



Sales Support System for Sales Service
of C-Tech

by

Mr. Chatchaporn Triwimol

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

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Project Title Sales Support System for Sales Service of C-Tech
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Academic Year November 2004

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

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ABSTRACT

C-Tech Co., Ltd. was established in 1990 and currently has more than 270 professional staff selling and providing technical services. The company offers its high quality water treatment chemicals to various types of industry plant for wastewater or portable water treatment, along with technical support and consulting services. We are committed to provide superior products and services to ensure customer satisfaction by giving channel to customers to order the product or make enquiry 24 hours * 7 days via internet. In order to achieve that, the existing manual system has to be changed to computer system.

By employing a database system, the developed sales support system provides prompt, correct and updated information about products, orders, delivery, financial status, customer contact and all historical data. This can ensure that customer obtains product and service that meet their requirements and, in addition, C-Tech Inc. can maintain relationship with customer closely by using less human resources so that operating cost is lower. All of the ordered processing and historical contact data will also become information for decision making in strategic planning for marketing to develop market and customer share.

New computerized system will help the organization to have less sales system operating cost compared to existing manual system within 3 years and provide better performance of sales.

ACKNOWLEDGEMENTS

This system development project requires several people's cooperation. Without it, this project cannot be absolutely completed. The writer would like to take this opportunity to express gratitude to all people who sacrificed their valuable time to provide the needed information for this system project.

The writer is deeply grateful to Air Marshal Dr. Chulit Meesajjee, the project advisor, for his valuable suggestions and advice given in preparation of this project. The writer is also indebted to all committee members of the degree of Master of Science in Computer Information Systems, Prof.Dr. Srisakdi Charmonman, Air Marshal Dr.Chulit Meesajjee, for the constructive feedback and valuable guidance on the modification to be included in this project.

In conclusion, the writer would like to thank Mr. Sasorn Sorat, Dr. Somchai Pakapakwiat for the knowledge given on customer relationship management and strategic planning that is the main objective of this project. And to Ms. Karen Wiebelhaus, Mr.Somsak Kunanitisarn of Network Technology Co.,Ltd., and all staff of the company for the interview, support, and providing related documents and more information throughout the project.

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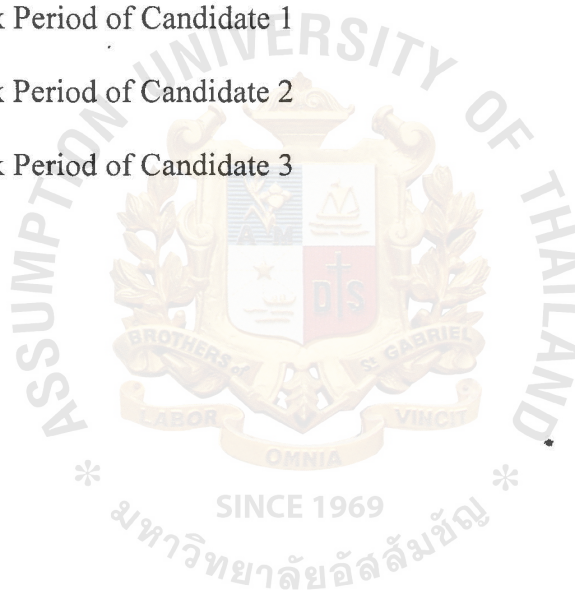
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I. INTRODUCTION

1.1 Background of the Project

Information technology development consists of computer technology and communication technology. Computer technology helps people to have high efficiency and capability for all tasks; it can record a lot of data and process it into information formats of many styles which can be easily understood, describing each event and then forecasting what will happen in the future. Not only this, but also people can store unlimited information, and reuse it again and again. As to communication technology, this enables convenient and rapid data exchange and analysis. There is global change, moving industry age to an information age. It causes changing idea, organizational style and job performance. It also affects quality of human life and work, and creates a new business environment stated as follows:

- (1) Digitization, powerful and far-reaching digital electronic services enable networked PC and workstation users to obtain information from outside their companies instantly without leaving their desks. Stock prices, periodicals, competitor's data, industrial supplies catalogs, legal research, news articles, reference works, and weather forecasts are some kind of information that can be accessed online.
- (2) Globalization of the world's industrial economies greatly enhances the value of information to companies and offers new opportunities for business. Today, information system provides the communication and analytical power that companies need for conducting trade and managing business on a global scale.

- (3) Mobility, because of the needs of the general workforce and business society to access information from several sources.
- (4) Work groups generally have rapidly changing information needs, peak-load work schedules associated with project deadlines, and high communication requirements. Informal task forces, interdepartmental committees, project teams, and committees do much of the work in an organization.

1.2 Objectives of the Project

The main objectives of this project are to increase customer satisfaction. On that account, the new system is designed to improve the following.

- (1) To increase sales and productivity.
- (2) To provide a channel that customer can enquire through this powerful electronic support system
- (3) To provide information on customer contact and sales historical data to enable precise forecast and excellent support.
- (4) To get accurate insight into customer.
- (5) To enhance customer service.

1.3 Scope of the Project

This project covers system analysis, system design and implementation of Sales and Customer Contact System, which are based on project management in Sales and Marketing department. The scope of the project is to study the existing system to find out which area should be improved, and changed from manual system to be presented on computer network system.

1.4 Deliverables

The following are the deliverables of this project.

- (1) Project Introduction

- (a) Background of Project
- (b) Objectives
- (c) Scope
- (2) Description of the Current System
 - (a) Background of Existing System
 - (b) Current Problems and Areas to be improved
- (3) Description of the New Proposed System
 - (a) System (user) Requirement
 - (1) Context Diagram
 - (2) Data Flow Diagram
 - (b) System Design
 - (c) Hardware and Software Requirement
 - (d) Security and Controls
 - (e) Cost and Benefit Analysis
- (4) Project Implementation
 - (a) Overview of Project Implementation
 - (b) Test Plan and Results
- (5) Conclusions and Recommendations

1.5 Project Plan

The project plan of Sales Support System for Project Management of C-Tech Co.,Ltd. is given in Figure F.1.1.

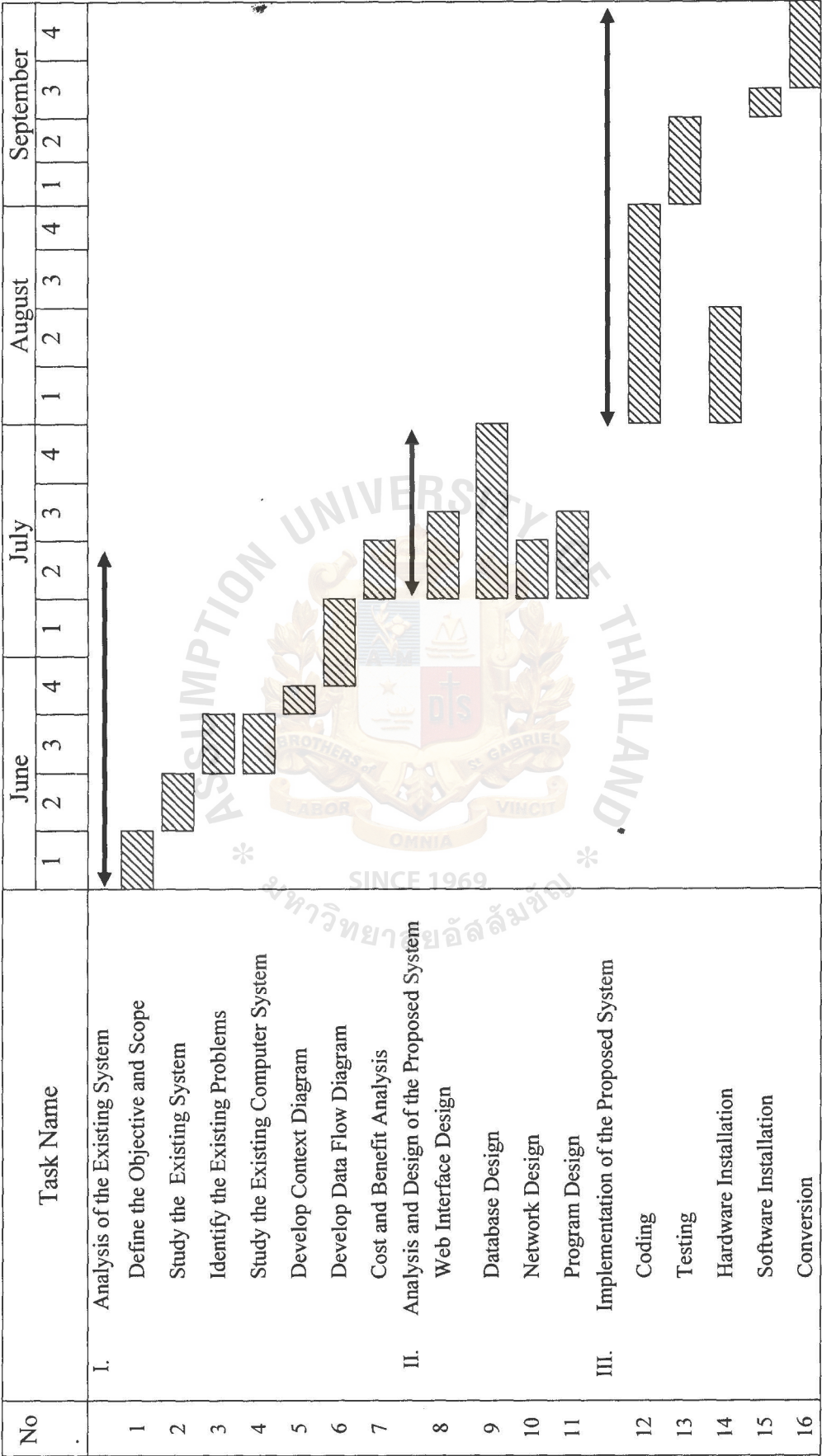


Figure 1.1. Project Plan of Sales Support System.

II. THE EXISTING SYSTEM

2.1 Background of the Organization

C-Tech Co.,Ltd., is one of the leading companies in the chemical industry, has increasingly expanded its business in Thailand by offering state-of-the-art technology and products through C-Tech Co.,Ltd..

It is a joint venture between Thai and American and was founded in 1990. We manufacture and distribute water treatment chemicals for industrial waste water treatment, community sewage treatment and portable water treatment. In addition, C-Tech provides onsite technical consultant and support services to customers. At present, the company has 350 employees and over 200 , domestic and export, customers throughout Asia Pacific region.

Under the global strategy of the company, our ability to adapt to change and our foundation of unending scientific inquiry have enabled C-Tech to become one of the world's most innovative companies. But, in the face of constant change, innovation and discovery, our core values have remained constant: commitment to safety, health and the environment, high ethical standards, and treating people with respect.

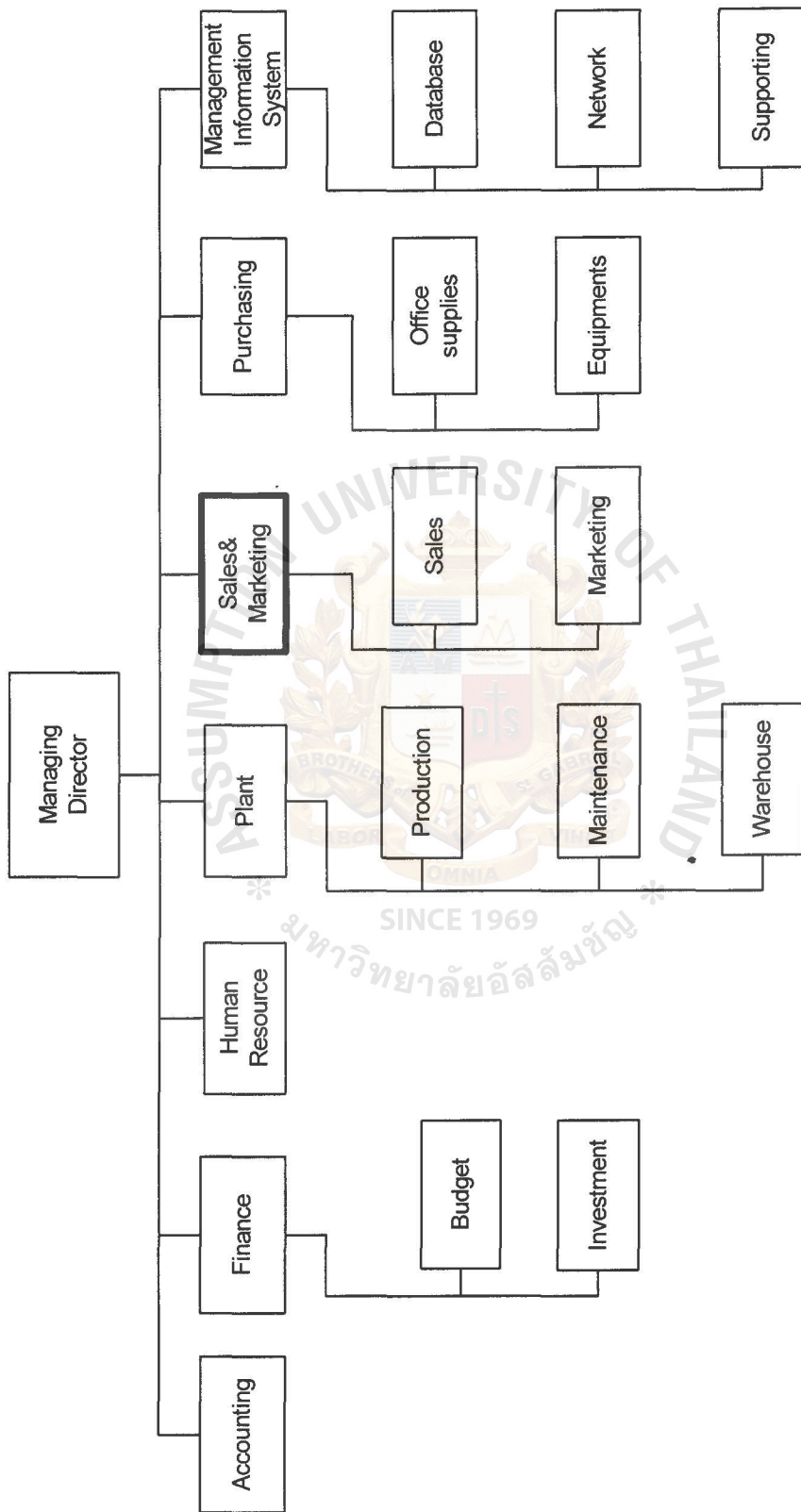


Figure 2.1. Organization Chart of C-Tech Co.,Ltd.

2.2 Existing Business Function

The company manufactures and distributes water treatment chemicals throughout Asia Pacific region. Sales & Marketing department as shown in Figure 2.1 is managed by Sales & Marketing Manager who is responsible to contact and serve customers. Manager and sales staff seldom stay in the office. They mostly go out to meet customers who are sometimes in another province or country.

Sales support staff who work in the office receive customers' call and perform paper work such as quotation, sales order, report, etc. Customer information is kept in centralized folder to allow searching and tracking of information. Nonetheless, each sales keeps his/her own customer contact record individually. Sales support staff will make a report for the manager at the end of the month, or upon manager's request, by gathering and analyzing all scattered data as requested.

2.3 Current Problems and Areas for Improvement

Currently, more than 50 sales executive in Sales & Marketing Division have massive customer information on hand. The company has grown very fast. Sales support staff and management face many problems which can be categorized into four major groups.

- (1) No available updated data for other sales person to follow up with customer.
After implementing sales support system, contact and support of customer data can be accessed 24 hours day, 365 days a year through sales support.
- (2) Redundant customer inquiries on product and technical problems. Sales staff spends a long time to search the data and provide solutions to customer.
- (3) Sales person cannot focus on sales and explore new market because they are handling a lot of customer problems and inquiries.

- (3) It is difficult to analyze data to review current status of selling since data is fragmented, redundant and missing. Sales support system offers a quick and easy way to query data to analyze and review the status of selling.

2.4 Existing Computer System

At present, Sales & Marketing Department does not have any information system to support organizational business. Each sales executive has its own document to operate the work. Some information may be kept with only one staff. There is no information system to share and/or exchange information between other employees in Sales & Marketing Department. When other employees need information to support customers, they have to request from sales support staff and sales executive themselves and if support staff take day off or leave or sales executive rarely stay in the office, employees have to wait for one more day. By establishing a Sales Support System, problems that often occur in Sale & Marketing Department would be gone.

III. THE PROPOSED SYSTEM

3.1 System Specification

After studying the existing system such as business process, existing manual system and identifying the problems of the existing system, the next step is to analyze and design the proposed system.

User requirements are obtained from Joint Application Design method (JAD), which associates concerned people (users, analyst, designers, builder, and owners) to jointly define and design the system. Group consensus on problems, objectives and requirements are obtained and user requirements are summarized, as shown below:

- (1) Each customer can access to share information to perform faster and better response.
- (2) Available online, 24 x 7 – always available twenty-four hours a day, seven days a week.
- (3) Users need a secure system that only authorized people can access sales support.
- (4) Customers submit or modify service request online.
- (5) Once the information has been entered and validated, the system returns a request number for future tracking and routes the request to the appropriate agent or queue.
- (6) Customer can check the status of their problems by entering inquires of this powerful knowledge management system and its maintenance.

3.2 System Design

System Design is the specification or construction of a technical, computer based solution for business requirements identified in systems analysis.

We start the system design process by designing process, database, input, output, user interface, and software respectively. Their pictures are shown in the Appendix section.

(1) Process Design

Data flow diagrams depict the flow of data through the Sales Support System. All pictures are shown in Appendix B. and context diagram is shown in Figure B.1. Level 0 is the data flow that contains the subsystem of the whole system. It is shown in Figure B.2. Level 1 data flow diagrams are shown in Figures B.3-B.8, showing the details of each subsystem.

(2) Database Design

Entity Relationship Model is used to draw the diagram. The model is shown in Appendix D including the tables that show database design. The tables show the details of data type, data domain, attribute, foreign key, etc.

