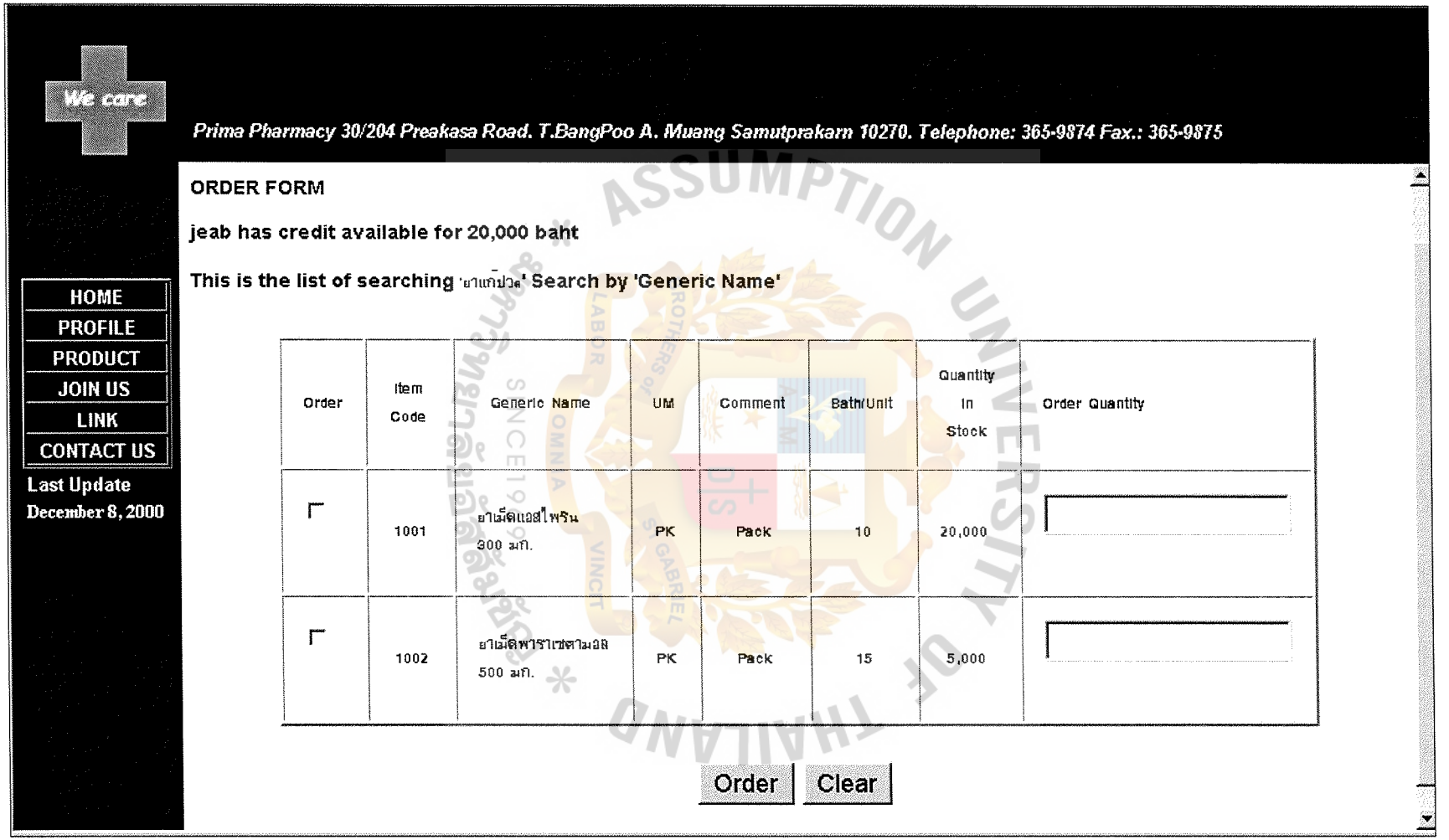

Figure G.8. Search Result Page.

