



Sales Information System for IT Distribution Business

by

Mr. Sanya Pawakranond

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
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Project Title	Sales Information System for IT Distribution Business
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Academic Year	December 2, 2001

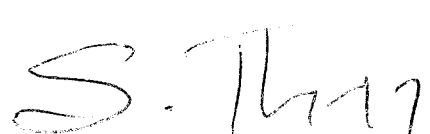
The Graduate School of Assumption University has approved this final report of the three-credit course, CS 6998 System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information Systems.

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ABSTRACT

Nowadays the computer system has been widely used in every field of business. The system can increase the efficiency and effectiveness of business. The work will be done in shorter time with more accuracy. Therefore, the manual system must be replaced by the computerized system to increase the competitive advantages against one's competitors.

The current existing Sales Information System is based on the manual and some computerized system (stand alone). Most of data are stored on paper, while some parts are kept in the Microsoft Excel, and stored in the hard disk of personal computer. It requires many operating staffs to maintain the system, and has to face the general problems of manual system, which are error-prone and having a high maintenance cost.

The new proposed Sales Information System will be developed to replace the manual and some computerized information system with Computerized and some Intranet System. It will reduce the number of administrative staffs, solve the problem of manual system and decrease the high maintenance cost.

ACKNOWLEDGEMENTS

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

He would like to thank Dr. Ketchayong Skowratananont, his project advisor, for his valuable suggestions and advice given into preparation of this project.

He extends his sincere thanks to Miss Orawan Wattanachaimongkol, Pre-Sales Assistant Manager, Mr. Kittiphot Sawatdichai, Sales Manager, and Miss Sunetr Chieochalakom for their timely assistance and information provided to him while carrying out the data collection required for his project.

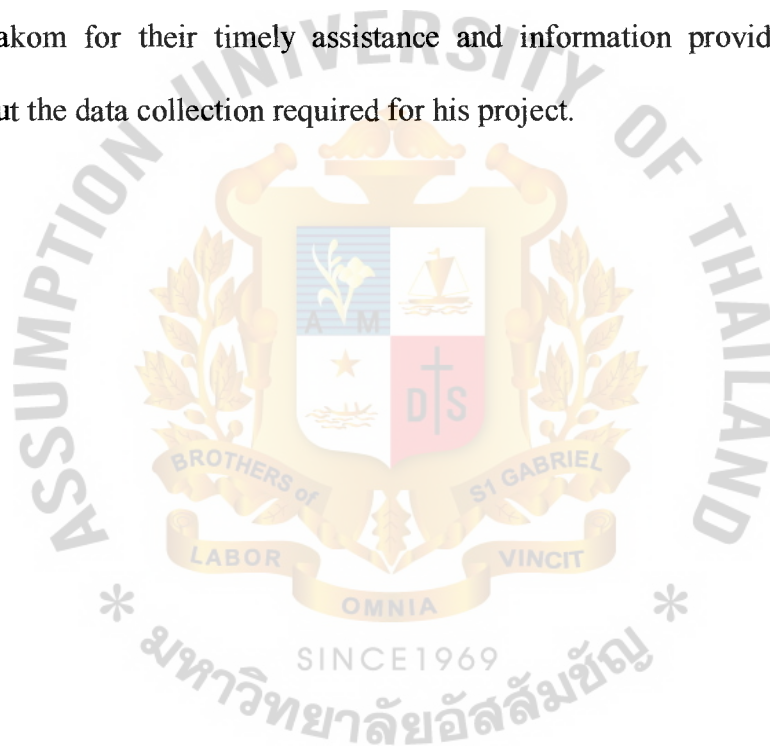


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I. INTRODUCTION

1.1 Background of the Project

Wholesale in IT industry is becoming more customer-focused to help resellers and manufacturers succeed. Wholesale in IT industry is growing fast, but transaction of selling is failing to keep pace given the weak returns on selling by purchasing process cycle.

Currently, the company has the problems about sales and support information that is the result of the company quickly expanding. These problems can be defined as the delay in finishing customer order, incorrect pricing, credit checking, overdue credit, blacklist customer, etc.