(3) Input and Output design

Sales Support System emphasizes on web based interface design. Both input and output will be performed and displayed on the web. Graphic user interface is designed to be easy to understand and capture the information. The pictures are shown in Appendix A.

(4) User Interface

The interface of Input and Output design will be web based design. It will be easy for users to use, similar to the use of internet.

(5) Software Design

The structure design technique is used dealing with the size and sampling of program by breaking the program into easier units to implement and maintain. Structure charts to graphically depict the modular design of the program are shown in Figure B.9 to Figure B.14.

3.3 Hardware and Software Requirement

This section describes hardware and software which is used in the proposed system. For this proposed system, only one server is required to provide the full functions and the company decided to use oracle software for the proposed Sales Support System. The following table contains the hardware and software requirements for Internet server.

Table 3.1. Hardware Specification for Server.

Hardware	Specification
CPU	Dual 3.4 GHZ Intel Xeon Processor
Memory	16 GB
Hard Disk	1.2 TB or higher
CD-read/write Drive	Plextor 48/32/48X or higher
Floppy Drive	1.44 MB
Network-Adapter	3COM Ethernet 10/100/1000-BaseT
Display Adapter	VGA card AGP 8 MB
Monitor	15" ADI Micro Sand GSO
UPS.	1,000 VA
Printer	HP LaserJet 5 MP

In the software part of Sales Support web server, Oracle Database is used to store data. The reasons are that it can act as a single repository for all business intelligent needs including OLAP Data mining and Data Warehousing and reduce management cost. Oracle9i Database increases IT productivity with self-tuning, self-correcting, self-mangy, automatic routine backup and recovery and reduces IT time. Wizard-driven

management tuning complex operations are easier, and it also shortens IT training time. Application server software is Oracle9i Application server. It is a scalable, secure, middle-tier application server. It enables to deliver Web content, and host web application.

Table 3.2. Specification for the Server.

Software	Specification
Operating System	Microsoft Windows Server 2003
Application Server	Oracle9i Application server (9iAS)
Database server	Oracle9i Database

For the Sales Support System, the client machine will have a capacity only high enough to run a Web Browser, such as Microsoft Internet Explorer, etc. It, however, should have specification higher than that, because it is sometimes used to run other office automation software, such as Microsoft office, for example. Therefore, in general standard, it should have hardware specification high enough to run Microsoft Windows 2003. The hardware and software specifications for each client machine are shown in the Tables 3.3 and 3.4 respectively.

Table 3.3. Hardware Specification for Each Client Machine.

Hardware	Specification
CPU	2.66 GHz Intel Pentium IV
Memory	256 MB or higher
Hard Disk	40 GB or higher
CD-Rom Drive	Plextor 48/32/48X
Floppy Drive	1.44 MB
Network Adapter	3COM Ethernet 100-Base T
Display Adapter	VGA card
Display	15" ADI Micro Sand GSO

Table 3.4. Software Specification for Each Client Machine.

Software	Specification
Operating System	Microsoft Windows 2003
Web browser	Microsoft Internet Explorer 6.1 or higher
Application Software	Microsoft Office 2003 Professional Edition



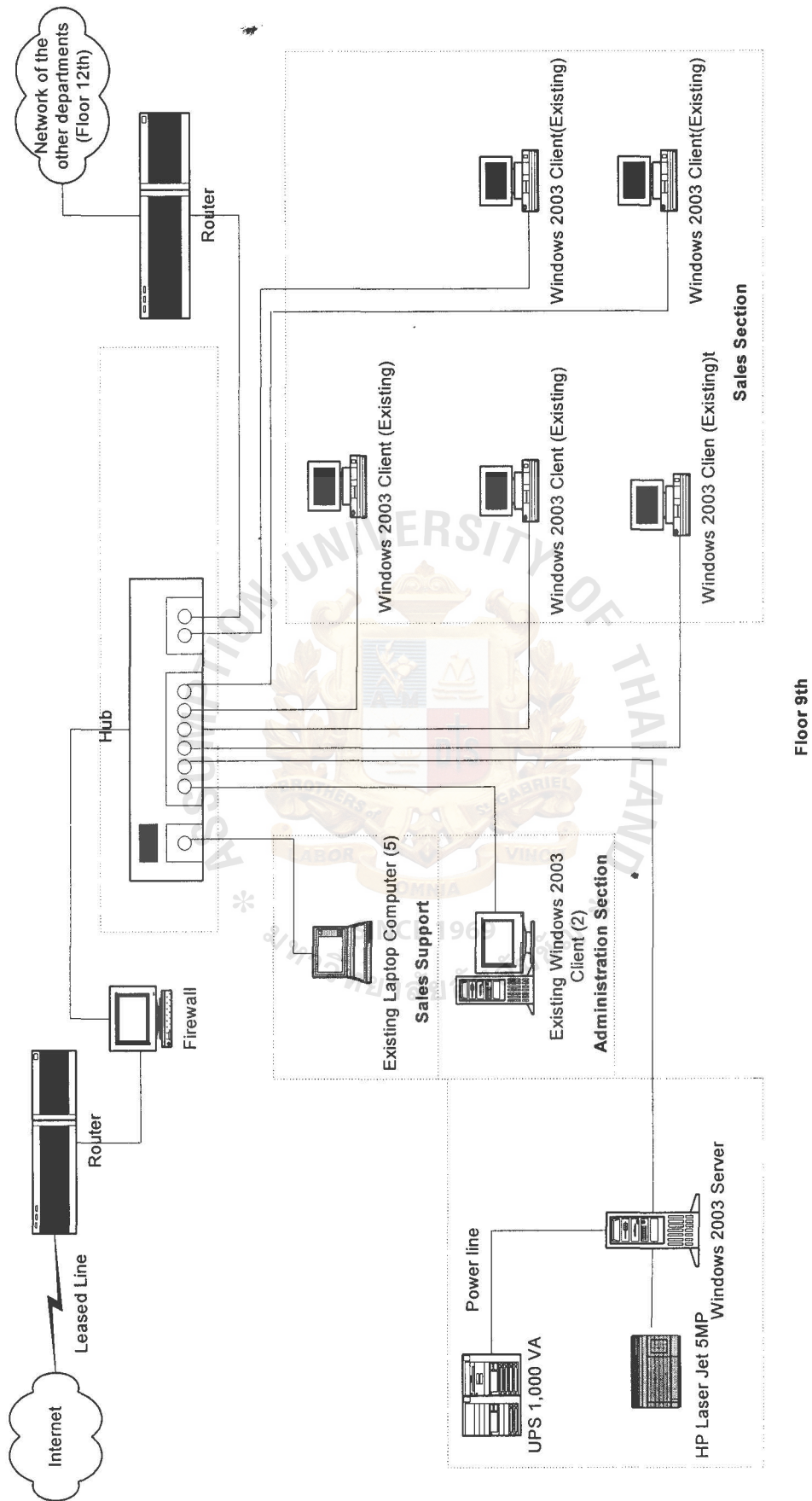


Figure 3.1. Hardware Configuration of Sales & Marketing Department.

3.4 Security and Control

Data on an Intranet is vulnerable for the following reasons:

- (1) Sometimes we need to exchange information through the Internet in order to save cost from remote access. As we know, Internet is an open place. Everyone can access to use its service. The chance of unauthorized access is increased.
- (2) Password: Before you can use the Sales Support System, you must login first. Each support department's member has his/her own password to login.
- (3) Firewall: We install firewall to protect our network from intruders by monitoring the traffic (information passing) through the firewall both inside to outside and vice versa. Only authorized traffic, as defined by the security policy, will be allowed to pass.
- (4) Virus Scan: Viruses are also mainly concerned with information destruction. So we need to prevent virus by installing the Macafee Virus scan software. It can detect and clean the virus out of the system. But we need to update the virus definition every week in order to be able to cover new viruses that will be created.

3.5 Cost and Benefit Analysis

(1) Cost of Manual System

Table 3.5. Manual System Cost Analysis, in Baht.

Cost items	Years				
	1	2	3	4	5
<u>Fixed Cost</u>					
Copying machine 1 machine	150,000.00	–	–	–	–
Total Fixed Cost	150,000.00	–	–	–	–
<u>Operating Cost</u>					
<u>Salary Cost:</u>					
Information recorder	1,464,000.00	1,550,400.00	1,645,200.00	1,749,840.00	1,864,980.00
<u>Communication Cost:</u>					
Telephone (included foreign toll)	100,000.00	140,000.00	188,000.00	245,600.00	314,720.00
Facsimile (Fax)	4,000.00	4,400.00	4,840.00	5,324.00	5,857.00
Remote Access	100,000.00	140,000.00	188,000.00	245,600.00	314,720.00
Total communication Cost	204,000.00	284,400.00	380,840.00	496,524.00	635,297.00
<u>Office Supplies & Miscellaneous Cost:</u>					
Stationary Per Annual	30,000.00	32,000.00	34,200.00	36,620.00	39,282.00
Paper Per Annual	7,000.00	7,700.00	8,470.00	9,317.00	10,249.00
Utility Per Annual	20,000.00	21,000.00	22,100.00	23,310.00	24,641.00
Miscellaneous Per Annual	2,000.00	2,200.00	2,420.00	2,662.00	2,928.00
Total Annual Office Supplies & Miscellaneous Cost	49,000.00	52,900.00	57,190.00	61,909.00	67,100.00
Total Annual Operating Cost	1,927,000.00	2,097,700.00	2,293,230.00	2,518,273.00	2,777,377.00
Total Manual System Cost	1,877,000.00	1,897,700.00	2,093,230.00	2,318,273.00	2,577,377.00

Table 3.6. Five Years Accumulated Manual System Cost, in Baht.

Year	Total Manual Cost	Accumulated Cost
1	1,877,000.00	1,877,000.00
2	1,897,700.00	3,774,700.00
3	2,093,230.00	5,867,930.00
4	2,318,273.00	8,186,203.00
5	2,577,377.00	10,763,580.00
Total	10,763,580.00	-

(2) Costs of Computerized System

Table 3.7. Computerized System Cost Analysis, in Baht.

Cost items	Years				
	1	2	3	4	5
<u>Fixed Cost</u>					
<u>Hardware Cost:</u>					
Server	22,000.00	22,000.00	22,000.00	22,000.00	22,000.00
PC 1 item @44,950	53,940.00	53,940.00	53,940.00	53,940.00	53,940.00
Hub 10/100/1000mbs 24 ports	3,360.00	3,360.00	3,360.00	3,360.00	3,360.00
UPS 1,000 VA	1,400.00	1,400.00	1,400.00	1,400.00	1,400.00
Laser printer	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
Scanner	1,500.00	1,500.00	1,500.00	1,500.00	1,500.00
Total Hardware Cost	85,200.00	85,200.00	85,200.00	85,200.00	85,200.00
<u>Maintenance Cost:</u>					
Maintenance Cost	30,000.00	30,000.00	30,000.00	30,000.00	30,000.00
Total Maintenance Cost	30,000.00	30,000.00	30,000.00	30,000.00	30,000.00
<u>Software Cost:</u>					
Windows server 2003 OS	8,000.00	8,000.00	8,000.00	8,000.00	8,000.00
MS Office 2003 professional	4,000.00	4,000.00	4,000.00	4,000.00	4,000.00
Database and Tools Cost	115,000.00	115,000.00	115,000.00	115,000.00	115,000.00
Total Software Cost	127,000.00	127,000.00	127,000.00	127,000.00	127,000.00
<u>Implementation Cost:</u>					
Training Cost (CBT)	5,000.00	-	-	-	-
Set up & Install Cost	25,000.00	-	-	-	-
Total Implementation Cost	30,000.00	-	-	-	-
<u>People -Ware Cost:</u>					
System Analyst 1 person (4 months)	120,000.00	-	-	-	-
System Designer 1 person (4 months)	120,000.00	-	-	-	-
Total People – Ware Cost	240,000.00	-	-	-	-
Total Fixed Cost	512,440.00	242,440.00	242,440.00	242,440.00	242,440.00
<u>Operating Cost</u>					
<u>Salary Cost :</u>					
Information recorder	1,317,600.00	1,395,360.00	1,316,160.00	1,399,872.00	1,491,984.00
<u>Network Expense Cost :</u>					
Internet Expense	250,000.00	120,000.00	120,000.00	120,000.00	120,000.00
Leased line Expense	30,000.00	130,000.00	130,000.00	130,000.00	130,000.00
<u>Office Supplies & Miscellaneous Cost:</u>					
Stationary Per Annual	12,000.00	6,600.00	7,400.00	8,200.00	9,000.00
Paper Per Annual	5,000.00	4,600.00	4,500.00	4,500.00	4,300.00
Utility Per Annual	5,500.00	6,500.00	7,500.00	8,500.00	9,500.00
Miscellaneous Per Annual	2,000.00	2,200.00	2,500.00	2,700.00	2,900.00
Total Office Supplies & Miscellaneous Cost	24,500.00	19,900.00	21,900.00	23,900.00	25,700.00
Total Operating Cost	1,695,300.00	1,665,260.00	1,588,060.00	1,673,772.00	1,767,684.00
Total Computerized System Cost	2,207,500.00	1,907,460.00	1,830,260.00	1,915,972.00	2,009,884.00

Table 3.8. Five Years Accumulated Computerized Cost, in Baht.

Year	Total Computerized Cost	Accumulated Cost
1	2,177,500.00	2,207,500.00
2	1,777,460.00	4,144,960.00
3	1,700,260.00	5,945,220.00
4	1,785,972.00	7,861,192.00
5	1879,884.00	9,871,076.00
Total	9,871,076.00	

(3) Comparison of the System Costs between Computerized System and Manual System

Table 3.9. Comparison of the System Costs, in Baht.

Year	Accumulated Manual Cost	Accumulated Computerized Cost
1	1,877,000.00	2,207,500.00
2	3,774,700.00	4,144,960.00
3	5,867,930.00	5,945,220.00
4	8,186,203.00	7,861,192.00
5	10,763,580.00	9,871,076.00

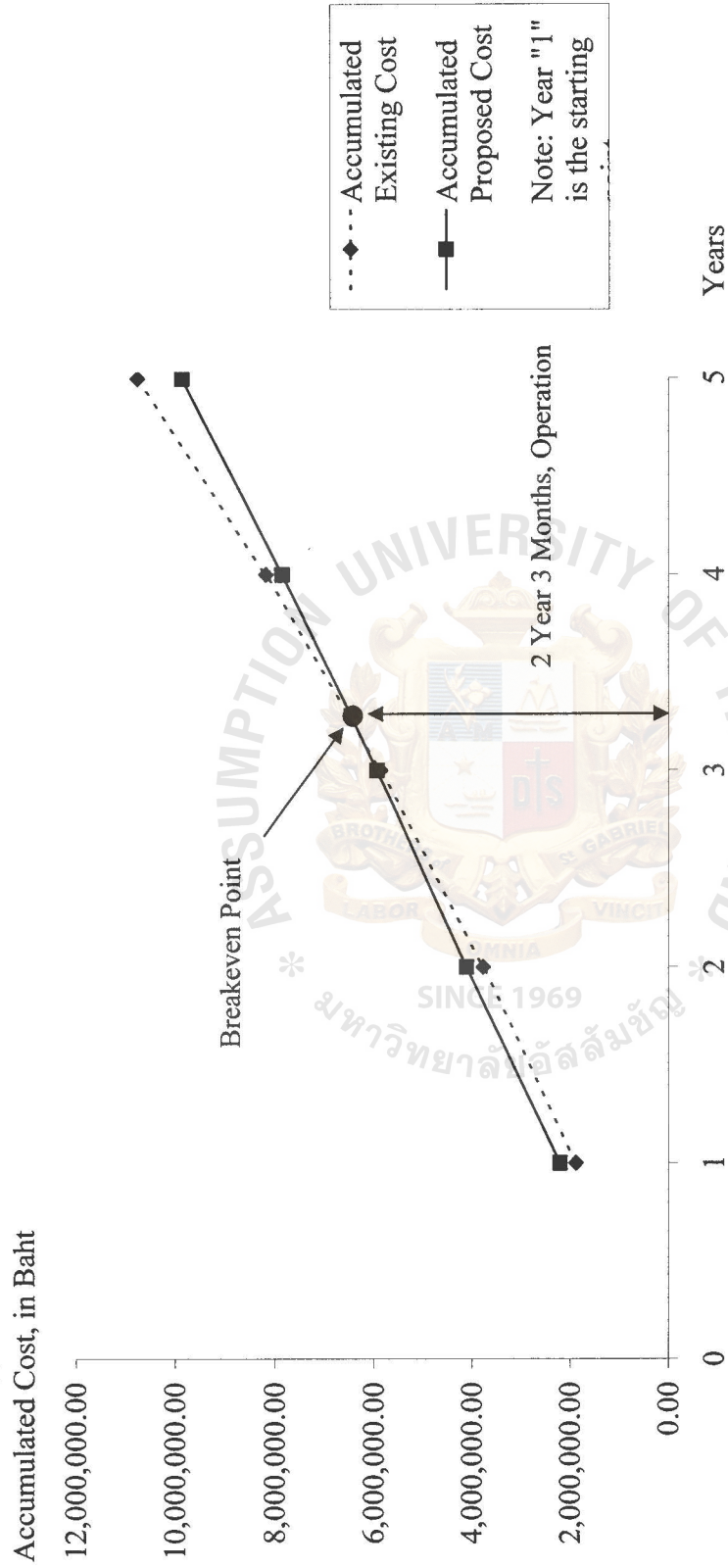


Figure 3.2. Cost Comparison between Existing System and Proposed System.