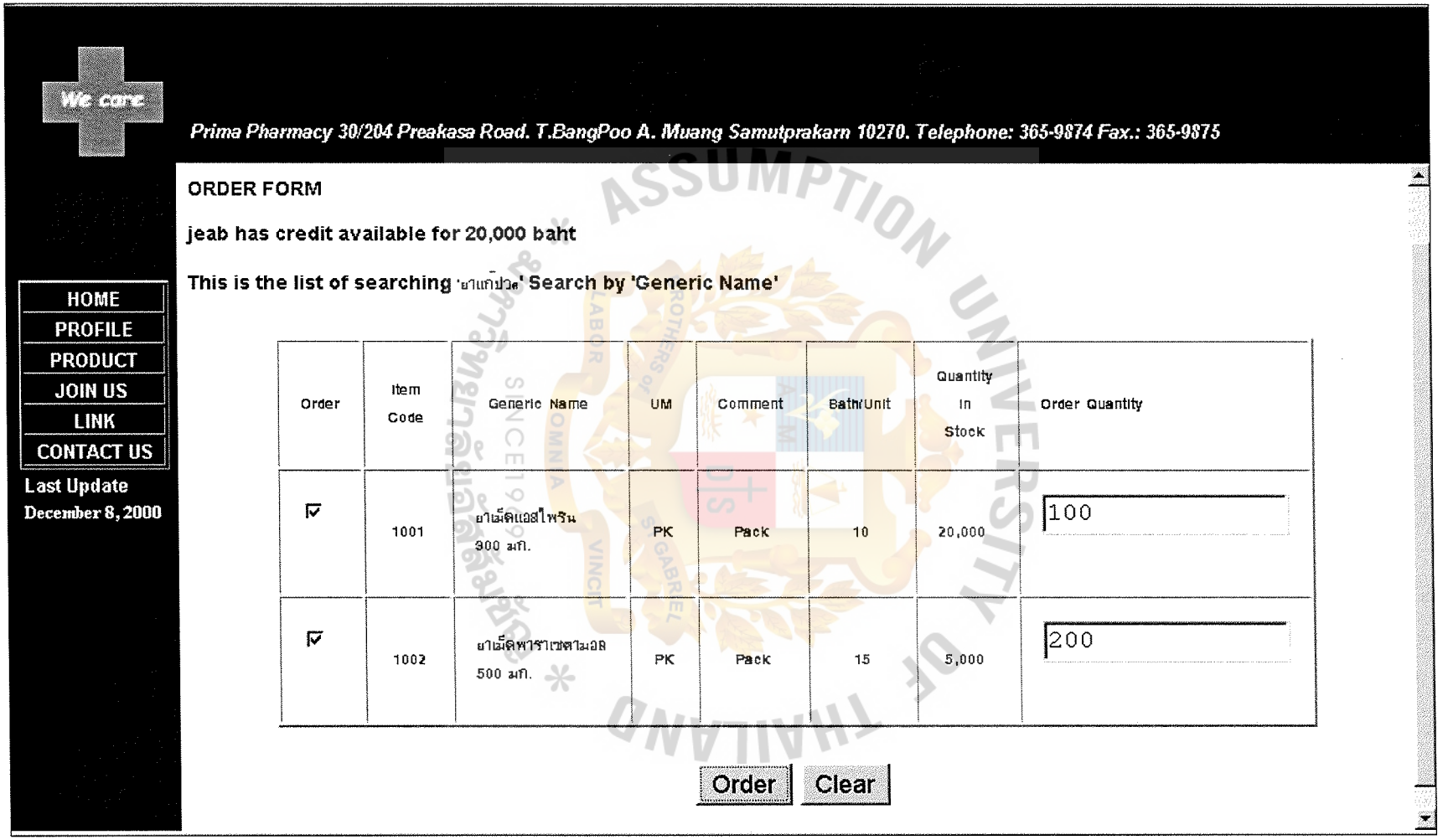

Figure G.9. Order Page.