The transactions of purchasing use salespeople to take purchase order from customer. Problem of purchasing is limit of person. Salesperson has limit to serve quantity of customers, status of customer, and waste time to check stock status. Credit control department matches all data before approving. Delivery department prepares customer address for delivering product. Stock department and marketing department cannot check stock status real-time.

In the project, the main focus is on the Sales Information System for Distribution Division. This will be developed to automating existing operations such as issuing purchasing order, credit checking, customers status and by establishing a management information base for improving division making concerning sales revenue. The project aims to integrate the business application to increase its efficiency and support the accurate information for the management.

1.2 Objectives of the Project

This project is aims to develop a computerized customer information system to support business functions of the company that has 1,000 customers. The new computerized system will enhance the business functions in terms of capability and efficiency. All related information of the customers could be accessed easily through the database system.

- (1) To analyze and design a computer-based system for the purchase processing cycle.
- (2) To implement the ready-to-use system within the sales department, delivery department, credit control department, marketing department, and stock department.
- (3) To provide information of customers to support the sale department, delivery department, stock department and marketing department.
- (4) To increase the effectiveness and efficiency of the purchasing function.
- (5) To increase the customers' satisfaction in company's purchase procession service.*
- (6) To develop the user-friendly application.

1.3 Scope

This project will cover the major parts of the Sales Information Systems for IT Distribution Business. The following areas were studied:

- (1) Process Customer Orders
 - (a) After receiving the customer order, Salesperson will examine the correctness of the order and issuing the purchase order to the principals, confirming the order with the customer, forward

information to Sales Manager, and Sales Manager must be approve it before sending to Credit Control Department.

(2) Process Credit Control

- (a) After Sales department sent customer order, Credit Control check customer status in database or external information.
- (b) Credit Control can stop the order, send back to Sales Department when they find some problem or need more customer information.

(3) Process Inventory (Stock)

- (a) To record the new inventory once the shipment come in before delivering to the customer location.
- (b) To update stock in real-time.
- (c) To remind marketing department and stock department when product in stock is lower than “minimum stock”.

(4) Process Delivery Prepare.

- (a) Issuing delivery order together with Tax Invoice, which is issued by accounting department, and deliver all products to the customer.

(5) Process Customer Payment.

- (a) Accounting department will call the customer, collect the money when the invoice is being due, and pass the result to sales department.

1.4 Deliverable

The deliverables of the project of Sales Information System are as follows:

- (1) Design User Interface
- (2) Update New Customers
- (3) Create Customer Order System
- (4) Generate Reports such as (but not limited to):

- (a) Customer listing report
- (b) Stock update report
- (c) Customer information report
- (d) Customer order report

1.5 Project Plan

During September of year 2001 to January of year 2002, the project plan will start and implement, as shown in Figure I.1. It is mainly divided into 3 phases as follows:

- (1) Analysis of the existing system
- (2) Analysis and design of the proposed system
- (3) Implementation of the proposed system



II. THE EXISTING SYSTEM

2.1 Background of the Organization

In 1986, International Research Corporation Company Limited (iRC) developed Thai language system on Microcomputer and operated in IT business.

The Objective of corporate founding is to be a leader in IT business, Technology through computer outlets around the country and countries in Indochina region by emphasizing on product quality and pre and post sales services.

In 1997, IT Distribution Co., Ltd. (iDC) was founded to be a subsidiary of International Research Corporation Company Limited (iRC) for IT Whole Sale Business. IDC's customers are IT resellers, OEMer, IT Super stores, and System Integrators.

As the leading wholesale distribution company, iDC offers more than 280,000 products (as measured by distinct part numbers assigned by manufacturers and other suppliers) with inventory from 1,700 technology manufacturers and leading PC suppliers to its 175,000 technology solution provider customers. iDC is more than a wholesale distribution company - it is also a service powerhouse delivering logistics and supply-chain management services to increase value and drive efficiency for companies at all levels of the IT supply chain.