Table 3.10. Candidate Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized : A description of the portion of the computerized system.	Package CRM system. This application cannot customization by Technical staff.	Knowledge base and CRM application in relation to support user requirement.	CRM System. Need customization some requirement.
Benefit: The benefit of each alternative that the company should consider in order to make decision.	To gain competitive advantage and speed of processing.	Fully support user requirements and business process.	To support business process.
Server and Workstations: The needs of server and workstation to support alternatives.	Pentium Xeon 3.4 GHz., RAM 16 GB for server, Pentium IV 2.66 GHz., RAM 256 MB for workstation.	Pentium Xeon 3.4 GHz., RAM 16 GB for server, Pentium IV 2.66 GHz., RAM 256 MB for workstation.	Pentium Xeon 3.4 GHz., RAM 16 GB for server, AMD Athlon 2.4 GHz., RAM 256 MB for workstation.
Software Tools Needed: Tools needed to facilitate each candidate such as computer programming languages.	Microsoft Window 2003 JAVA and HTML	Microsoft Window 2003 , Oracle Developer 2000, Oracle Portal, ASP	Linux, Delphi, ASP and HTML
Method of Data Processing: An alternative solution to data procession.	Internet	Internet	Internet.
Output Devices and Implications: The devices that will be used to show, present document information.	HP LaserJet 5 MP	HP LaserJet 5 MP	HP LaserJet 5 MP
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.	DB2	Oracle 9i	SQL Server
Technical Staff: A Description of the alternative way for the company to hire the people who have knowledge about the new technology.	To hire the new employees who have the knowledge.	The technical staffs have the knowledge about new technology.	To hire the new employees who have the knowledge.

Table 3.11. Alternative Candidate Requirement Analysis.

Characteristic	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized			
- Support Process		X	
- CRM System	X		X
Benefit			
- Competitive advantage	X		
- Support business process		X	X
Server			
- Pentium Xeon 3.4 GHz.	X	X	X
Workstation			
- Pentium IV 2.66 GHz.	X	X	
- AMD Athlon 2.4 GHz.			X
Operation system			
- Microsoft Windows 2003	X	X	X
- Microsoft Windows NT	X	X	
- Linux			X
Software Tools			
-Oracle Portal		X	
- JAVA	X		
- Delphi			X
- HTML	X		X
- ASP		X	X
Method of Data Processing			
- Internet		X	
Output Devices and Implications			
- HP LeserJet 5 MP	X	X	X
Input Devices and Implications			
- Keyboard	X	X	X
- Mouse	X	X	X
Storage Devices and Implications			
- DB2	X		
- Oracle 9i		X	
- SQL server			X

Note: X means the characteristic that each candidate processes.

Table 3.12. Feasibility Analysis Matrix.

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
<u>Operational Feasibility</u> Functionality: A description of to what degree the candidate would benefit the organization.	30%	Support only helpdesk functionality and has to modified or customized to complete with business process. Score: 80	The candidate supports all business requirements. Score: 100	The candidate supports business requirements. But need to modify some function. Score: 80
<u>Technical Feasibility</u> 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 is widely accepted and supported by various computers. Current employees are promoted and trained to support the system, they may not have any on hand experience Score: 85	Pentium is widely accepted and supported by various computers. Oracle Portal is easy to use. Technical staff will be easier to coding program. Employees will have the experience supporting the developed system. Score: 90	AMD is not as widely used compared to Pentium but its performance is comparable. Employees will have the experience supporting the developed system. Score: 80
<u>Economic Feasibility</u> Cost to Develop (Baht) Payback Period: Net Present Value	30%	1,541,000.00 2 years 6 months 1,604,368.88 Score:75	1,331,000.00 2 years 2 months 1,814,368.88 Score:85	1,372,300.00 2 years 3 months 1,773,068.88 Score:80
<u>Schedule Feasibility</u> An assessment of how long the solution will take to design and implement.	10%	4 months Score:100	4 months Score:100	4 months Score:100
Ranking	100%	85.00%	93.75%	85.00%

The above feasibility analysis matrix is used to rank the candidates to support decision what choice is the best by scoring and weighing the feasibility criteria. For our Sales Support System project, the best choice after summarizing all data is Candidate 2. It can fully support user requirement and spends less money in system development compared with other candidates.

Benefit Analysis:

We can classify benefits into 2 groups which comprise of tangible benefits and intangible benefit. Tangible benefit is benefit that can be quantified and assigned monetary value but intangible benefits are not easily quantified.

(1) Tangible benefits

- (a) Reduce overtime because customers can search information by themselves thus reducing redundant questions.
- (b) Reduce information-recording staff: There is no need to hire extra employees to handle paper documents.
- (c) Reduce office supplies expense i.e. stationery, paper, etc.
- (d) Increase customer support maintenance cost .

(2) Intangible benefits

- (a) Improve employees' goodwill because they have a system to handle their tasks and to reduce their workload.
- (b) Increase efficiency and accuracy in working process.
- (c) Identify and retain profitable customers.
- (d) Solve the problems quickly and improve working process.
- (e) In the proposed system, data will be kept in permanent storage, which eliminates loss of information and document damages while providing more security than the existing system.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

System implementation is construction and delivery of the new system into production (daily operation). It can be divided into 2 phases, i.e. the construction phase and delivery phase.

Construction phase contains writing and testing of the network, database, new program and also includes installation and testing new software package. Delivery phase is likely conversion to new system, conducting system test, database installation, and conversion plan preparation and training system users.

4.2 Coding

Oracle Portal is used to code the Sales Support System to set up the web portal. A portal will offer news, and favorites, and application link to Oracle Developer 9i by using Active Server Page (ASP). Oracle Developer 9i is used to develop Sales Support System, gathering information in forms and integrating it with database user to perform transaction, and queries on other database. This section also includes construction of the database. Database table is constructed by using Oracle Enterprise Manager (OEM) tools.

4.3 Hardware and Software Installation

With the proposed system, we need to install server including Window 2003, Oracle9i Database, Oracle9i Application server and Oracle Forms server. Sales Support System uses three tier distributed computing framework as Internet Computing Architecture which are 1) the database tier, which manages Oracle9i database, 2) the application tier, which manages Sales Support System and other tools, and 3) the desktop tier, which provides the user interface display.

4.4 Test Plan

We separate the test plan into 2 periods. The first period is during coding the new system and the second is during conversion.

For the first period, we handle:

- (1) Unit Test: We need to test Request Information, problems, new solution, inquiry, search patches and responses to customer process. The test is run on individual module.
- (2) System Test: After doing unit test, we program the test again to test all modules to integrated units. At first, we test by logging in wrong username or password and observe the result. Next, we test each feature by trying to use each feature as in real working environment. Developer tries to insert, updates and inquires the information in order to observe its process and outcome.

After completion of hardware and software installation, we perform validation testing, and the final system test is done by running the system in a live environment using real data. The users perform their tests by themselves as follows:

- (1) System performance: through put and response time.
- (2) Peak workload processing performance: whether the system can handle the peak process period.
- (3) Procedure test.
- (4) Backup and recovery test.

The system can run properly if it passes all the steps of the test plan.

4.5 Conversion

Abrupt cut-over is our choice for conversion plan. The old system is terminated and the new system is placed into operation.

The proposed system is web based system that is easy to learn and use.

Training manual is not required. We just verbally explain the functions for each feature and how to operate it.

We plan to convert the new system completely in 1 month. We shall later allow customers to use this system.



V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The proposed system replaces the old system and brings more benefits to the organization. It concerns cost, management, information technology, organization, information and business solution. We will generate each concerned benefit respectively.

In terms of management, the proposed system improves the performance of sales support, and offers a wide range of data analysis which leads to customers' satisfaction. Customers do not need to waste time to contact any staff. Customers can enter and modify service requests, and perform inquiries of a powerful system, empowering customers through self-service that results in increasing customer retention and loyalty.

We use high advanced new information technology with the proposed technology such as Oracle9i Database. It simplifies the infrastructure and gives greater control over critical business information. Oracle9i can help eliminate extra hardware costs. It combines the benefits of web page with an application server. Oracle portal and Oracle Developer 6i are easy tools to use with high capacity. The investment cost in the first year may be high but the operating cost will be reduced and revenue increased in later years. Its technology helps to reduce cost, improve performance, increase customers and cover the business process for consecutive years.

Sales Support System achieves the business solution in all sides. It provides the opportunity to increase revenue, increase customer, reduce support time and reduce time in supporting customers. Before we put in Sales Support System, we need to increase the technical support staff. After that there is no need to increase headcount, and can save money, and deliver record profits.

We have witnessed that the internet system gains more benefits in most cases. We ensure that this project will be really worth implementing.

The table below shows the degree of achievement of the proposed system. The content of the table shows each process of the proposed system performs in less time than each process of the existing system, which requires many work steps.

Table 5.1. Degree of Achievement of the Proposed System.

Process	Existing System Cost	Proposed System
Information Inquiry Process	At least 20 mins	3 mins
Upload/Download file Process	10 mins	2 mins
Update Information Process	At least 1 hr.	5 mins
Group Discussion Process	At least 2 hrs.	Less than 2 hrs.

There is a little difference in the total amount of spending time in achievement of both systems where the existing system uses at least 3 hrs. 30 mins and the proposed system uses about 2 hrs. 10 mins.

Each sales staff in the manual system keeps his or her information with himself or herself. The others need to contact that person to get the desired information. Due to the documents being kept in paper form, it is hard to find them and are not sharable. When some information should be found immediately, we lose the chance to respond to this customer if that person is not available. The proposed system allows everyone to share the information.

Sometimes, we can not notify the updated information to everybody in one time. Some are out of the office or are occupied by another operation. It leads to a misunderstanding of information. The proposed system will be the center of notifying the update information such as purchase order status, market tendency, etc.

At present, it is difficult to find time for meeting in order to obtain information from each sales. It leads to delayed selling that affects customer satisfaction and sales volume. The proposed system allows sales support in saving customer's historical information, and purchase order so that it can be analysed and responded faster. This method is based on written form instead of speaking.

5.2 Recommendations

Further steps after conversion is collection of user feedback, whether the system requires modification or not. Some problems may happen after using it for some period, e.g. Menu using problem. At first, staff may not be familiar with the new application. It may be hard to find the desired menu or information on the new screen. We provide staff the time to be familiar with the new application before we collect the response. Therefore, we have to wait for feedback and then study and gather additional information in order to adapt the system.

We also plan to implement this project in other departments. We may have to develop specific features or modify the existing feature to be suitable for each customer.

Right now, Internet technology is very popular because it is cheap, wide scale (worldwide), user-friend, and simple to use. We are sure that the proposed system can handle our requirements within less than 5 years. However, we may need to modify some features to fit future business process.



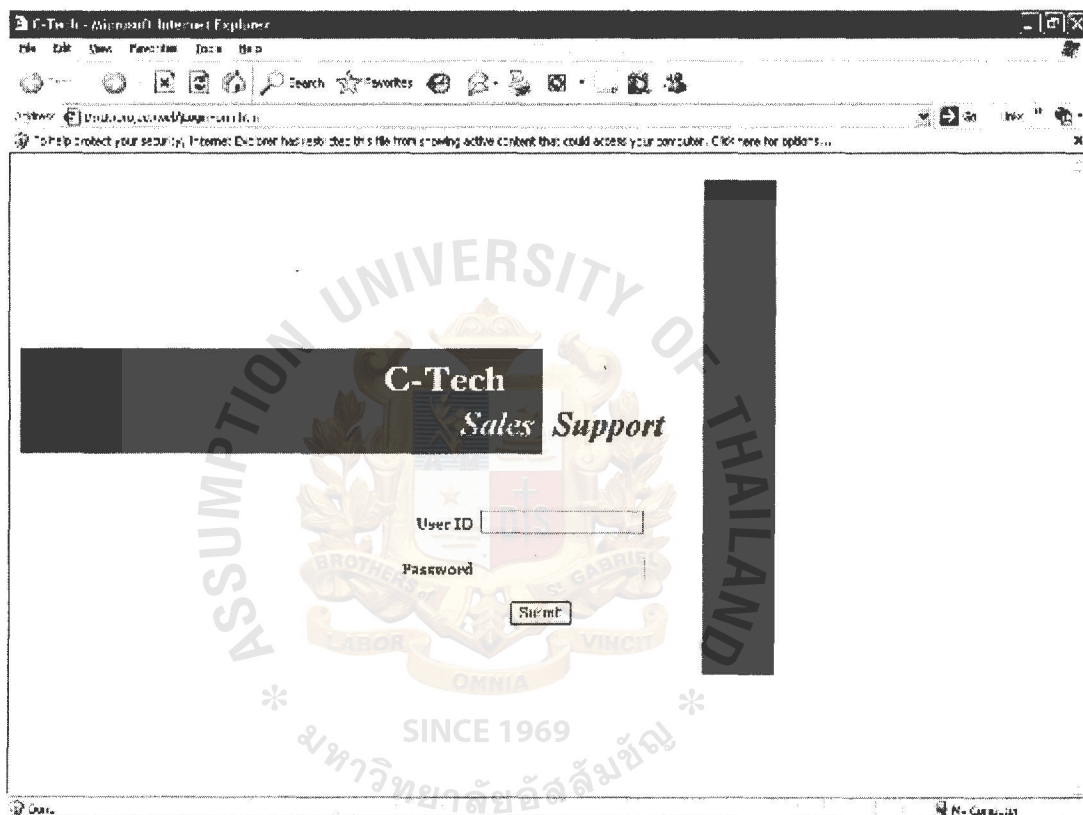


Figure A.1. Login Form.

C-Tech Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address: http://www.c-tech.com/

Logout

C-TECH
WORLD LEADERS IN SOFTWARE

Home Search Products Contacts Downloads Support

New Products | New Downloads | New Contact | New Task | New Product

Mark Overmer
Wednesday, October 23, 2002

Search:

My Tasks

Complete Date	Subject	Completed	Added by
X	Completed ASP on Num	Completed	
X	Completed Web on Event	Completed	
	Chark AND omma		
10/20/2004	Bank Data	Bankak K.	Chark and

Done

Figure A.2. Main Menu Form.

Account: Ace Hardware ~ C-Tech - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address D:\UR\project\web\Account Information.htm

C-TECH
WORLD CLASS CHEMICAL MANUFACTURER

Logout

Home Accounts Contacts Contracts Products Reports

New Account | New Contact | New Contract | New Task | New Product

Account: Matsushita

Account Owner: <u>Mark Overmer</u>	Credit: 5,000,000
Account Name: Matsushita	Phone: (535) 555-9300
Account Number: 843900	Fax: (535) 555-9983
Type: Manufacturer	Website: http://www.matsushita.com/
Billing Address: 18147 Bangadi Industrial estate, BKK, TH, 10152	Shipping Address: 18147 Bangadi Industrial estate, BKK, TH, 10152
Created By: <u>Mark Overmer</u> , 10/20/2004 3:36 AM	Last Modified By: <u>Mark Overmer</u> , 10/20/2004 3:36 AM
Description:	

Edit Delete

Contacts New

Contact Name	Company	Email	Phone
Mark Overmer	Matsushita	mark@matsushita.com	(02) 555-9300

Done Internet

Figure A.3. Account Information Form.

Account Edit: New Account - C Tech - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address: http://www.c-tech.com/AccountEdit/NewAccount.htm

WORLD CLASS CHEMICAL MANUFACTURER

Home Accounts Contacts Credits Products Reports

Account Edit: New Account

Account Information:

Account Owner Name Overline:

Account Name:

Account EMail:

Account Number:

Credit:

Phone:

Fax:

Wholesale:

Address Information:

Billing Street:

Billing City:

Billing Postal Code:

Billing Country:

Shipping Street:

Shipping City:

Shipping Postal Code:

Shipping Country:

Description Information:

Description:

Save Cancel

Figure A.4. Create New Account Form.

Microsoft Internet Explorer - C-Tech - All Accounts

Address: http://www.c-tech.com/AllAccounts.htm

C-TECH
WORLD LEAD CHEMICAL MANUFACTURER

Home Accounts Contacts Contracts Products Reports

All Accounts

Search: All Accounts

Account Name	Phone	Contact Name
DELTA	001 555-0000	Opal K.
Washburn	001 555-0000	Alan B.
World Wide	001 555-2000	Nicholas E.
ANNO EYE	001 555-5000	Ernest K.

DATE: 11/11/2000 10:00 AM

Figure A.5. Search Account Result Form.

Microsoft Internet Explorer - C-Tech

File Edit View Favorites Tools Help

Address: http://www.c-tech.com/

C-TECH
WORLD CLASS CHEMICAL MANUFACTURER

Home Accounts Contacts Products Reports

Search: All Contacts

Name	Company	Phone
Alan Zelano	WAD Mechanical Contractors Inc.	(02) 556-9700
Brad Johnson	Water Doctor	(02) 556-8500
Adam Reshner	WaterPro	(02) 556-7400
Mike Acad	Asian PDS	(02) 001-7700
Ken Shir	Sabam	(02) 556-2100
Michael Karhad	Ch-Tech Roadmap	(02) 556-3700

Assumption University of Thailand
SINCE 1969
มหาวิทยาลัยอัสสัมชัญ

Figure A.6. Search Contact Result Form.