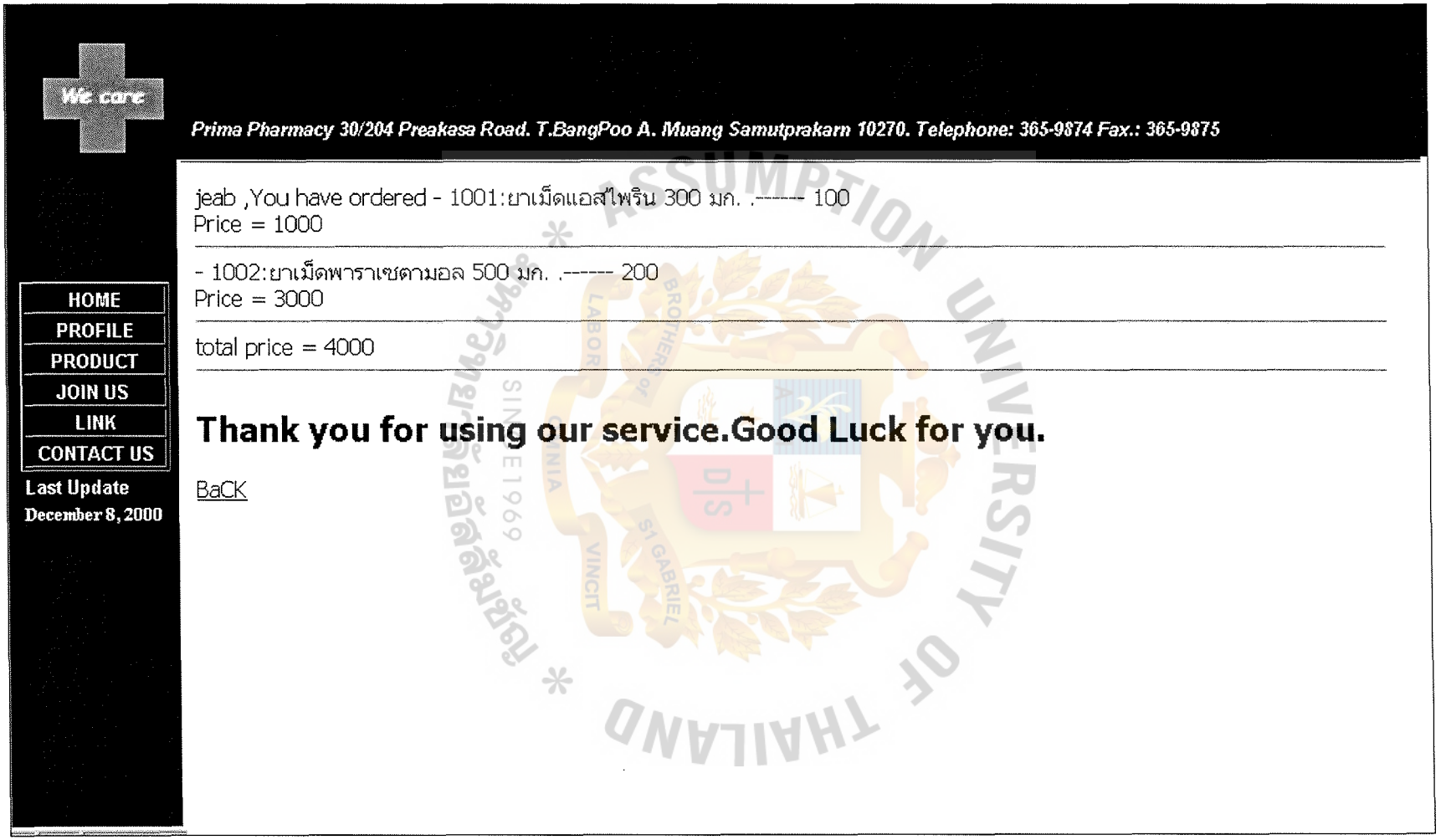

Figure G.10. Order Conclusion Page.