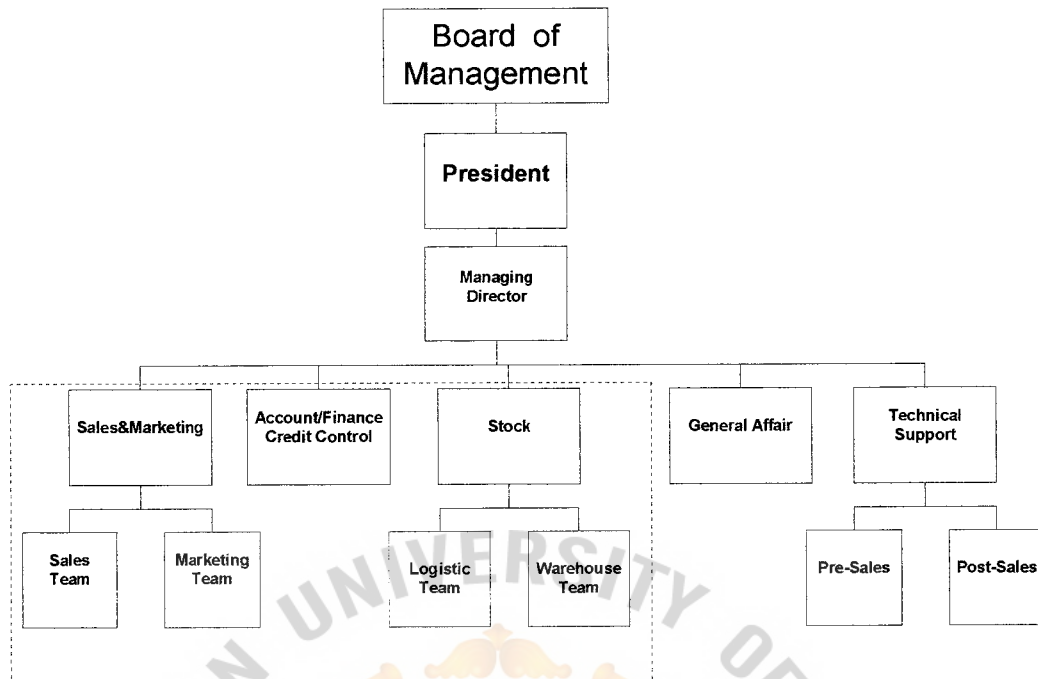


Figure 2.1. Organization Chart of iDC.

2.2 Current Problems and Areas for Improvement

At present the existing sales system has been done manually, IT Distribution Co., Ltd. (iDC) aims at the centralized system to improve the sales information system.

- (1) The data is separate on each computer.
- (2) Same data are kept in many places and create redundancy problem.
- (3) No database of customer information, product information, and sales history.
- (4) No summary report for management level.
- (5) No quality information history.

The advantages that we will get from implementing the computerized sales information system in order to enhance sell performance are in the following area:

- (1) To reduce the error from the existing system.

- (2) To speed up the sale process.
- (3) To decrease the documents draw up process.
- (4) To create reliability and accuracy database for sale process.
- (5) To create user friendly program with graphic user interface.

2.3 Existing Computer System

In the existing system, iDC has a local area network, supporting users in Sales and Marketing department, Credit control department, and Stock department. The network operating system is Window2000 Server which is running on Intel @server x200, Pentium®III 700 MHz, 512MB Ram, and hard disk 9.1 GB. The clients/workstations are IBM NetVista, Celeron™ Processor 533 MHz and Notebooks are IBM ThainkPad A21m, Pentium®III 500 (64MB Ram both). Even though, iDC has an advance in Hardware area it is not efficiently utilized. Figure 2.2 presents the existing hardware and software in our company.

The software on each workstation is Window2000 Professional with Microsoft office2000 Professional Thai Edition, with the following program:

- (1) MS-Word2000 Thai
- (2) MS-Excel2000 Thai
- (3) Ms-Access2000 Thai
- (4) Ms-Outlook2000 Thai
- (5) MS Internet Explorer 5.5

Network of iDC is LAN (Star Topology); iDC has Avaya P330 Series for LAN Backbone Switch and Avaya P120 Series is Switch for each department. Whole system supports 10/100 Mbps Full duplex.