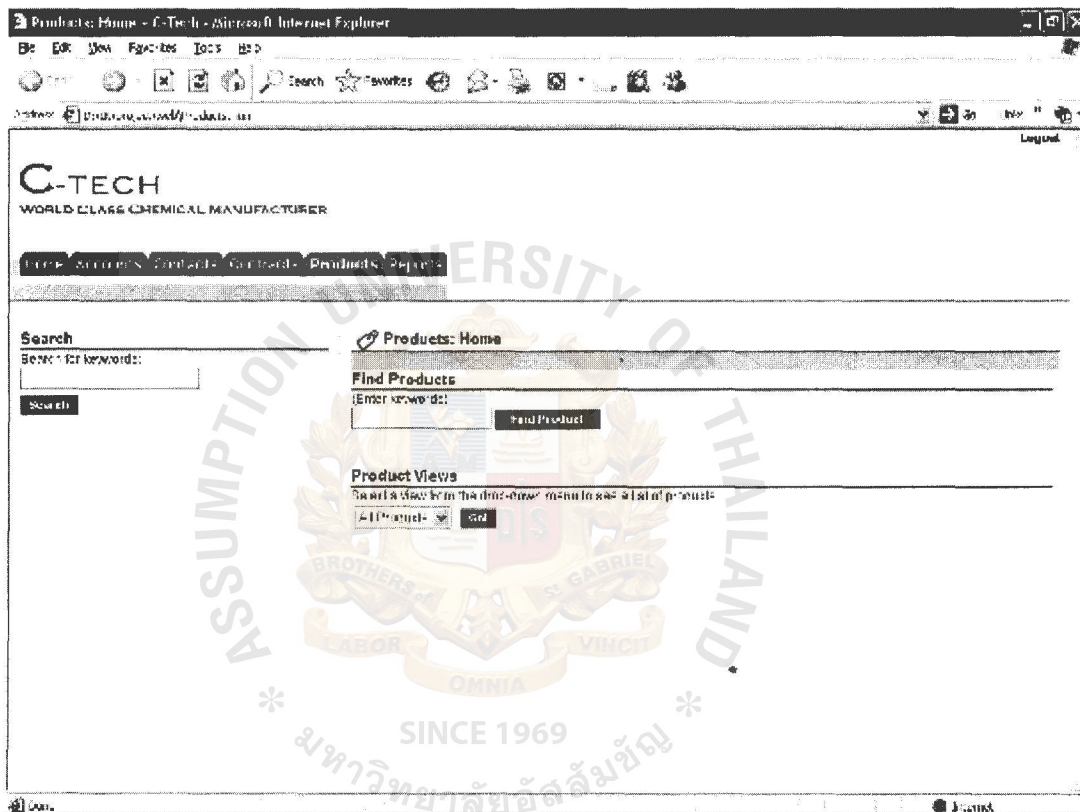


Figure A.7. Product Search Form.

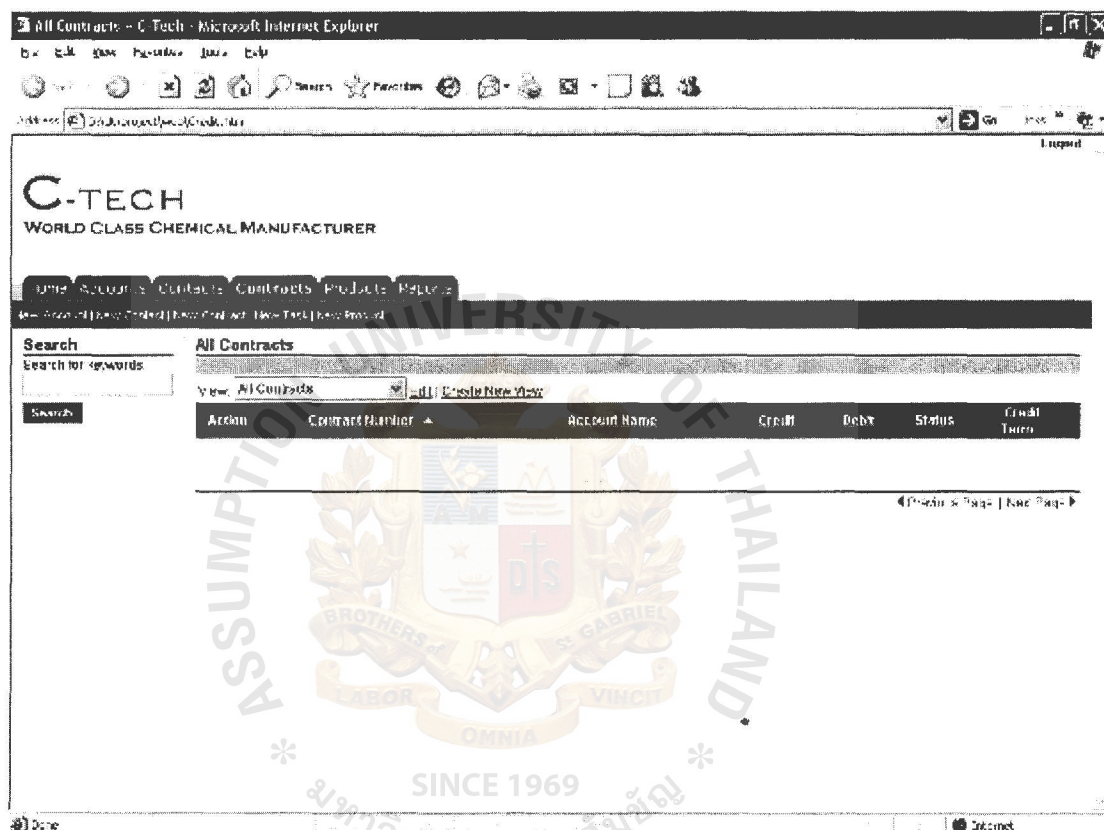


Figure A.8. Credit Request Form.

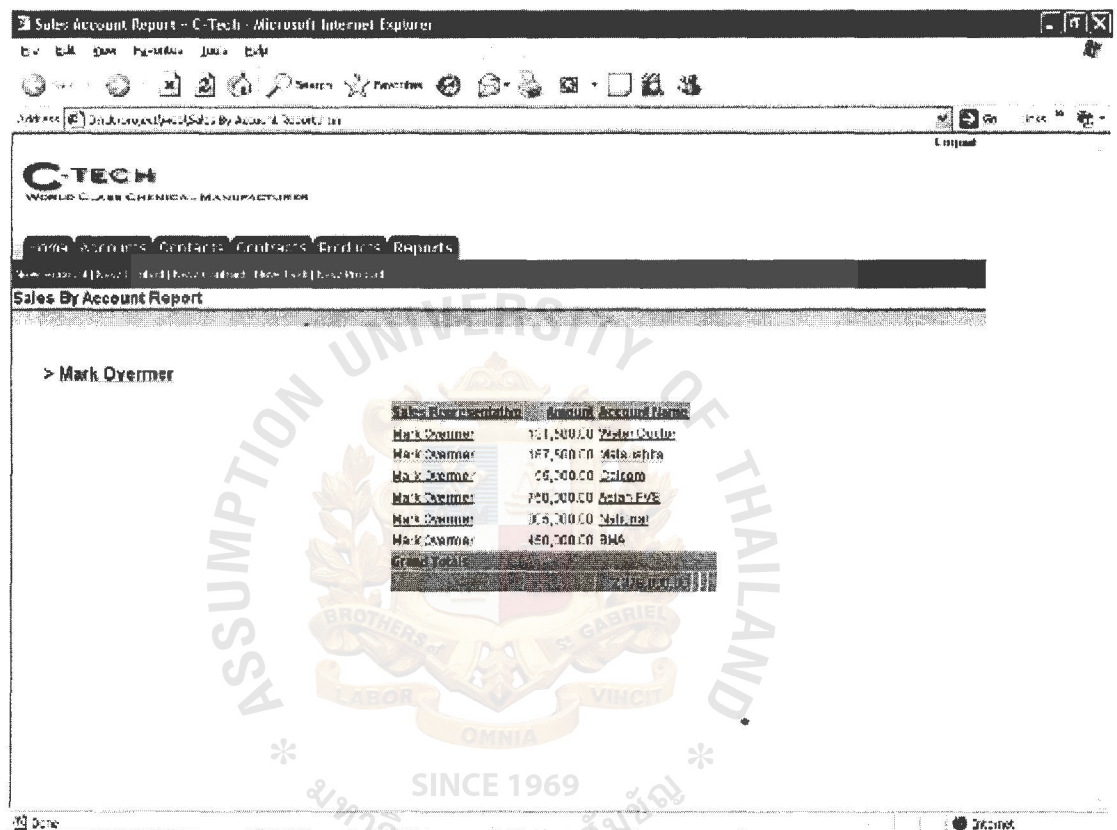
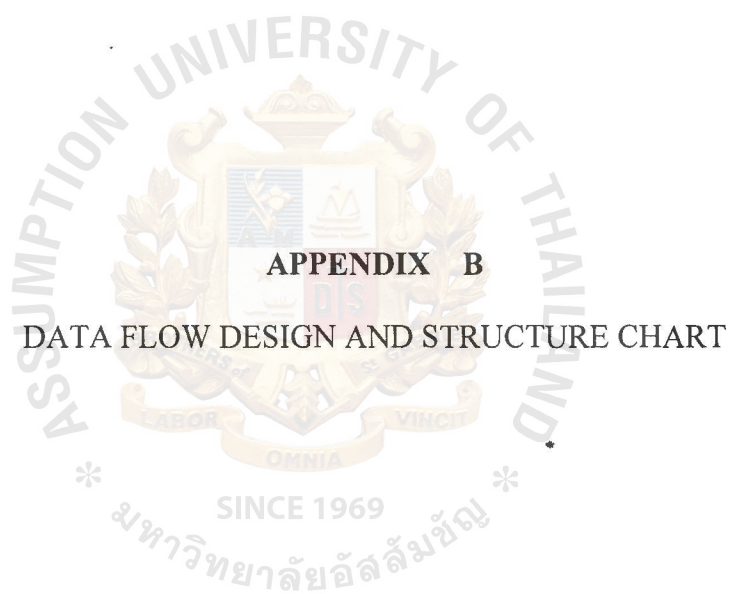


Figure A.9. Sales Report Form.



APPENDIX B

DATA FLOW DESIGN AND STRUCTURE CHART

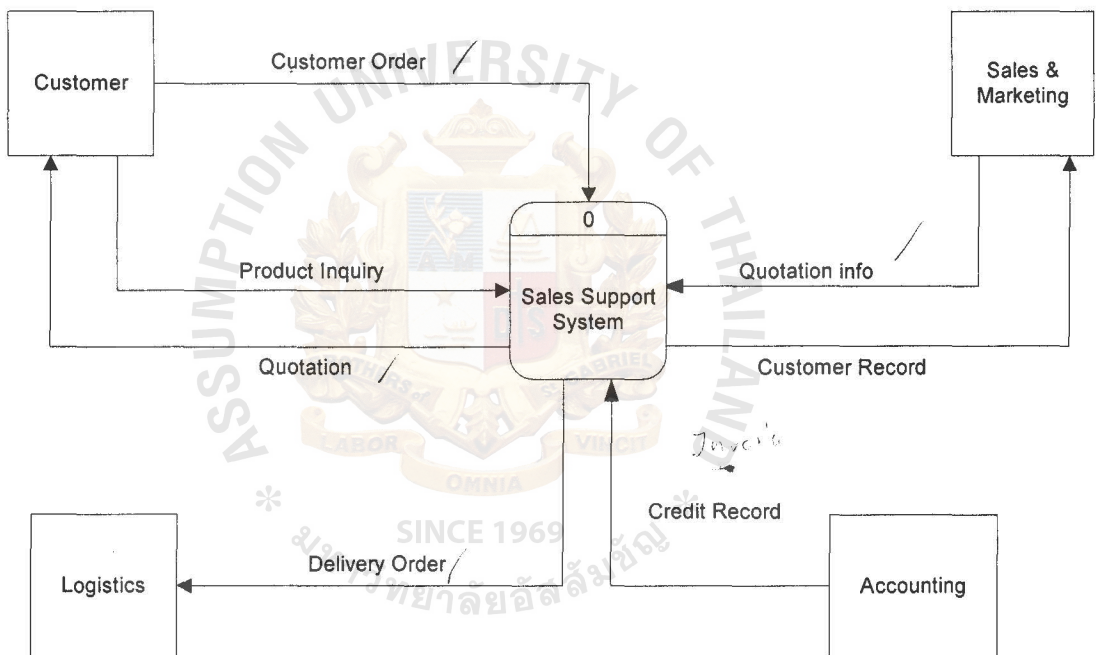


Figure B.1. Context Diagram of Sales Support System.

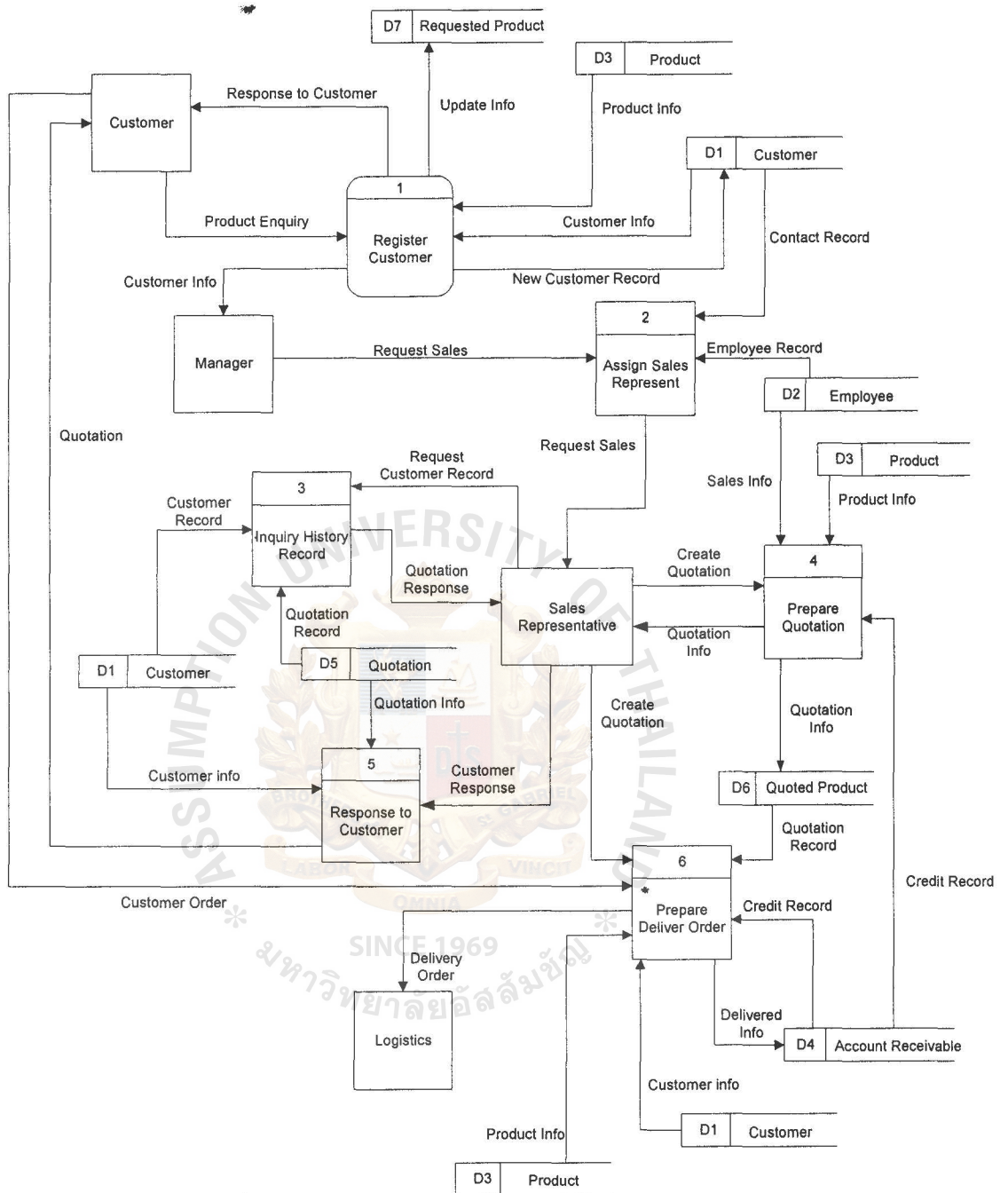


Figure B.2. Level 0 Data Flow Diagram of Sales Support System.

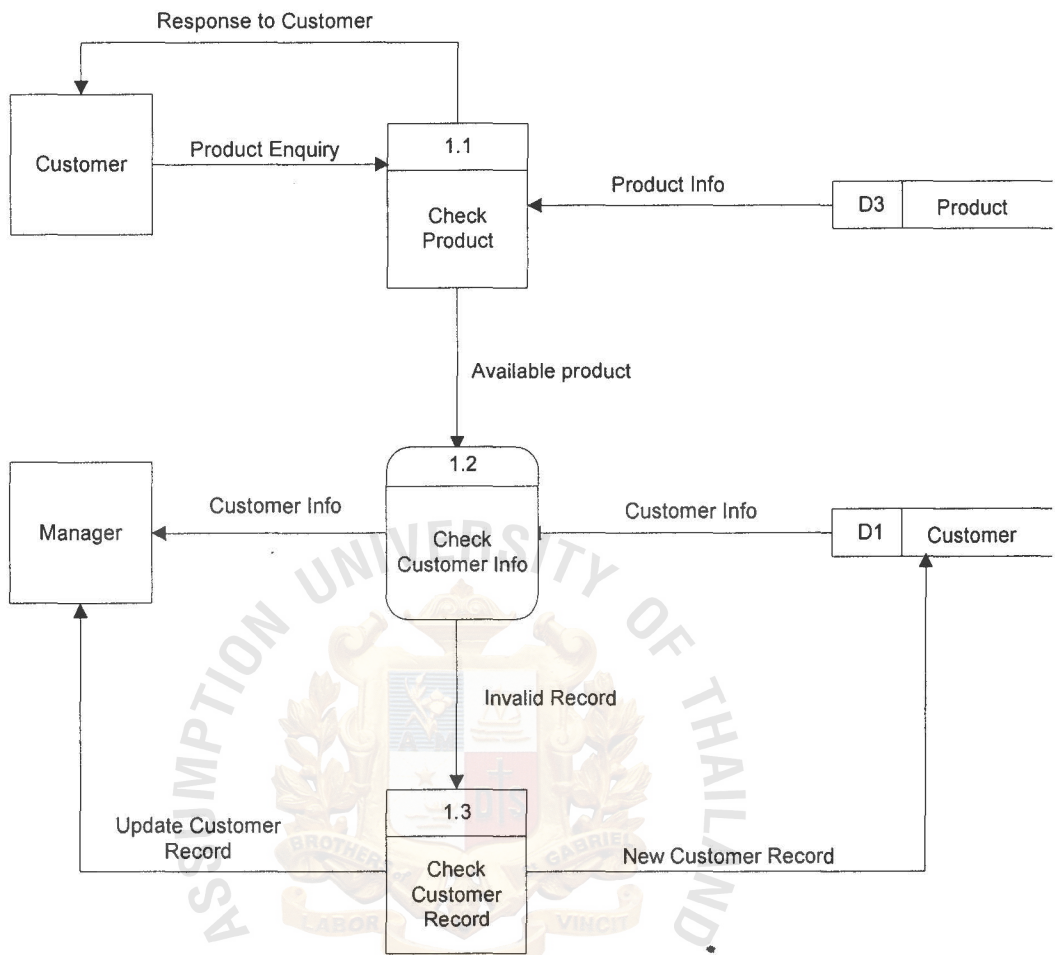


Figure B.3. Level 1 Data Flow Diagram of Register Customer.