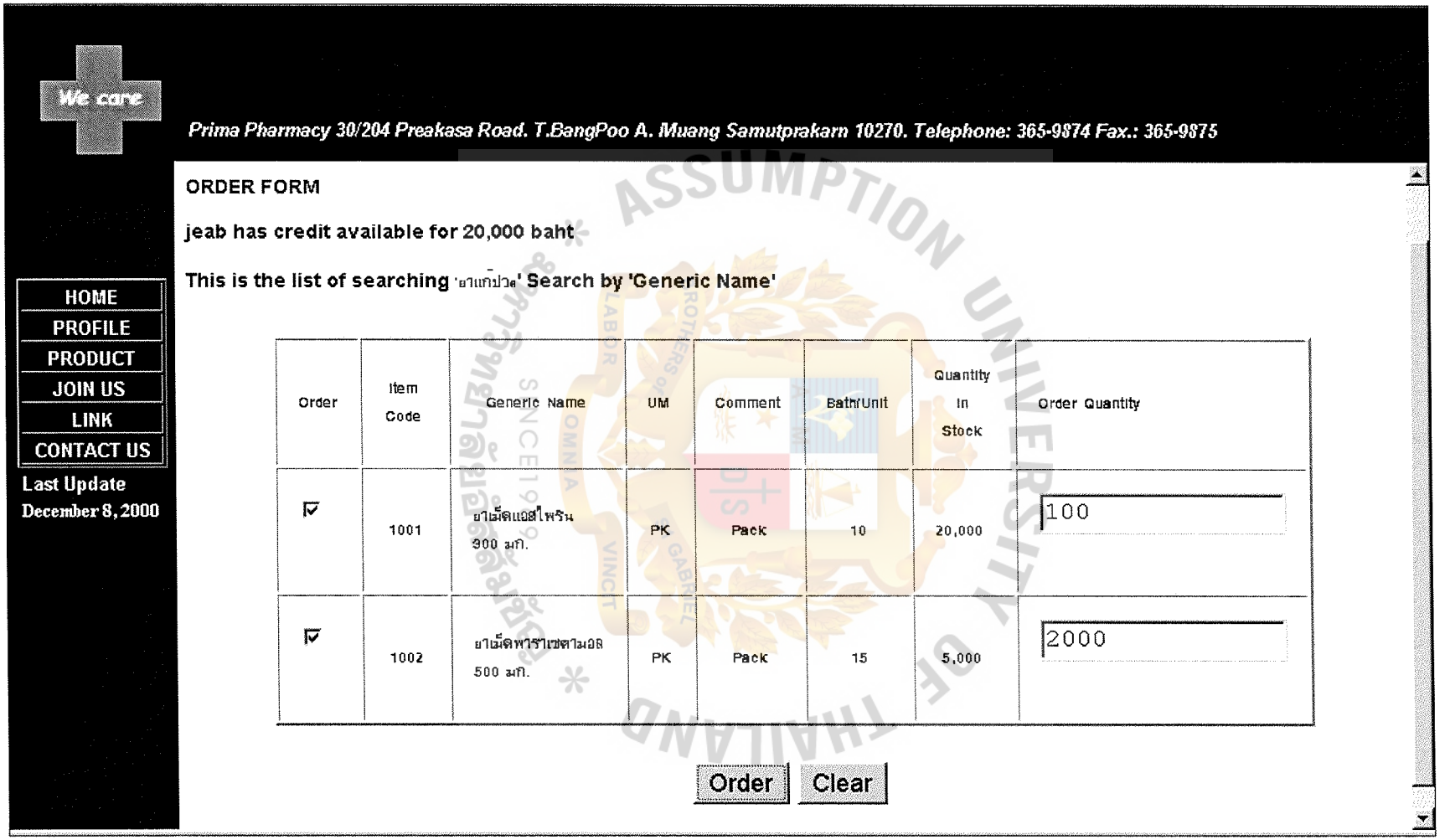

Figure G.11. Order Page (Unavailable Credit).

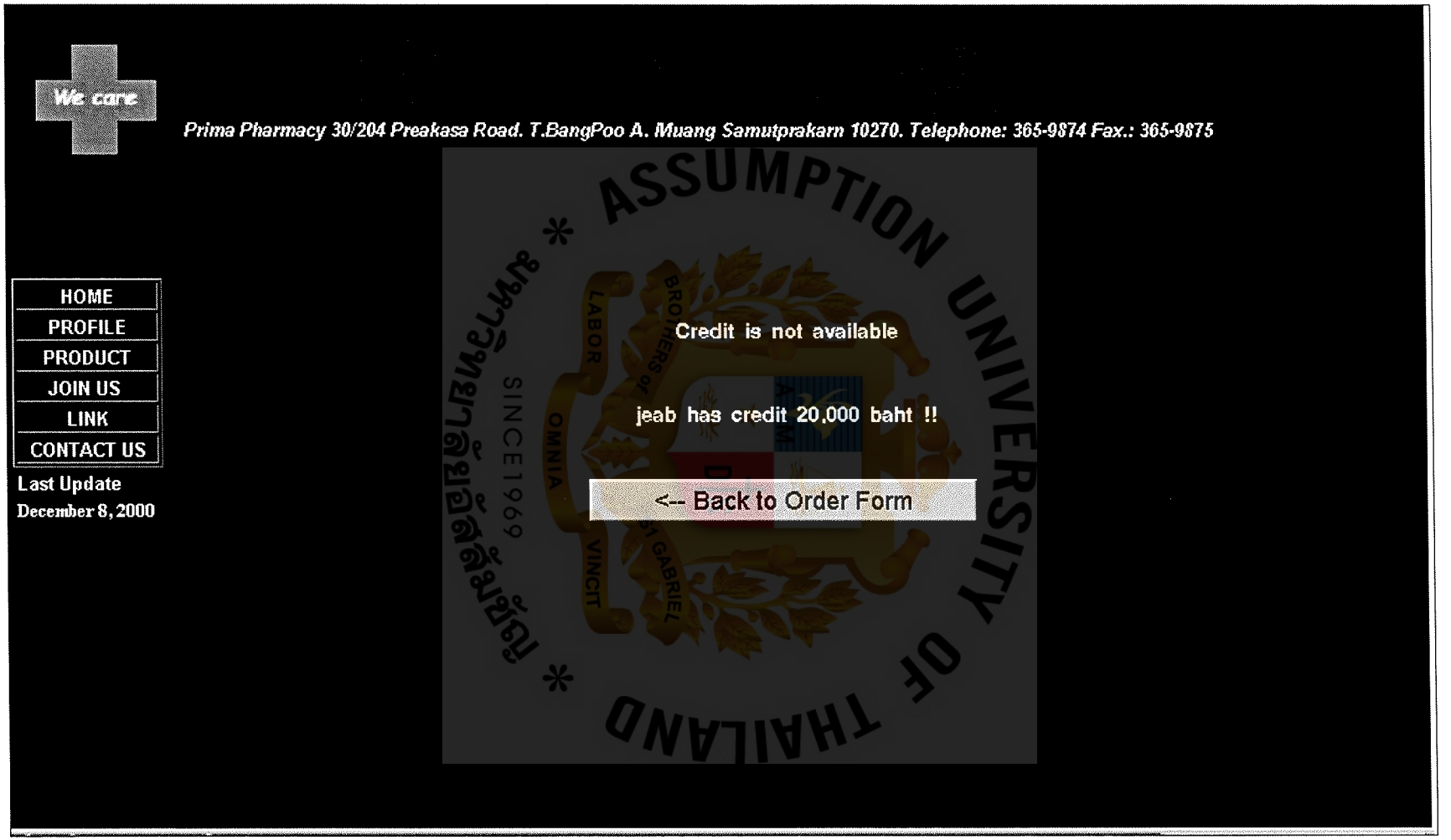

Figure G.12. Credit Unavailable Page.

APPENDIX H

COST ANALYSIS

Table H.1. Cost of Alternative Candidate 1, Baht.