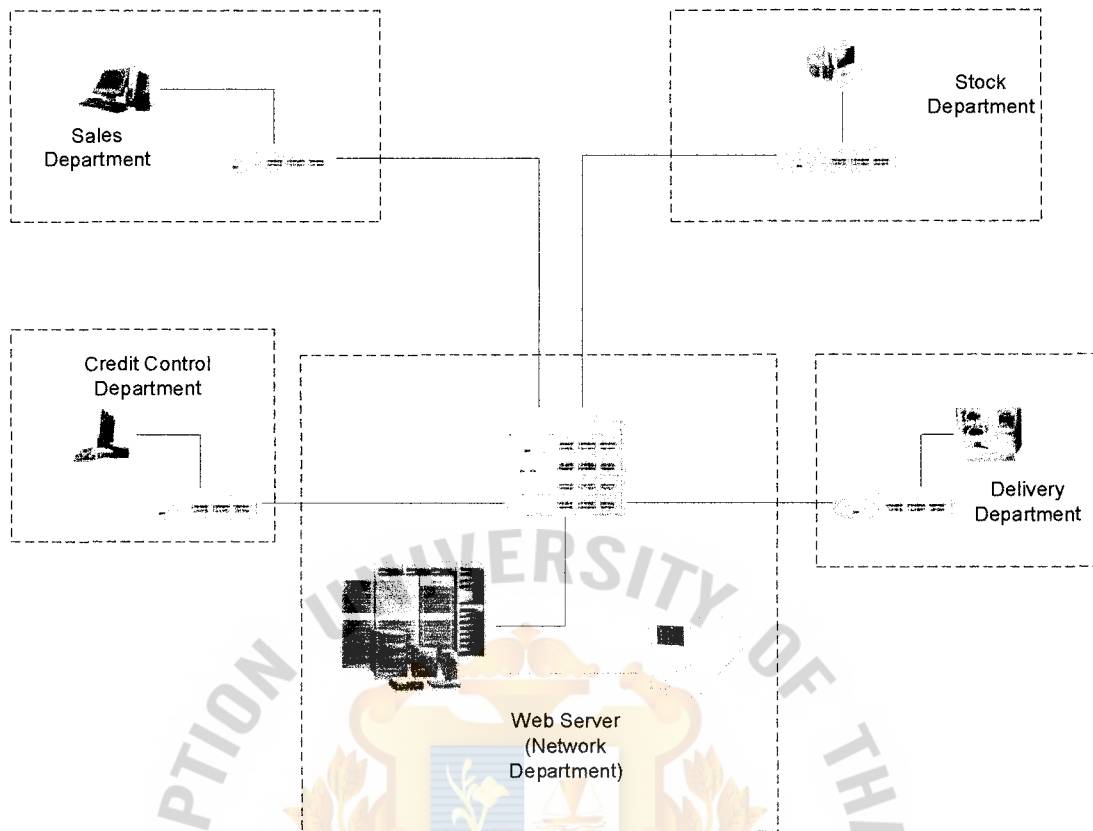


Figure 2.2. iDC Network Diagram.



= Avaya P120: Switch for each department

= Avaya P330: Stackable switch with redundant power supply for Network Backbone and supply network for Web Server



= Socomec UPS, 2000VA

= Network line, CAT5, RJ45

= Power line (Server connect to UPS with Power line)

III. THE PROPOSED SYSTEM

3.1 System Specification

User Requirements

The system analyst has interviewed all users – from manager level to operation level. The following requirements are obtained.

- (1) User-friendly interface screen for the whole system.
- (2) Keep the sale history in the database in order to be easily retrieved in the future.
- (3) Share the sale information to whole department.
- (4) Provide the summary report to management level and other parties.
- (5) Update the sale information real time.
- (6) Support the quality information and countermeasure result.

3.1.1 Input Design

The Input design is an important design of all database designs. The analyst has to design source documents, input screen, and methods and procedures for getting the data into the computer. System analyst must be extremely accurate because the data input is so critical to successful processing, file maintenance, and output. The data input design must be easy to create data, not confuse the users, easy to learn and user friendly.

The input design refers to the design of screen design, document form, and document flow. The basic functions are to accept data entry, verification, validation, editing, adding, changing and deleting information. The input design is the most important, and also one of the most difficult parts, which takes more time in programming and designing because of the validation, checking, retrieving, saving,

looping, calculation, screen positioning, and viewing functions must be done by the input functions.