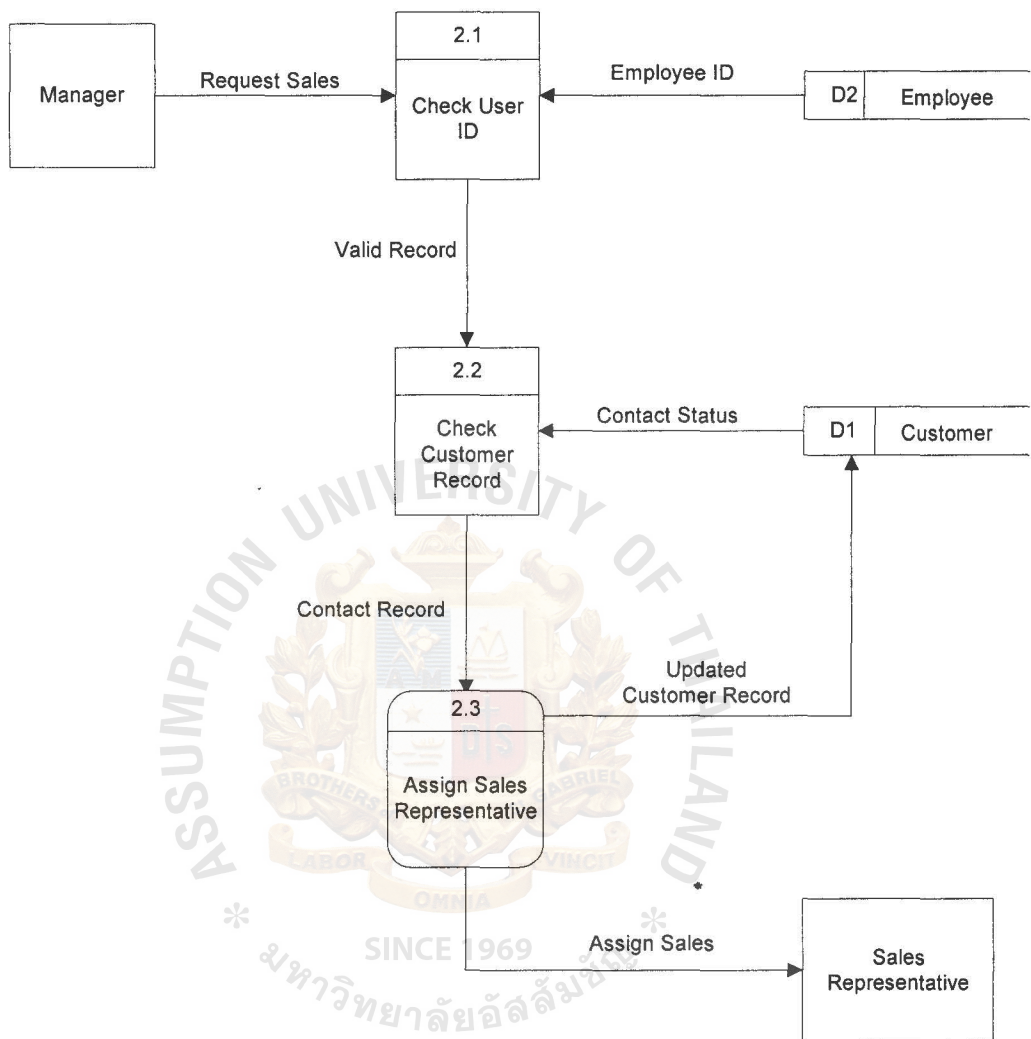


Figure B.4. Level 1 Data Flow Diagram of Assign Sales Representative.

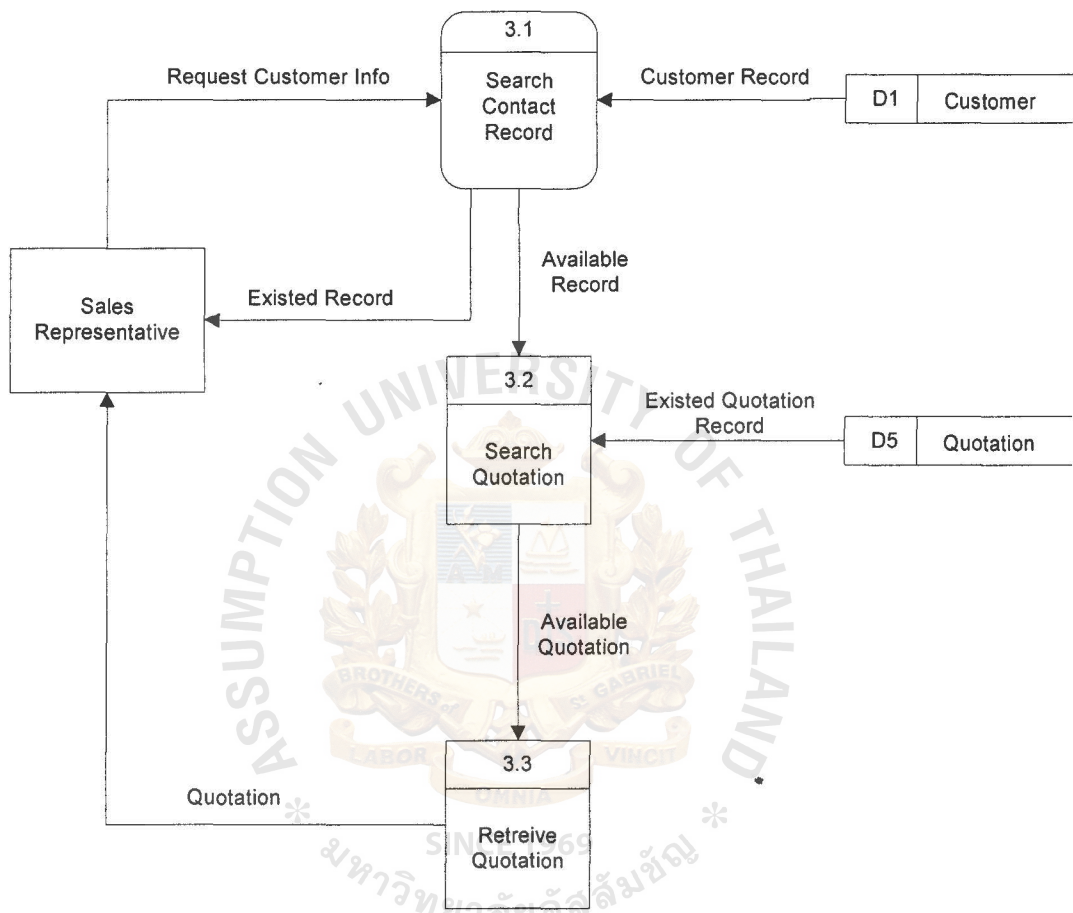


Figure B.5. Level 1 Data Flow Diagram of Inquiry History Record.

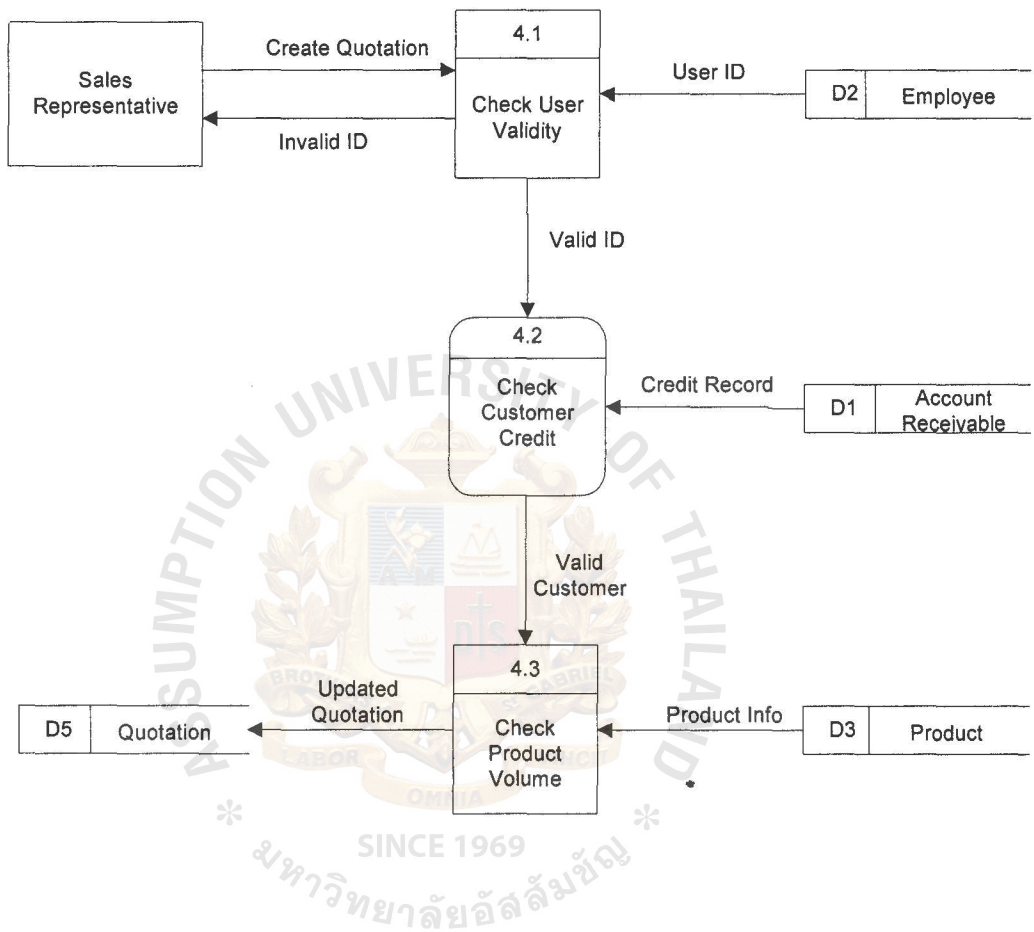


Figure B.6. Level 1 Data Flow Diagram of Prepare Quotation.

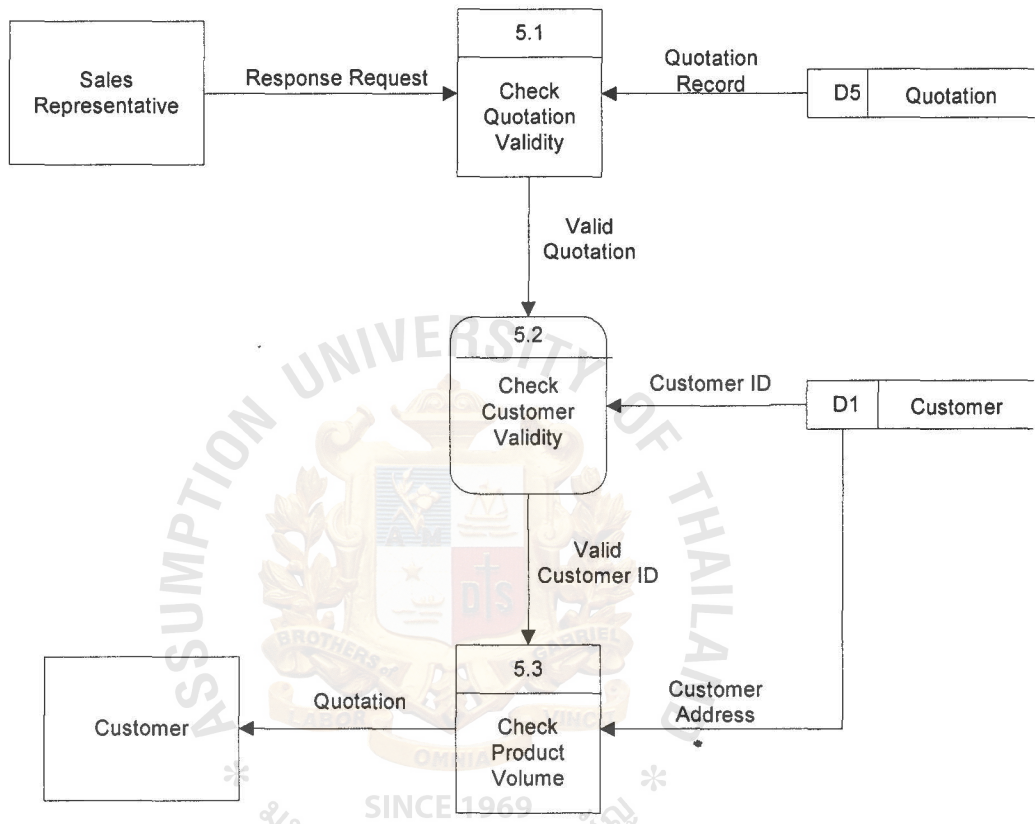


Figure B.7. Level Data Flow Diagram of Response to Customer.

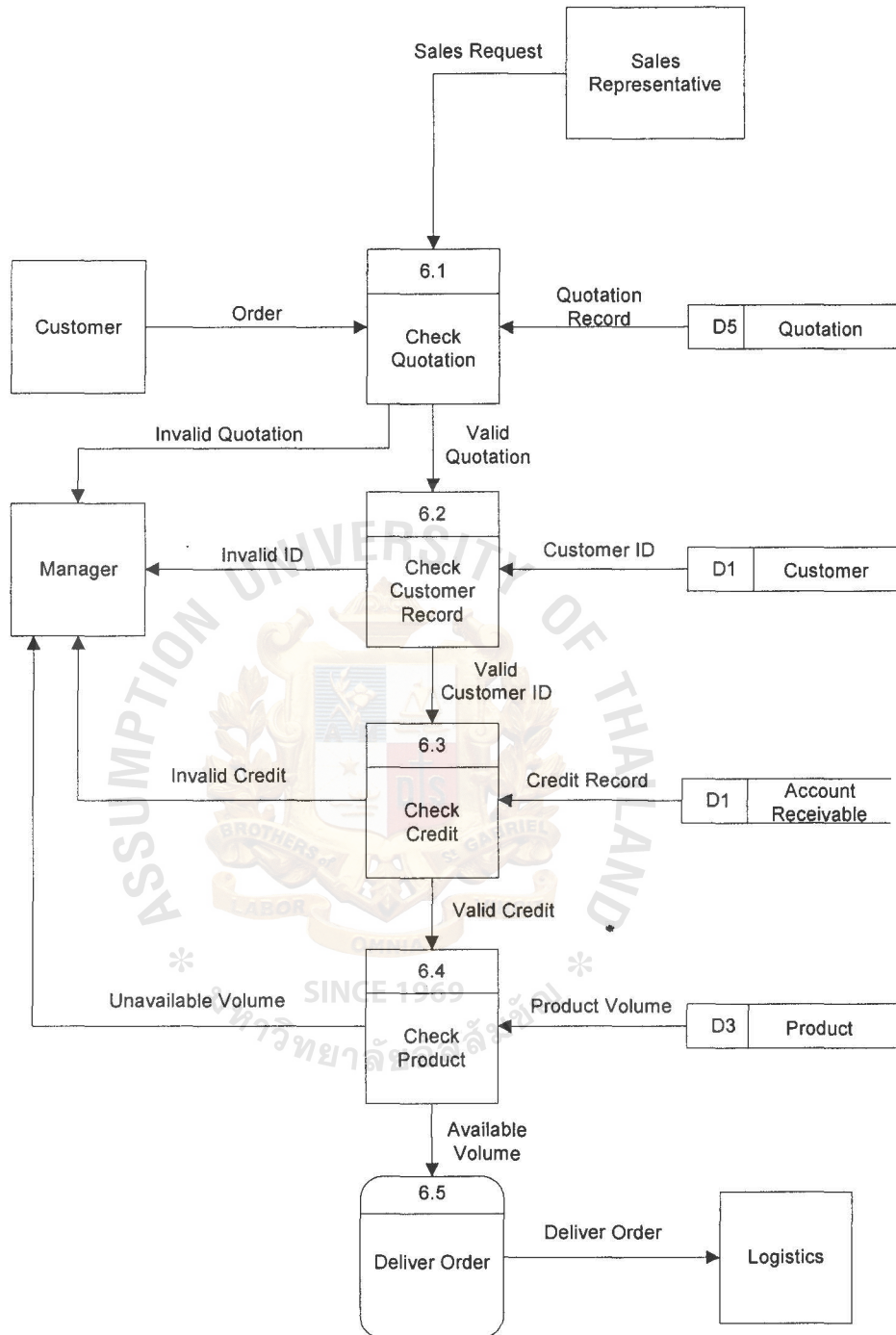


Figure B.8. Level 1 Data Flow Diagram of Prepare Delivery Order.