Cost Items	Description	Amount	Unit Price	Price
1. Development Cost:				
	1.1 Personnel Cost:			
	System Analysts (160 hrs./ea)	1	375.00	60,000.00
	System Designer (160 hrs./ea)	1	375.00	60,000.00
	IT Specialist (200 hrs/ea)	2	250.00	100,000.00
	Programmer (200 hrs./ea)	2	200.00	80,000.00
	Subtotal 1:			300,000.00
	1.2 Expense:			
	Training Cost	7	10,000.00	70,000.00
	Installation Cost			2,000.00
	Subtotal 2:			72,000.00
	1.3 New Hardware:			
	Server (Pentium III class)	1	100,000.00	100,000.00
	Work Station (Penium Celeron)	10	26,000.00	260,000.00
	Hub Sevice (8 ports)	2	10,000.00	20,000.00
	HP LaserJet	2	25,000.00	50,000.00
	Epson LQ2170i	2	5,000.00	10,000.00
	Subtotal 3:			440,000.00
	1.4 New Software:			
	Server Software			
	(operating system, miscellaneous	1	80,000.00	80,000.00
	DBMS Client Software	10	6,000.00	60,000.00
	Subtotal 4:			140,000.00
	Total Development Cost			952,000.00
2. Operating Cost:				
	2.1 Personnel Cost:			
	IT Specialist	1	30,000.00	300,000.00
	IT Assistances	1	180,000.00	180,000.00
	Manager	1	300,000.00	300,000.00
	Staff	4	528,000.00	528,000.00
	Subtotal 1:			1,308,000.00
	2.2 Maintenance:			
	Hardware Maintenance			52,000.00
	Software Maintenance			33,000.00
	Subtotal 2:			85,000.00
	Total Operating Cost			1,393,000.00
	Total Projceted Annual Cost			2,345,000.00

Table H.2. Payback Analysis of Alternative Candidate 1, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-952,000.00	-	-	-	-	-
Operation and Maintenance Cost		-1,393,000.00	-1,504,440.00	-1,624,795.20	-1,754,778.82	-1,895,161.12
Discount Factors (5%)	1.00	0.95	0.91	0.86	0.82	0.78
Time-Adjust Costs (Adjusted to Present Value	-952,000.00	-1,326,666.67	-1,364,571.43	-1,403,559.18	-1,443,660.87	-1,484,908.33
Cumulative Time-Adjusted Costs Over Lifetime	-952,000.00	-2,278,666.67	-3,643,238.10	-5,046,797.28	-6,490,458.15	-7,975,366.48

Remark: Operating and Maintenance Cost Estimated Annual Growth Rate of 5%

Benefit Derived from Operation of New System	-	1,864,000.00	2,050,400.00	2,255,440.00	2,480,984.00	2,729,082.40
Discount Factors (5%)	1.00	0.95	0.91	0.86	0.82	0.78
Time-Adjust Benefits (Adjusted to Present Value)	-	1,775,238.10	1,859,773.24	1,948,333.87	2,041,111.68	2,138,307.47
Cumulative Time-Adjusted Benefit Over Lifetime	-	1,775,238.10	3,635,011.34	5,583,345.21	7,624,456.89	9,762,764.36

Remark: Benefits Derived from Operation of New System Estimated Annual Growth Rate of 5%

Cumulative Lifetime Time-Adjusted Cost + Benefits	-952,000.00	-503,428.57	-8,226.76	536,547.93	1,133,998.73	1,787,397.88