Typically, most programmers try to design attractive input screens, which are time consuming but are not concerned with the exact functionality of those screens. Good input screen should be user-friendly. The users spend a considerable amount of time to input the data. The efficiency of entering data is the most critical part in screen and document form design in order to gather the information into the database files. Thus more time should be spent on input function design rather than designing the screen.

- (1) The document forms and flow are shown in Appendix C respectively.

3.1.2 Database Design

With a view to reduce redundancy and provide easy insertion, deletion, and modification along with easy access and maintenance of a logically coherent collection of data pertaining to different objects, a relational database system has been proposed.

Most relation systems represent each base relation as physical database file. The access path options include specifying the type of file, each relation and the attributes on which indexes should be defined. One of the indexes of each file may be a primary or clustering index.

The database design of the proposed system is divided into three parts as follows:

- (1) ER Diagram of the proposed system (shown in Figures 3.1.-3.3.).
- (2) Database Design of the proposed system (shown in Appendix E).
- (3) Data Dictionary of the proposed system (shown in Appendix G).

3.1.3 Network Design

The network design of sales information system will be separated from the main system on AS/400 that applies to Downsizing method from the last system to small (flexible) system.

The local area network (LAN) is required for data communication of the system.

The objectives of using LAN are as follows:

- (1) To improve the employee productivity through automation of routine job functions.
- (2) To improve manageability of the information through reduction of duplication and improvement of accessibility.
- (3) To improve employee interaction through the shared information.
- (4) To improve employee interaction through the use of cost-effective communication methods.
- (5) To be able to implement cooperative processing with high-speed links between PC clients and the server.
- (6) To get standardization of computer communication usage.

The configuration of the computerized system is shown in Figure 2.1.

3.1.4 Feasibility Analysis

(1) Candidate System Matrix

After studying the business and all possible users' requirements, we created three possible candidates for discussion. We have to compare the difference of each candidate solution in terms of Portion of System Computerized, Benefits, Servers and Workstations, Software Tools Needed, Application Software, Method of Data Processing, Output Devices, Input Devices, and Storage Devices.

All candidates we choose use MS-Windows2000 Server and MS-Office2000 Professional Thai Edition for Clients and all candidates have Network Infrastructure as illustrated in Table 3.1. In summary, each candidate has the following characteristics:

Candidate Solution1:

This candidate uses MS-Access2000 Thai Edition as current software tools to keep the data of Sale Information. MS Access2000 is easy to create database, form and report and it fully support users' requirements. Advantage of this candidate is low cost, and easiness (Power User can create report by themselves).

Candidate Solution2:

Second candidate uses MS-SQL Server as DBMS, Ultimus Workflow Software as Web Application Develop Software, and MS-FrontPage2000 as WebPages design. User can create, delete and update the database by Internet Explorer as WebPages (Intranet, Remote Access). This candidate is easy to study and real time update. Ms-SQL Server is easy to customize and it fully supports all MIS report. Ms-Exchange Server manages E-mail and database of employees; Ms-Outlook2000 is client E-mail and database access.

Candidate Solution3:

Last candidate uses Oracle Application Server and Oracle personal for DBMS. This candidate supports the Internet Access, real time report and can upgrade to Advance database system in future. Disadvantage of this candidate is very high cost.