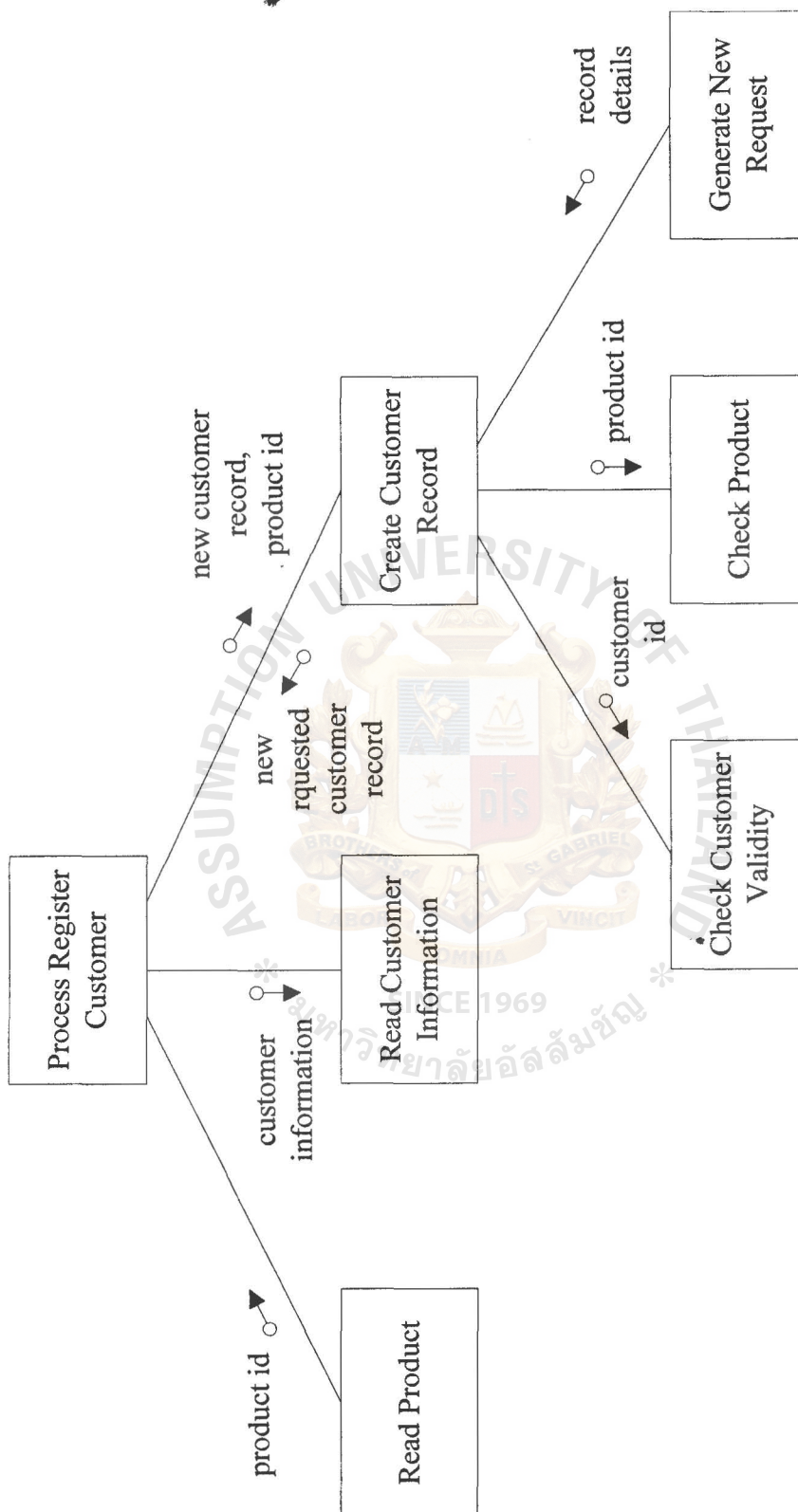


Figure B.9. Structure Chart of Create Request.

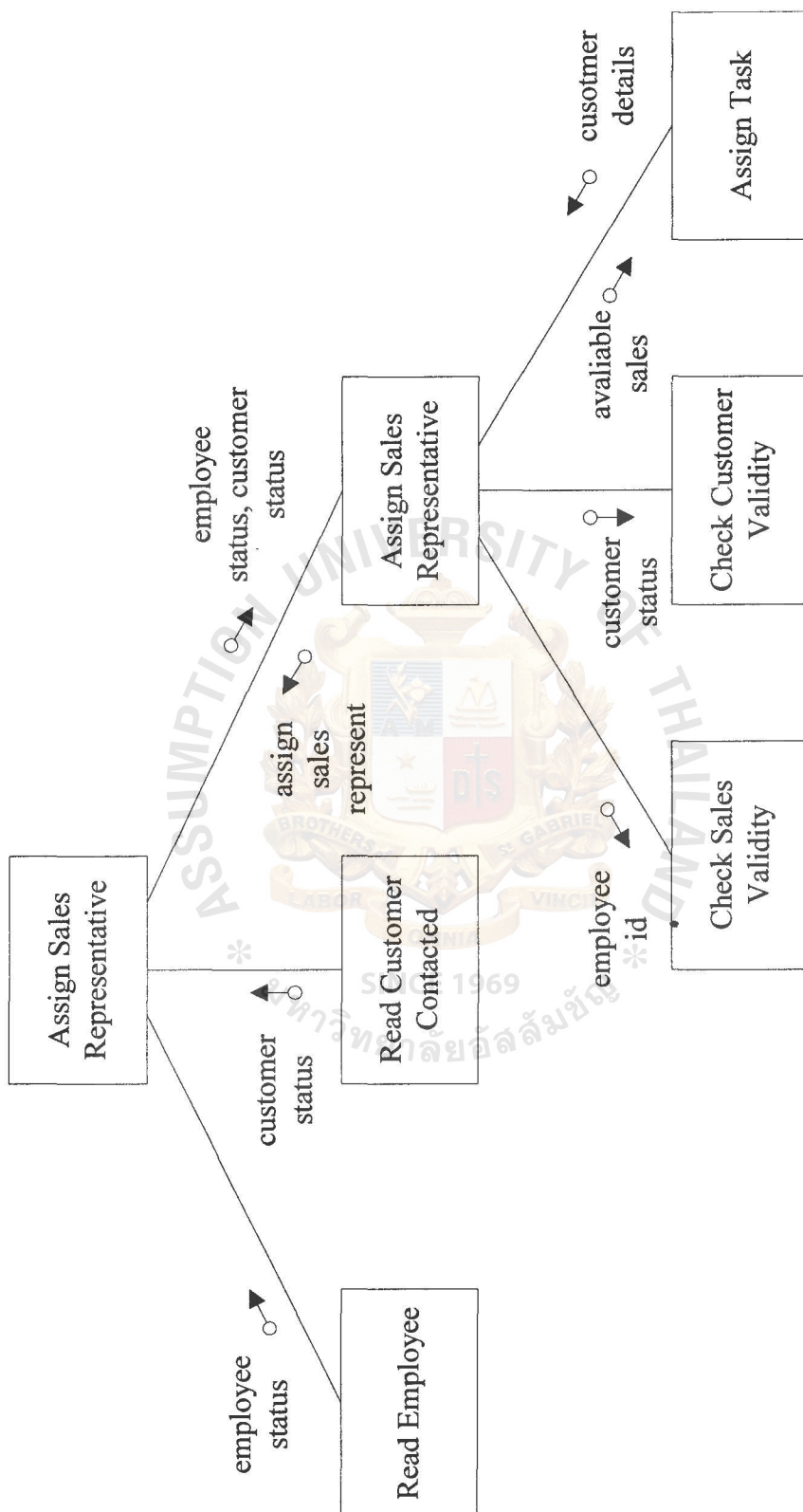


Figure B.10. Structure Chart of Assign Request.

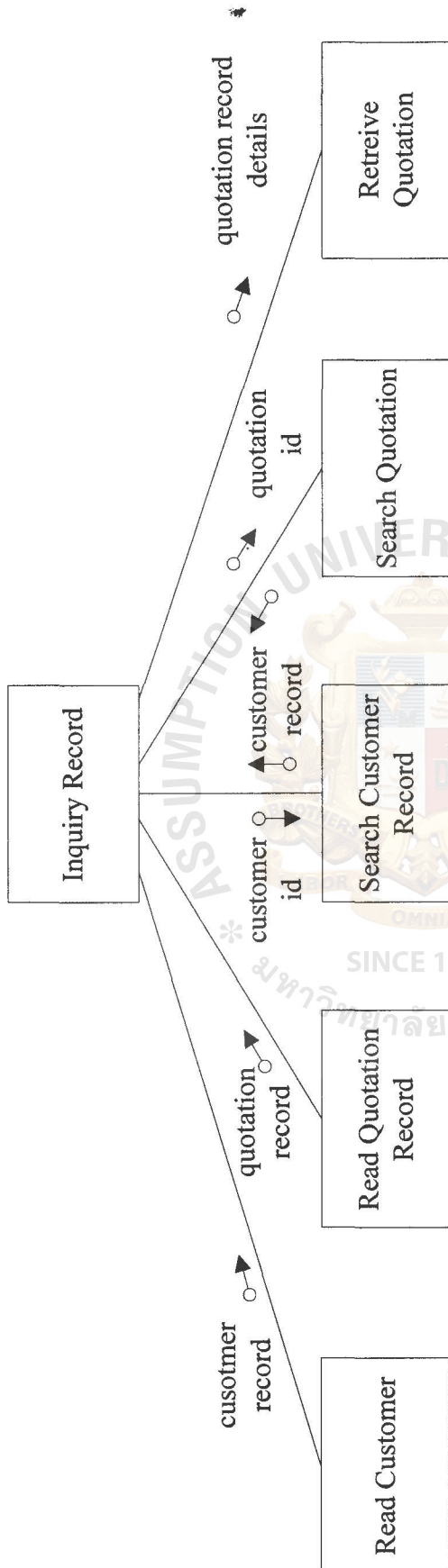


Figure B.1.1. Structure Chart of Inquiry History Record

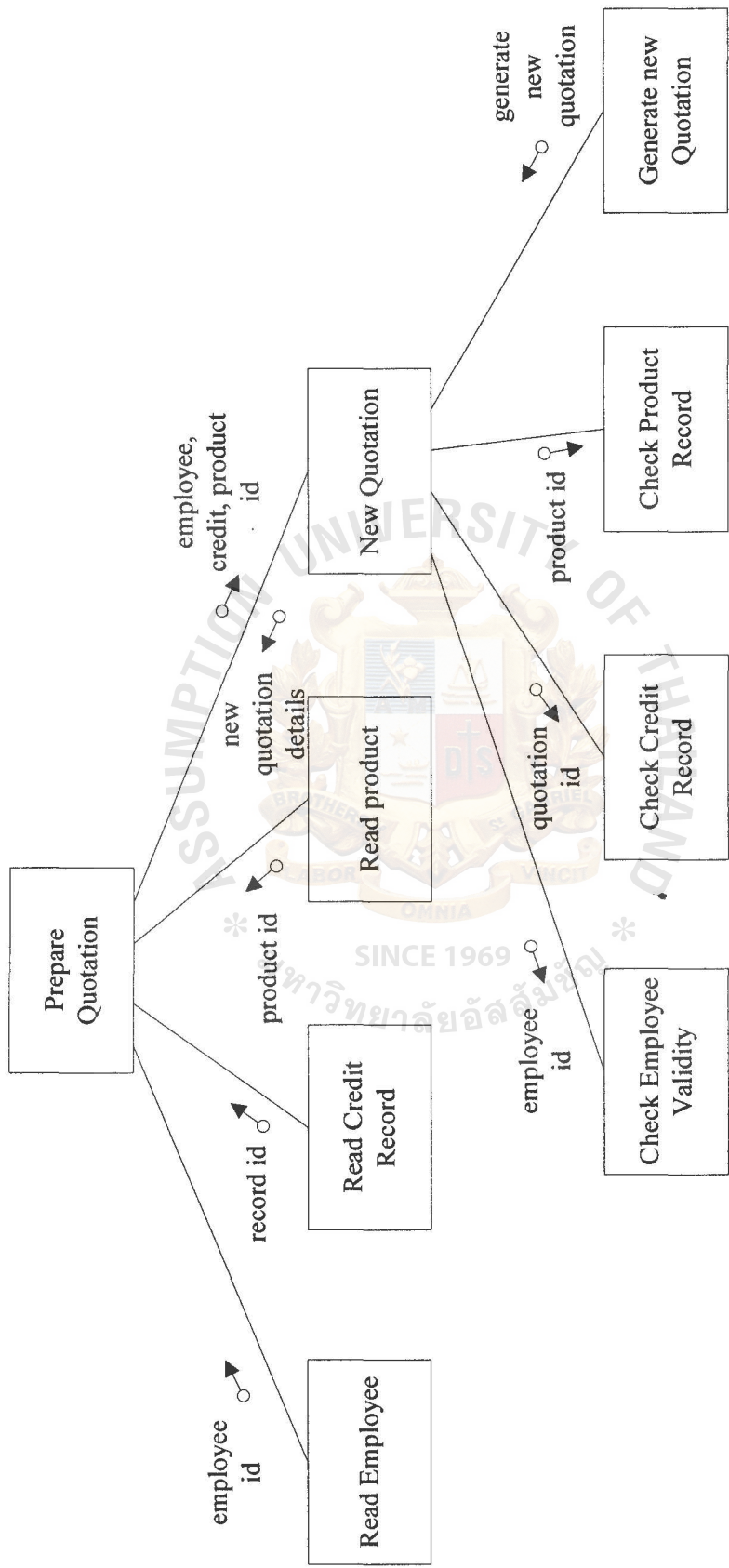


Figure B.12. Structure Chart of Prepare Quotation.