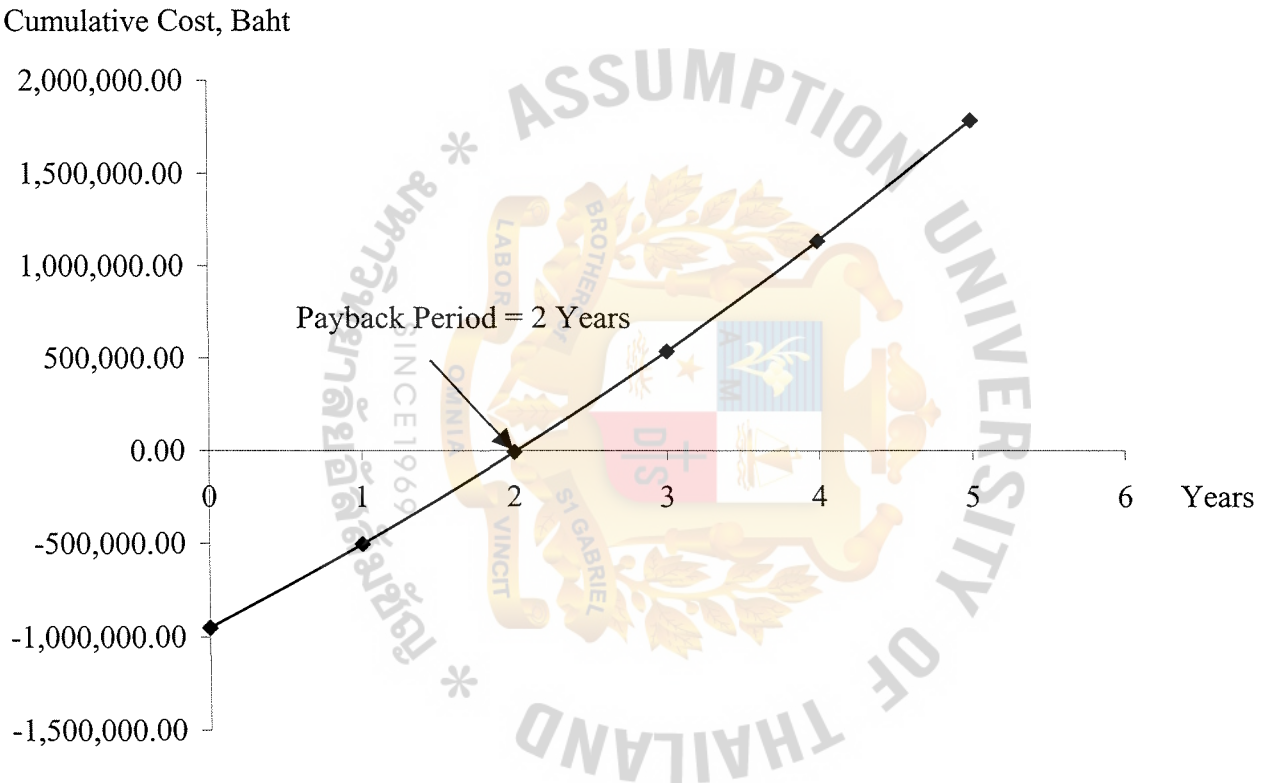

Figure H.1. Payback Period of Candidate 1.

Table H.3. Cost of Alternative Candidate 2, Baht.

Cost Items	Description	Amount	Unit Price	Price
1. Development Cost:				
	1.1 Personnel Cost:			
	System Analysts (160 hrs./ea)	1	375.00	60,000.00
	System Designer (160 hrs./ea)	1	375.00	60,000.00
	IT Specialist (200 hrs/ea)	2	250.00	100,000.00
	Programmer (200 hrs./ea)	2	200.00	80,000.00
	Subtotal 1:			300,000.00
	1.2 Expense:			
	Training Cost	13	20,000.00	260,000.00
	Installation Cost			2,000.00
	Subtotal 2:			262,000.00
	1.3 New Hardware:			
	Server (Pentium III class)	1	166,500.00	166,500.00
	Work Station (Penium Celeron)	10	260,000.00	260,000.00
	Hub Sevice (8 ports)	2	10,000.00	20,000.00
	HP LaserJet	2	25,000.00	50,000.00
	Epson LQ2170i	2	5,000.00	10,000.00
	Subtotal 3:			506,500.00
	1.4 New Software:			
	Server Software			
	(operating system, miscellaneous	1	50,000.00	50,000.00
	DBMS Client Software	10	90,000.00	900,000.00
	Subtotal 4:			950,000.00
	Total Development Cost			2,018,500.00
2. Operating Cost:				
	2.1 Personnel Cost:			
	IT Specialist	3	300,000.00	900,000.00
	Manager	1	300,000.00	300,000.00
	Staff	2	264,000.00	264,000.00
	Subtotal 1:			1,464,000.00
	2.2 Maintenance:			
	Hardware Maintenance			32,000.00
	Software Maintenance			5,000.00
	Subtotal 2:			37,000.00
	Total Operating Cost			1,501,000.00
	Total Projceted Annual Cost			3,519,500.00

Table H.4. Payback Analysis of Alternative Candidate 2, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-2,018,500.00	-	-	-	-	-
Operation and Maintenance Cost		-1,501,000.00	-1,621,080.00	-1,750,766.40	-1,890,827.71	-2,042,093.93
Discount Factors (5%)	1.00	0.95	0.91	0.86	0.82	0.78
Time-Adjust Costs (Adjusted to Present Value	-2,018,500.00	-1,429,523.81	-1,470,367.35	-1,512,377.84	-1,555,588.64	-1,600,034.03
Cumulative Time-Adjusted Costs Over Lifetime	-2,018,500.00	-3,448,023.81	-4,918,391.16	-6,430,769.00	-7,986,357.64	-9,586,391.66

Remark: Operating and Maintenance Cost Estimated Annual Growth Rate of 5%

Benefit Derived from Operation of New System	-	1,864,000.00	2,050,400.00	2,255,440.00	2,480,984.00	2,729,082.40
Discount Factors (5%)	1.00	0.95	0.91	0.86	0.82	0.78
Time-Adjust Benefits (Adjusted to Present Value)	-	1,775,238.10	1,859,773.24	1,948,333.87	2,041,111.68	2,138,307.47
Cumulative Time-Adjusted Benefit Over Lifetime	-	1,775,238.10	3,635,011.34	5,583,345.21	7,624,456.89	9,762,764.36

Remark: Benefits Derived from Operation of New System Estimated Annual Growth Rate of 5%

Cumulative Lifetime Time-Adjusted Cost + Benefits	-2,018,500.00	-1,672,785.71	-1,283,379.82	-847,423.79	-361,900.75	176,372.69