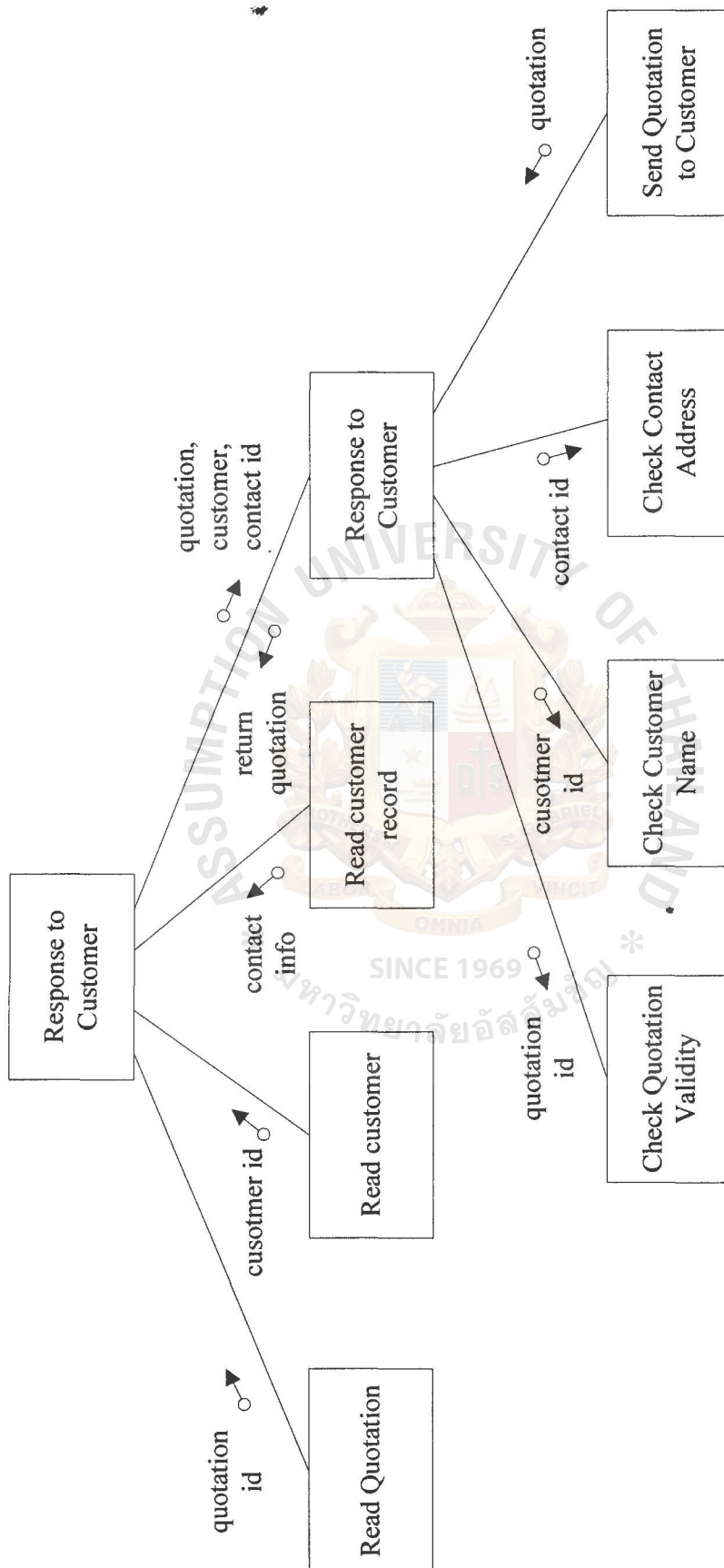


Figure B.13. Structure Chart of Response to Customer

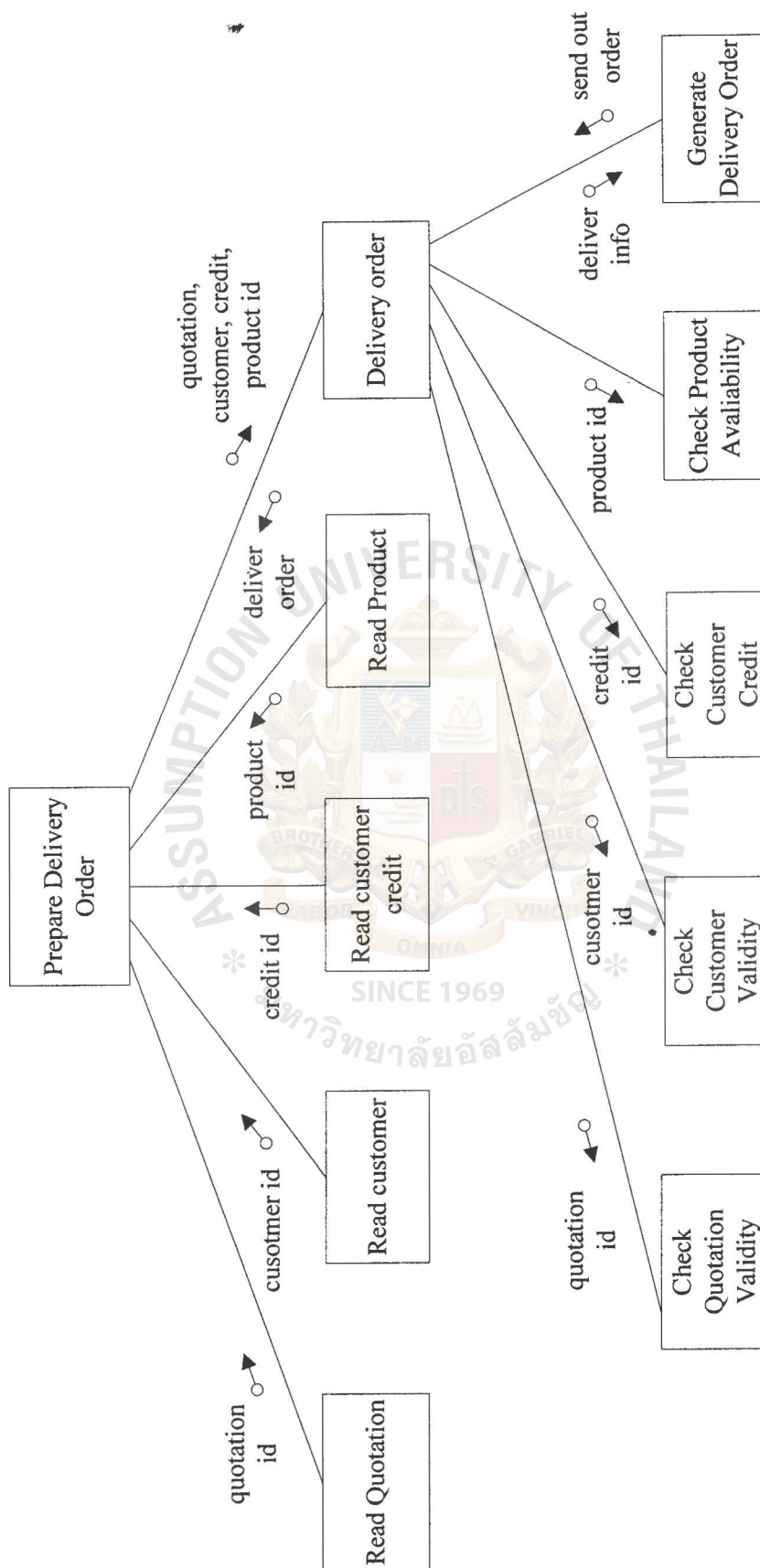


Figure B.14. Structure Chart of Prepare Delivery Order



APPENDIX C
PROCESS SPECIFICATION

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

Item	Description
Process name:	Register Customer
Data In:	Customer info
Data Out:	Customer information Record
Process	(1) The system checks product name to ensure product is available. (2) Check customer name if it is new customer. Current customer info is sent to Sales Manager. (3) Check customer contacted record. (4) Update new customer contacted in database.
Attachment:	(1) Customer record

Table C.2. Process Specification of Assign Sales Representative Process.

Item	Description
Process name:	Assign Sales Representative
Data In:	Request info
Data Out:	Assign Request
Process:	(1) The system will check user validity. (2) If user is valid, then check sales name that customer contacted. (3) Assign task to Sales Representative.
Attachment:	Assign Sales

Table C.3. Process Specification of Inquiry History Record Process.

Item	Description
Process Name:	Inquiry History Record
Data In:	Request info
Data Out:	Sell record
Process:	(1) Sales representative inputs the customer name to search sale record from the system. (2) The system will display the customer sale record for Sales to follow up.
Attachment:	Sale record

Table C.4. Process Specification of Prepare Quotation Process.

Item	Description
Process Name:	Create New Quotation
Data In:	Quotation info
Data Out:	Quotation
Process:	<ol style="list-style-type: none"> (1) Enter quotation of each customer requested. (2) Check authority to enter the quotation offer with identification number of this Sales representative. (3) Check customer credit if financial record is good. (4) Check product volume in stock. (5) Record the Quotation data into Quotation database.
Attachment:	(1) Quotation Information

Table C.5. Process Specification of Response to Customer Process.

Item	Description
Process Name:	Respond to customer
Data In:	Customer Contact ID
Data Out:	Requested Information
Process:	<ol style="list-style-type: none"> (1) Quotation to be sent to customer. (2) Quotation number will be validated against current data record in quotation database. (3) The customer contact ID will be checked against customer record in database. (4) The valid contacted ID will retrieve the address of customer from customer database. (5) The solution is sent to customer according to contact ID and address.
Attachment:	(1) Quotation

Table C.6. Process Specification of Prepare Delivery Order Process.

Item	Description
Problem Name:	Prepare Delivery Order
Data In:	Quotation info
Out put :	Deliver order
Process:	(1) The system checks quotation ID. (2) The system checks employee authority. (3) Check customer's credit. (4) Check product availability. (5) Check delivery information.
Attachment:	(1) Delivery order





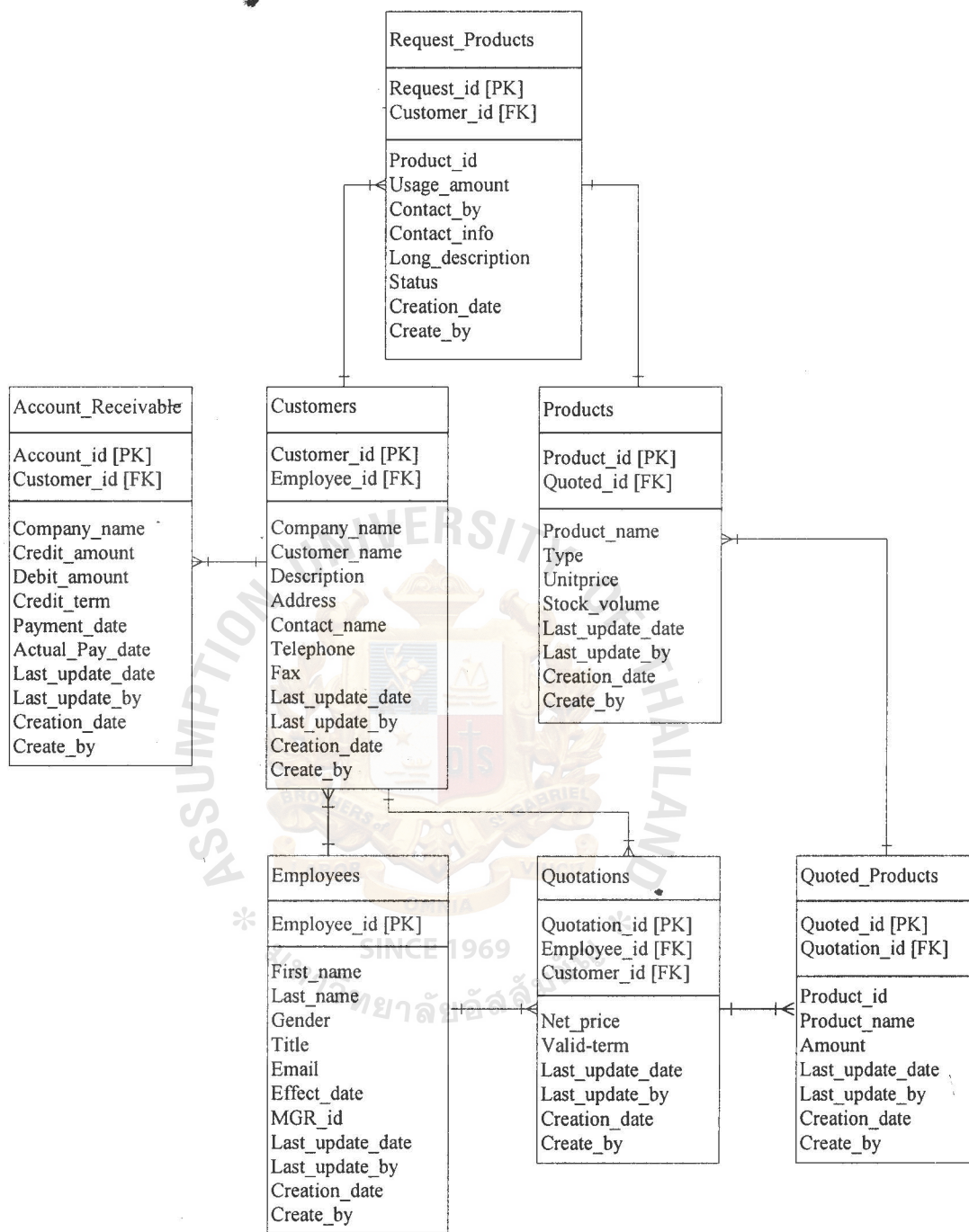


Figure D.1. Entity Relationship Model of Sales Support System.



TableE.1. Customers.

Column Name	Null	Type	Comments
Customer_Id	Not Null	Number	Primary Key
Employee_Id		Number	Foreign Key
Company_Name		Varchar2(50)	
Customer Name		Varchar2(50)	
Description		Varchar2(100)	
Address		Varchar2(120)	
Contact_Name		Varchar2(50)	
Telephone		Varchar2(25)	
Fax		Varchar2(25)	
Last_Update_Date		Date	
Last_Update_By		Number	
Create_Date		Date	
Create_By		Number	

TableE.2. Account_Receivable.

Column Name	Null	Type	Comments
Account_Id	Not Null	Number	Primary Key
Customer_Id		Number	Foreign Key
Company_Name		Varchar2(50)	
Credit_Amount		Number	
Debit_Amount		Number	
Credit_Term		Number	
Payment_date		Date	
Actual_Pay_Date		Date	
Last_Update_Date		Date	
Last_Update_By		Number	
Create_Date		Date	
Create_By		Number	

TableE.3. Products.

Column Name	Null	Type	Comments
Product_Id	Not Null	Number	Primary Key
Quoted_Id		Number	Foreign Key
Product_Name		Varchar2(50)	
Type		Varchar2(25)	
Unitprice		Number	
Stock_Volume		Number	
Last_Update_Date		Date	
Last_Update_By		Number	
Create_Date		Date	
Create_By		Number	

TableE.4. Quotations.

Column Name	Null	Type	Comments
Quotation_Id	Not Null	Number	Primary Key
Employee_Id		Number	Foreign Key
Customer_Id		Number	Foreign Key
Net_Price		Number	
Valid_Term		Number	
Last_Update_Date		Date	
Last_Update_By		Number	
Create_Date		Date	
Create_By		Number	

TableE.5. Requested Products.

Column Name	Null	Type	Comments
Request_Id	Not Null	Number	Primary Key
Customer_Id		Number	Foreign Key
Product_Id		Number	Foreign Key
Usage_Amount		Number	
Contact_By		Varchar2(25)	
Contact_Info		Varchar2(25)	
Long_Description		Varchar2(250)	
Status		Varchar2(5)	
Create_Date		Date	
Create_By		Number	

TableE.6. Quoted Products.

Column Name	Null	Type	Comments
Quoted_Id	Not Null	Number	Primary Key
Quotation_Id		Number	Foreign Key
Product_Id		Number	Foreign Key
Product_Name		Varchar2(25)	
Amount		Number	
Last_Update_Date		Date	
Last_Update_By		Number	
Creation_Date		Date	
Create_By		Number	

TableE.7. Employees.

Column Name	Null	Type	Comments
Employee_Id	Not Null	Number	Primary Key
First_Name		Varchar2(50)	
Last_Name		Varchar2(50)	
Gender		Varchar2(5)	
Title		Varchar2(25)	
Email		Varchar2(25)	
Effect_Date		Date	
Mgr_Id		Number	
Last_Update_Date		Date	
Last_Update_By		Number	
Creation_Date		Date	
Create_By		Number	



TableE.1. Customers.

Column Name	Null	Type	Comments
Customer_Id	Not Null	Number	Primary Key
Employee_Id		Number	Foreign Key
Company_Name		Varchar2(50)	
Customer_Name		Varchar2(50)	
Description		Varchar2(100)	
Address		Varchar2(120)	
Contact_Name		Varchar2(50)	
Telephone		Varchar2(25)	
Fax		Varchar2(25)	
Last_Update_Date		Date	
Last_Update_By		Number	
Create_Date		Date	
Create_By		Number	

TableE.2. Account_Receivable.

Column Name	Null	Type	Comments
Account_Id	Not Null	Number	Primary Key
Customer_Id		Number	Foreign Key
Company_Name		Varchar2(50)	
Credit_Amount		Number *	
Debit_Amount		Number	
Credit_Term		Number	
Payment_date		Date	
Actual_Pay_Date		Date	
Last_Update_Date		Date	
Last_Update_By		Number	
Create_Date		Date	
Create_By		Number	

TableE.3. Products.

Column Name	Null	Type	Comments
Product_Id	Not Null	Number	Primary Key
Quoted_Id		Number	Foreign Key
Product_Name		Varchar2(50)	
Type		Varchar2(25)	
Unitprice		Number	
Stock_Volume		Number	
Last_Update_Date		Date	
Last_Update_By		Number	
Create_Date		Date	
Create_By		Number	

TableE.4. Quotations.

Column Name	Null	Type	Comments
Quotation_Id	Not Null	Number	Primary Key
Employee_Id		Number	Foreign Key
Customer_Id		Number	Foreign Key
Net_Price		Number	
Valid_Term		Number	
Last_Update_Date		Date	
Last_Update_By		Number	
Create_Date		Date	
Create_By		Number	

TableE.5. Requested Products.

Column Name	Null	Type	Comments
Request_Id	Not Null	Number	Primary Key
Customer_Id		Number	Foreign Key
Product_Id		Number	Foreign Key
Usage_Amount		Number	
Contact_By		Varchar2(25)	
Contact_Info		Varchar2(25)	
Long_Description		Varchar2(250)	
Status		Varchar2(5)	
Create_Date		Date	
Create_By		Number	

TableE.6. Quoted Products.

Column Name	Null	Type	Comments
Quoted_Id	Not Null	Number	Primary Key
Quotation_Id		Number	Foreign Key
Product_Id		Number	Foreign Key
Product_Name		Varchar2(25)	
Amount		Number	
Last_Update_Date		Date	
Last_Update_By		Number	
Creation_Date		Date	
Create_By		Number	

TableE.7. Employees.

Column Name	Null	Type	Comments
Employee_Id	Not Null	Number	Primary Key
First_Name		Varchar2(50)	
Last_Name		Varchar2(50)	
Gender		Varchar2(5)	
Title		Varchar2(25)	
Email		Varchar2(25)	
Effect_Date		Date	
Mgr_Id		Number	
Last_Update_Date		Date	
Last_Update_By		Number	
Creation_Date		Date	
Create_By		Number	



APPENDIX F
PAYBACK ANALYSIS

Table F.1. Cost of Alternative Candidate 1, in Baht.

Cost Item	Description	Amount	Unit Price	Price
1. Development Cost:	1.1 Personnel Cost:			
	System Analysts (160 hrs./ea)	1	120,000	120,000
	System Designer (160 hrs./ea)	1	120,000	120,000
	Programmer (200 hrs./ea)	2	100,000	200,000
	Subtotal 1:			500,000
	1.2 Expense:			
	Training Cost			120,000
	Installation & Setup Cost			45,000
	Subtotal 2:			165,000
	1.3 New Hardware:			
	Server	1	110,000	110,000
	Workstation	6	44,950	269,700
	U.P.S 1,000 VA	1	7,000	7,000
	HP LaserJet 5 MP	1	15,000	15,000
	Scanner	1	7,500	7,500
	Hub 10/100mbs 24 port		16,800	16,800
	Subtotal 3:			426,000
	1.4 New Software:			
	Window 2003 server	1	40,000	40,000
	Window 2003 Software	6	3,333	20,000
	Database and Tool		450,000	450,000
	Subtotal 4:			510,000
	Total Development Cost			1,541,000
2. Operating Cost:	2.1 Salary cost			6,994,176
	Subtotal 1:			6,994,176
	2.2 Internet Expense cost			730,000
	Subtotal 1:			730,000
	2.2 Office supply and Miscellaneous:			
	Stationery			43,200
	Paper			22,900
	Utility			37,500
	Miscellaneous			12,300
	Subtotal 2:			115,900
	Total Operating Cost			7,840,076
	Total Projected Annual Cost			9,381,076

Table F.2. Payback Analysis of Alternative Candidate 1, in Baht.