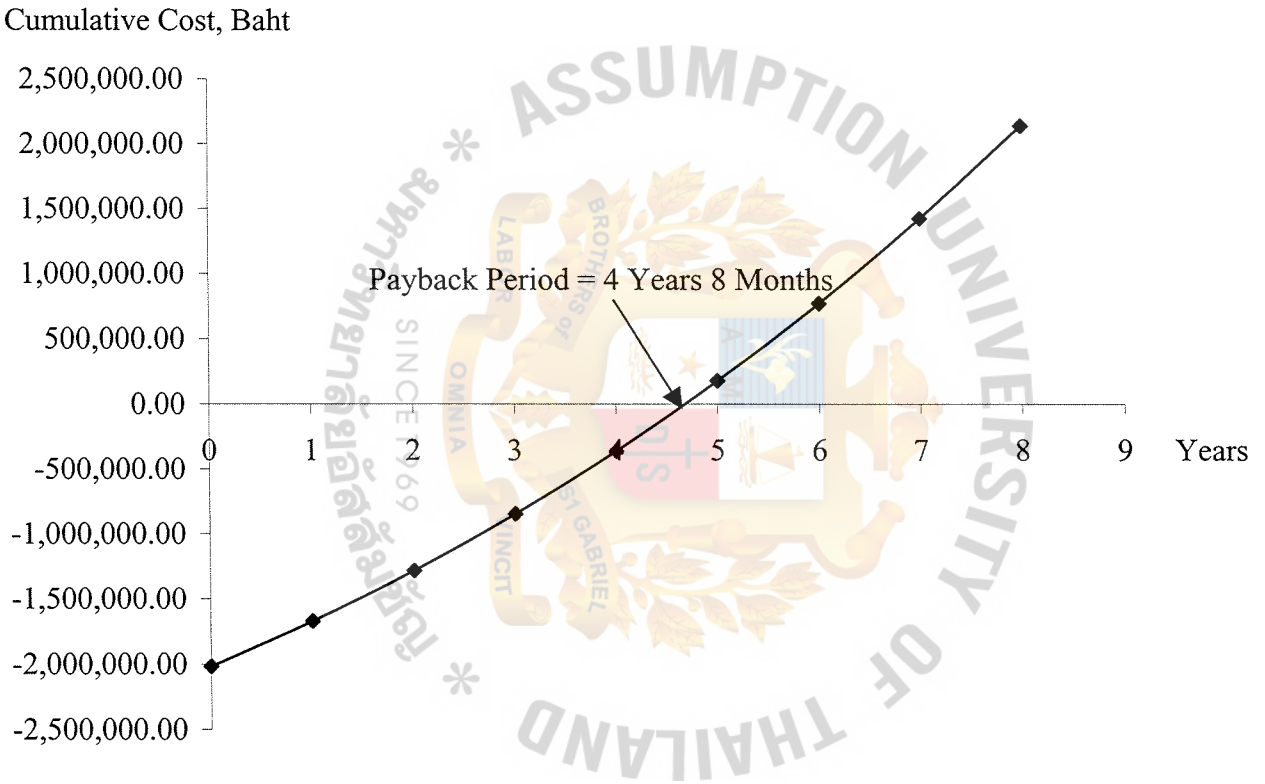

Figure H.2. Payback Period of Candidate 2.

Table H.5. Cost of Alternative Candidate 3, Baht.

Cost Items	Description	Amount	Unit Price	Price
1. Development Cost:				
	1.1 Personnel Cost:			
	System Analysts (160 hrs./ea)	1	375.00	60,000.00
	System Designer (160 hrs./ea)	1	375.00	60,000.00
	IT Specialist (200 hrs/ea)	2	250.00	100,000.00
	Programmer (200 hrs./ea)	2	200.00	80,000.00
	Subtotal 1:			300,000.00
	1.2 Expense:			
	Training Cost	10	8,000.00	80,000.00
	Installation Cost			2,000.00
	Subtotal 2:			82,000.00
	1.3 New Hardware:			
	Server (Pentium III class)	1	100,000.00	100,000.00
	Work Station (Penium Celeron)	9	28,000.00	252,000.00
	Hub Sevice (8 ports)	2	10,000.00	20,000.00
	HP LaserJet	2	25,000.00	50,000.00
	Epson LQ2170i	2	5,000.00	10,000.00
	Subtotal 3:			432,000.00
	1.4 New Software:			
	Server Software			
	(operating system, miscellaneous	1	7,000.00	7,000.00
	DBMS Client Software	10	9,000.00	90,000.00
	Subtotal 4:			97,000.00
	Total Development Cost			911,000.00
2. Operating Cost:				
	2.1 Personnel Cost:			
	IT Specialist	1	300,000.00	300,000.00
	IT Assistant	1	180,000.00	180,000.00
	Manager	1	240,000.00	240,000.00
	Staff	1	108,000.00	108,000.00
	Subtotal 1:			828,000.00
	2.2 Maintenance:			
	Hardware Maintenance			8,000.00
	Software Maintenance			4,000.00
	Subtotal 2:			12,000.00
	Total Operating Cost			840,000.00
	Total Projceted Annual Cost			1,751,000.00