Cost Item	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-1,541,000.00	-	-	-	-	-
Operation and Maintenance Cost		-1,496,000.00	-1,574,800.00	-1,671,600.00	-1,778,540.00	-1,895,880.00
Discount Factors(12%)	1.000	0.893	0.797	0.712	0.636	0.567
Time-Adjust Cost (Adjusted to Present Value)	-1,541,000.00	-1,335,928.00	-1,255,115.60	-1,190,179.20	-1,131,151.44	-1,074,963.96
Cumulative Time-Adjusted Costs Over Lifetime	-1,541,000.00	-2,876,928.00	-4,132,043.60	-5,322,222.80	-6,453,374.24	-7,528,338.20
Remark: Operating and Maintenance Cost Estiamted Annual Growth Rate of 12%						
Benefit Derived from Operating of New System	-	2,120,000.00	2,332,000.00	2,565,200.00	2,821,720.00	3,103,892.00
Discount Factors(12%)	1.000	0.893	0.797	0.712	0.636	0.567
Time-Adjust Benefits (Adjusted to Present Value)	-	1,893,160.00	1,858,604.00	1,826,422.40	1,794,613.92	1,759,906.76
Cumulative Time-Adjusted Benefit Over Lifetime	-	1,893,160.00	3,751,764.00	5,578,186.40	7,372,800.32	9,132,707.08
Remark: Benefits Derived from Operation of New System Estimated Annual Growth Rate of 12%						
Cumulative Lifetime Time-Adjusted Cost + Benefits	-1,541,000.00	-983,768.00	-380,279.60	255,963.60	919,426.08	1,604,368.88

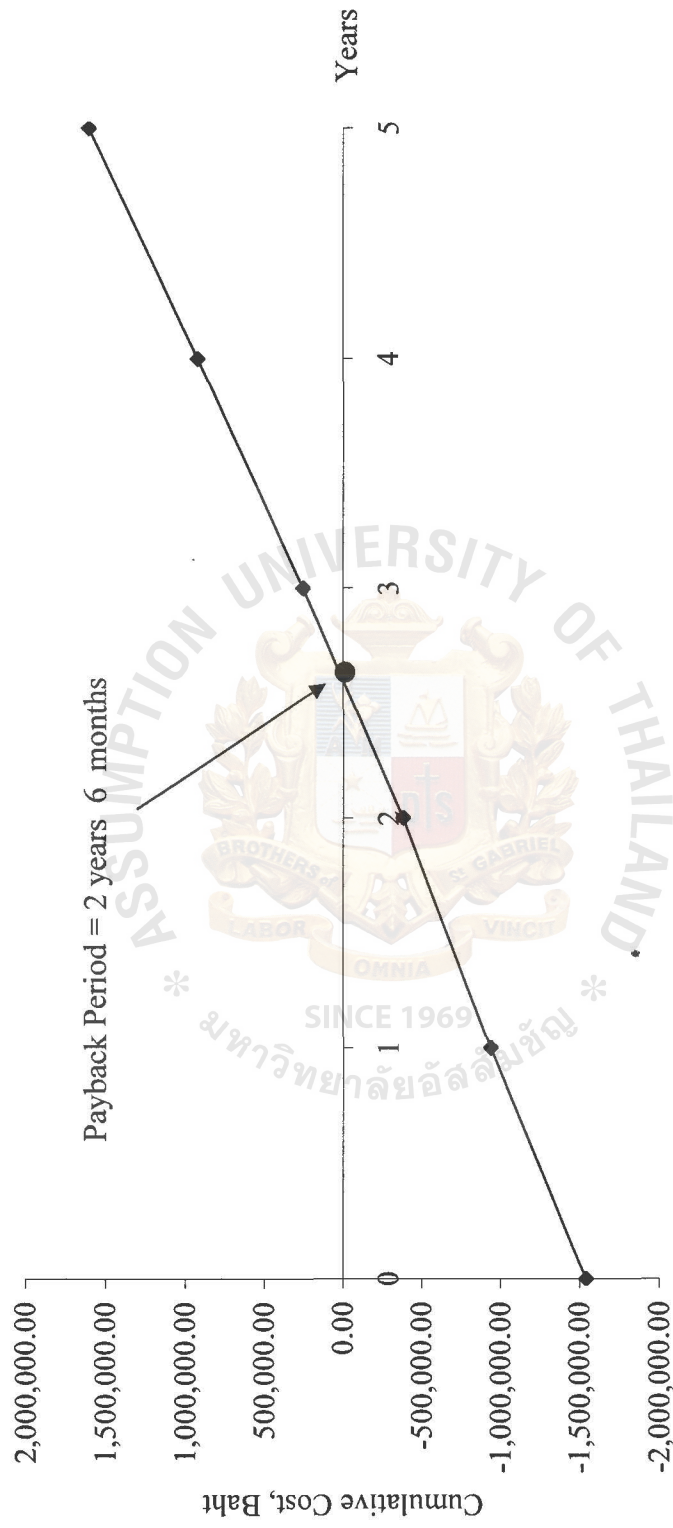


Figure F.1. Payback Period of Candidate 1.

Table F.3. Cost of Alternative Candidate 2, in Baht.

Cost Item	Description	Amount	Unit Price	Price
1. Development Cost:	1.5 Personnel Cost:			
	System Analysts (160 hrs./ea)	1	120,000	120,000
	System Designer (160 hrs./ea)	1	120,000	120,000
	Subtotal 1:			300,000
	1.6 Expense:			
	Training Cost			5,000
	Installation & Setup Cost			25,000
	Subtotal 2:			30,000
	1.7 New Hardware:			
	Server	1	110,000	110,000
	Workstation	6	44,950	269,700
	U.P.S 1,000 VA	1	7,000	7,000
	HP LaserJet 5 MP	1	15,000	15,000
	Scanner	1	7,500	7,500
	Hub 10/100/1000mbs 24 port		16,800	16,800
	Subtotal 3:			426,000
	1.8 New Software:			
	Window 2003 server	1	40,000	40,000
	Window 2003 Software	6	3,333	20,000
	Database and Tool		575,000	575,000
	Subtotal 4:			635,000
	Total Development Cost			1,331,000
2. Operating Cost:	2.3 Salary cost			6,994,176
	Subtotal 1:			6,994,176
	2.4 Internet Expense cost			730,000
	Subtotal 1:			730,000
	2.2 Office supply and Miscellaneous:			
	Stationery			43,200
	Paper			22,900
	Utility			37,500
	Miscellaneous			12,300
	Subtotal 2:			115,900
	Total Operating Cost			7,840,076
	Total Projected Annual Cost			9,171,076

Table F.4. Payback Analysis of Alternative Candidate 2, in Baht.

Cost Item	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-1,331,000.00	-	-	-	-	-
Operation and Maintenance Cost		-1,496,000.00	-1,574,800.00	-1,671,600.00	-1,778,540.00	-1,895,880.00
Discount Factors(12%)	1.000	0.893	0.797	0.712	0.636	0.567
Time-Adjust Cost (Adjusted to Present Value)	-1,331,000.00	-1,335,928.00	-1,255,115.60	-1,190,179.20	-1,131,151.44	-1,074,963.96
Cumulative Time-Adjusted Costs Over Lifetime	-1,331,000.00	-2,666,928.00	-3,922,043.60	-5,112,222.80	-6,243,374.24	-7,318,338.20
Remark: Operating and Maintenance Cost Estimated Annual Growth Rate of 12%						
Benefit Derived from Operating of New System	-	2,120,000.00	2,332,000.00	2,565,200.00	2,821,720.00	3,103,892.00
Discount Factors(12%)	1.000	0.893	0.797	0.712	0.636	0.567
Time-Adjust Benefits (Adjusted to Present Value)	-	1,893,160.00	1,858,604.00	1,826,422.40	1,794,613.92	1,759,906.76
Cumulative Time-Adjusted Benefit Over Lifetime	-	1,893,160.00	3,751,764.00	5,578,186.40	7,372,800.32	9,132,707.08
Remark: Benefits Derived from Operation of New System Estimated Annual Growth Rate of 12%						
Cumulative Lifetime Time-Adjusted Cost + Benefits	-1,331,000.00	-773,768.00	-170,279.60	465,963.60	1,129,426.08	1,814,368.88

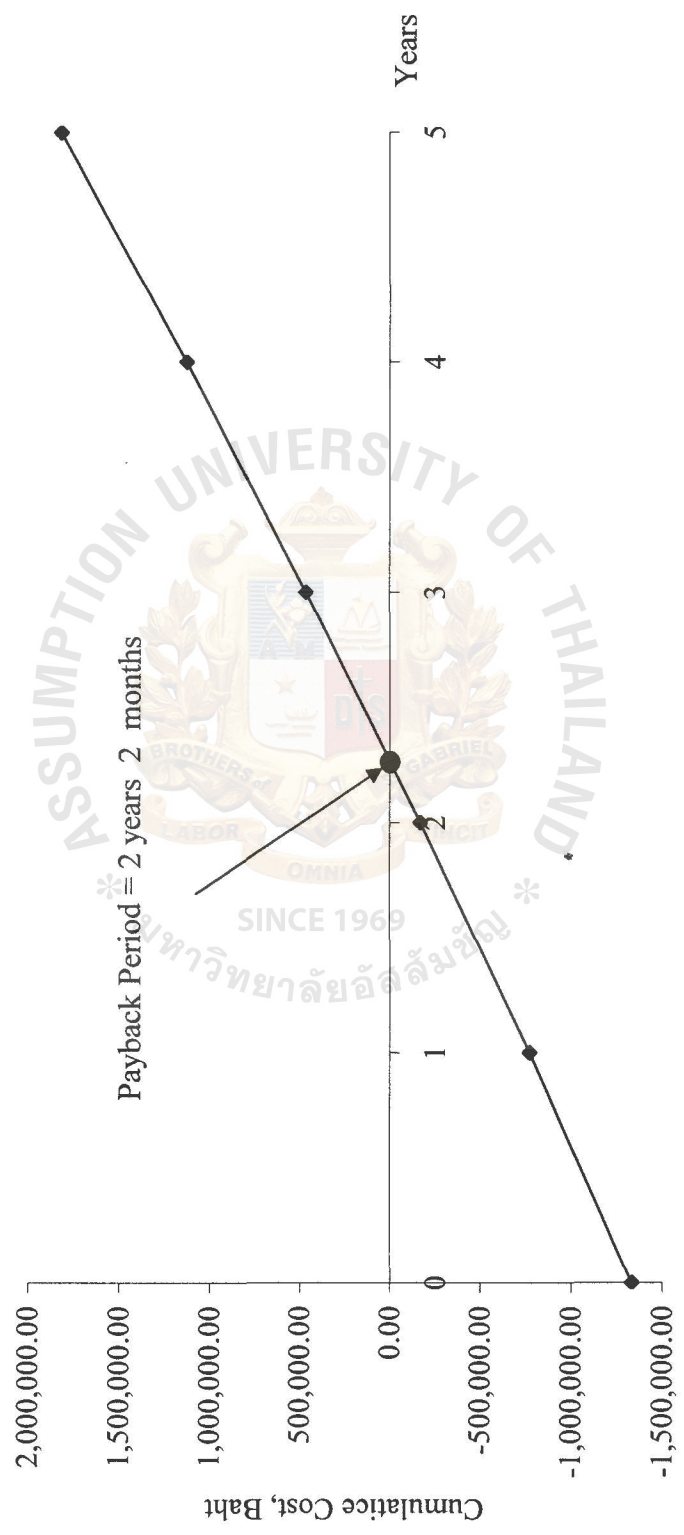


Figure F.2. Payback Period of Candidate 2.

Table F.5. Cost of Alternative Candidate 3, in Baht.

Cost Item	Description	Amount	Unit Price	Price
1. Development Cost:	1.9 Personnel Cost:			
	System Analysts (160 hrs./ea)	1	120,000	120,000
	System Designer (160 hrs./ea)	1	120,000	120,000
	Programmer (200 hrs./ea)	2	100,000	200,000
	Subtotal 1:			500,000
	1.10 Expense:			
	Training Cost			120,000
	Installation & Setup Cost			45,000
	Subtotal 2:			165,000
	1.11 New Hardware:			
	Server	1	110,000	110,000
	Workstation	6	44,950	269,700
	U.P.S 1,000 VA	1	7,000	7,000
	HP LaserJet 5 MP	1	15,000	15,000
	Scanner	1	7,500	7,500
	Hub 10/100/1000mbs 24 port		16,800	16,800
	Subtotal 3:			426,000
	1.12 New Software:			
	Window 2003 Software	6	3,333	20,000
	Database and Tool		386,000	380,000
	Subtotal 4:			406,000
	Total Development Cost			1,372,300
2. Operating Cost:	2.5 Salary cost			6,994,176
	Subtotal 1:			6,994,176
	2.6 Internet Expense cost			730,000
	Subtotal 1:			730,000
	2.2 Office supply and Miscellaneous:			
	Stationery			43,200
	Paper			22,900
	Utility			37,500
	Miscellaneous			12,300
	Subtotal 2:			115,900
	Total Operating Cost			7,840,076
	Total Projected Annual Cost			9,212,376

Table F.6. Payback Analysis of Alternative Candidate 3, in Baht.

Cost Item	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	-1,372,300.00	-	-	-	-	-
Operation and Maintenance Cost		-1,496,000.00	-1,574,800.00	-1,671,600.00	-1,778,540.00	-1,895,880.00
Discount Factors(12%)	1.000	0.893	0.797	0.712	0.636	0.567
Time-Adjust Cost (Adjusted to Present Value)	-1,372,300.00	-1,335,928.00	-1,255,115.60	-1,190,179.20	-1,131,151.44	-1,074,963.96
Cumulative Time-Adjusted Costs Over Lifetime	-1,372,300.00	-2,708,228.00	-3,963,343.60	-5,153,522.80	-6,284,674.24	-7,359,638.20
Remark: Operating and Maintenance Cost Estiamted Annual Growth Rate of 12%						
Benefit Derived from Operating of New System	-	2,120,000.00	2,332,000.00	2,565,200.00	2,821,720.00	3,103,892.00
Discount Factors(12%)	1.000	0.893	0.797	0.712	0.636	0.567
Time-Adjust Benefits (Adjusted to Present Value)	-	1,893,160.00	1,858,604.00	1,826,422.40	1,794,613.92	1,759,906.76
Cumulative Time-Adjusted Benefit Over Lifetime	-	1,893,160.00	3,751,764.00	5,578,186.40	7,372,800.32	9,132,707.08
Remark: Benefits Derived from Operation of New System Estimated Annual Growth Rate of 12%						
Cumulative Lifetime Time-Adjusted Cost + Benefits	-1,372,300.00	-815,068.00	-211,579.60	424,663.60	1,088,126.08	1,773,068.88

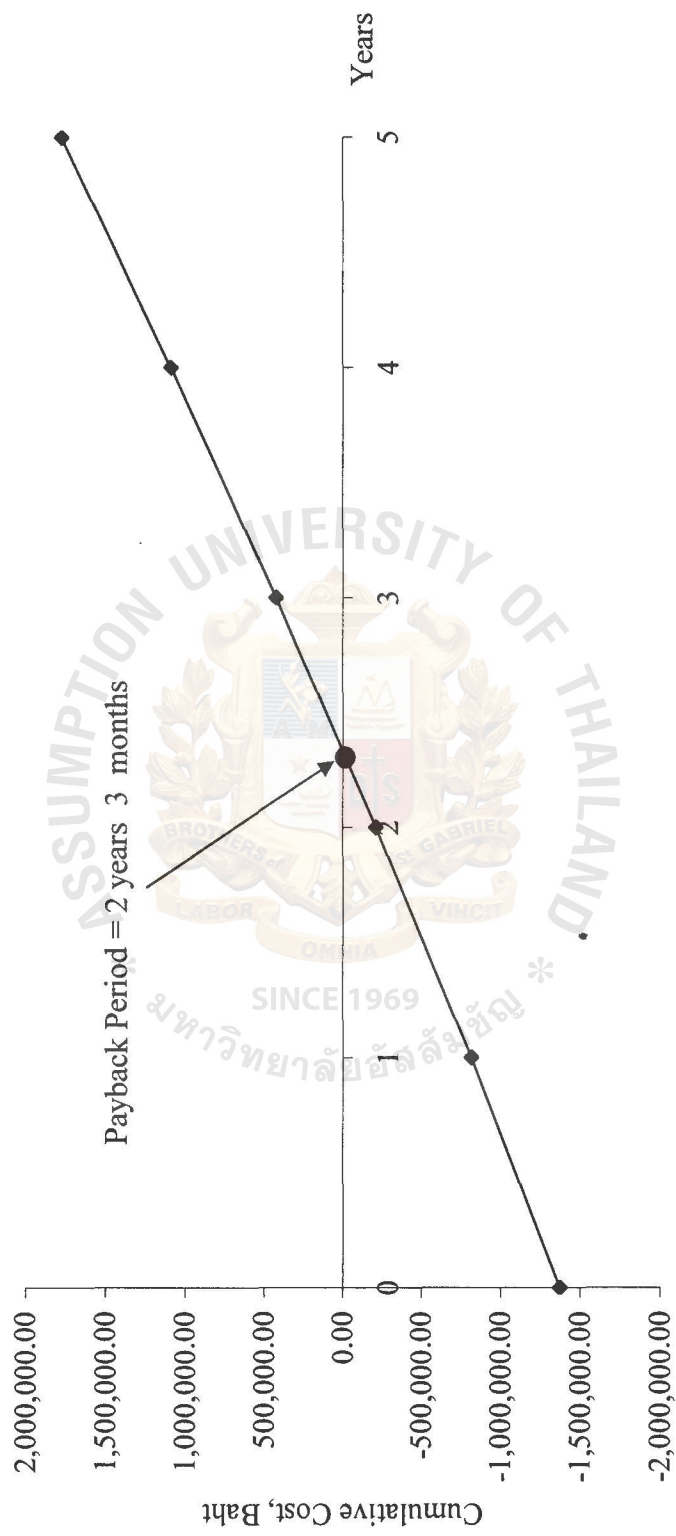


Figure F.3. Payback Period of Candidate 3.

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Khun Kling, this manual now belongs to BMCL. Upon its acceptance, BMCL will have to continually update the manuals to reflect actual practices and response requirements. These will continue to change as new systems are added, extensions are implemented and/or unforecasted circumstances change.

If we can be of any assistance, please do not hesitate to ask.

Rob C.

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From: Anawat Puangpairoj [mailto:AnawatP@bangkokmetro.co.th]

Sent: Monday, November 15, 2004 11:01 AM

To: Clark, Robert

Cc: Suwanakijboriharn, Sujin; Rosocha, Armin; Sutcliffe, Wayne; Prayuth Janjareansuk; Pichit Rukchonlatee; Prawit Impornrugee; ECO; @OPS.MNT.MECO; @OPS.TRF.CO.AllChief; Chuchuen, Siriporn

Subject: RE: MEA request for power cut - 69kv supply

Dear Rob,

MEA 69kV switch off works on next week will be carried out via option 1.

But Rob...please consider statement below which is picked up from Operation Procedure Manual CCR, Part 2 Engineering Control. If this procedure below is not a recommendation / a must or a favour option for this activity, what's a benifit of having this approach in our procedure manual?

Option 1 or 2 are inconsistent with what is written below. ECO needs a confirmation the validity of this approach. If this step is not foreseen, the procedure manual must be corrected by then!

Last but not least, there will be another MEA schedule maintenance in near future for sure and we need the right approach for this activity for the next time. Please confirm.

Best regards,
KLing

19/11/2547