Table H.6. Payback Analysis of Alternative Candidate 3, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-911,000.00	-	-	-	-	-
Operation and Maintenance Cost		-840,000.00	-907,200.00	-979,766.00	-1,058,158.08	-1,142,810.73
Discount Factors (5%)	1.00	0.95	0.91	0.86	0.82	0.78
Time-Adjust Costs (Adjusted to Present Value	-911,000.00	-800,000.00	-822,857.14	-846,367.35	-870,549.27	-895,422.11
Cumulative Time-Adjusted Costs Over Lifetime	-911,000.00	-1,711,000.00	-2,533,857.14	-3,380,224.49	-4,250,773.76	-5,146,195.87

Remark: Operating and Maintenance Cost Estimated Annual Growth Rate of 5%

Benefit Derived from Operation of New System	-	1,864,000.00	2,050,400.00	2,255,440.00	2,480,984.00	2,729,082.40
Discount Factors (5%)	1.00	0.95	0.91	0.86	0.82	0.78
Time-Adjust Benefits (Adjusted to Present Value)	-	1,775,238.10	1,859,773.24	1,948,333.87	2,041,111.68	2,138,307.47
Cumulative Time-Adjusted Benefit Over Lifetime	-	1,775,238.10	3,635,011.34	5,583,345.21	7,624,456.89	9,762,764.36

Remark: Benefits Derived from Operation of New System Estimated Annual Growth Rate of 5%

Cumulative Lifetime Time-Adjusted Cost + Benefits	-911,000.00	64,238.10	1,101,154.20	2,203,120.72	3,373,683.13	4,616,568.49

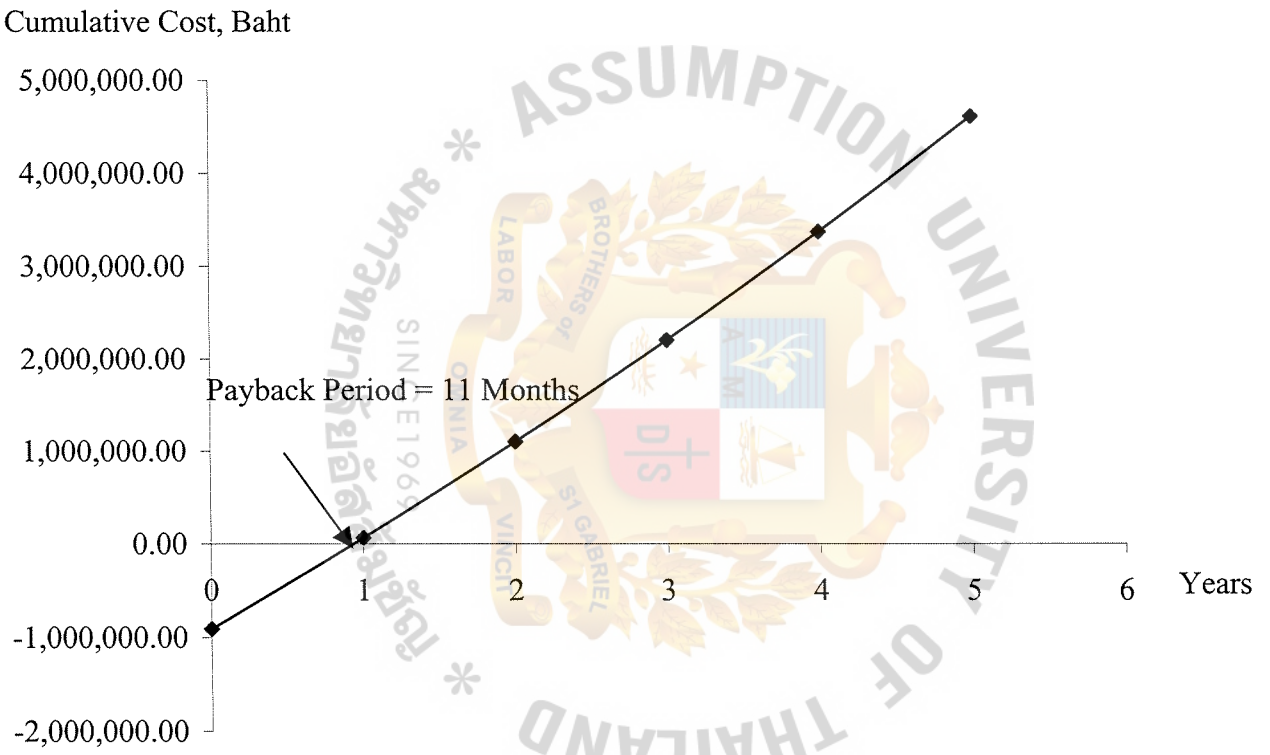

Figure H.3. Payback Period of Candidate 3.

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