Table 3.1. Candidate System Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized Brief descriptions of that portion of the system that would be computerized in this candidate.	Sale Information System. Support multi user in LAN.	Same as candidate 1	Same as candidate 1
Benefits Brief description of the business benefits that would be realized for this candidate.	Solution can be update quickly. Fully support and meet users' requirement. Real time update	Same as candidate 1	Same as candidate 1
Servers and Workstations A description of the servers and workstations needed to support this candidate.	Technically architecture dictates Server: Pentium III 700MHz with 512MB, MS-Windows2000 Server. Workstation: Celeron 533MHz with 128 MB, MS-Windows2000 Professional (Clients).	Same as candidate 1	Technically architecture dictates Server: Pentium III 700MHz with 512MB, MS-WindowsNT Server. Client: Celeron 533MHz with 128MB, MS-WindowsNT Workstations (Clients).
Software Tools Needed Software tools needed to design and build the candidate (e. g., database management system, emulators, operating systems, languages, etc.). Not generally applicable if applications software packages are to be purchased.	Ms-Access for customization of package to provide report writing and integration.	MS-SQL2000 Server for Data Base Management Systems Ultimus Workflow for Web Application Development Ms-FontPage2000 for WebPages Design Ms-Outlook2000 and Ms-Exchange Server for communicate between department (E-mail for remind new process) MS-Internet Explorer for Client Access.	Oracle Application Server Oracle personal
Application Software A description of the software to be purchased, built, accessed, or some combination of these techniques.	Custom Solution.	Same as candidate 1	Same as candidate 1
Method of Data Processing Generally some combination of: on-line, batch, deferred batch, remote batch, and real-time.	File Sharing.	E-mail Process, Web Application as Client / Server via LAN.	Client / Server via LAN.
Output Devices and Implications A description of output devices that would be used, special output requirements, (e.g. network, preprinted forms, etc.), and output considerations (e.g., timing constraints).	(1) HP LaserJet 1100 with Print Server card 10/100 Mbps	Same as candidate 1	Same as candidate 1

Table 3.1. Candidate System Matrix (Continued).

Characteristics	Candidate 1	Candidate 2	Candidate 3
Input Devices and Implications A description of Input methods to be used, input devices (e.g., keyboard, mouse, etc.), special input requirements, (e.g. new or revised forms from which data would be input), and input considerations (e.g., timing of actual inputs).	Mouse / Keyboard (1) Scanner HP ScanJet6300C (1) Digital Camera	Same as candidate 1	Same as candidate 1
Storage Devices and Implications Brief description of what data would be stored, what data would be accessed from existing stores, what storage media would be used, how much storage capacity would be needed, and how data would be organized.	Network file sharing with 10 GB capabilities.	Ms-SQL Server for DBMS and Ms-Exchange Server for Mail Server with 10 GB.	10 Mbps for Oracle DBMS

(2) Feasibility Analysis

Data for the feasibility study can be gathered through interviews. The kind of interview required is directly related to the problem or opportunity being suggested. The systems analyst typically interviews those requesting help and those directly concerned with the decision-making process—typically, management. The purpose of the feasibility analysis is to identify candidate solutions, analyze and recommend a target system that will be designed and implemented.

Once alternative candidate design solutions have been identified, each candidate is analyzed for feasibility against four sets of criteria: those are operational feasibility, technical feasibility, schedule feasibility, and economic feasibility. One alternative is recommended to system owners for approval. The approved solution becomes the basis for general and detailed design. As the result in Table 3.2., Feasibility Analysis Matrix, the highest rank which is candidate 1 is selected as our system solution.

For each candidate, the analysis team analyzes the estimated cost of candidate solutions, payback period analysis of the candidate solutions, and the net present value analysis of candidate solutions. Details are illustrated in Appendices A and B respectively.



Table 3.2. Feasibility Analysis Matrix.

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
<p>Operational Feasibility</p> <p>Functionality. A description of to what degree the candidate would benefit the organization and how well the system would work.</p> <p>Political. A description of how well received this solution would be from user management, user, and organization perspective.</p>	30%	<p>Support all Sale Department Service requirements. Power User can create report them self.</p> <p>Score: 95</p>	<p>Fully supports all user required functionality and real time update. Easy to use (Web Interface)</p> <p>Score: 95</p>	<p>Fully supports all user required functionality and real time update.</p> <p>Score: 90</p>
<p>Technical Feasibility</p> <p>Technology. An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate.</p> <p>Expertise. An assessment to the technical expertise needed to develop, operate, and maintain the candidate system.</p>	30%	<p>Ms-Access2000, easy to develop solution, low cost of programmer.</p> <p>File Sharing is no good for large system. Not enough for Enterprise Organization</p> <p>System for Small to Medium Organization</p> <p>User cannot know new transaction come; previous user must call to announce new process.</p> <p>Score: 85</p>	<p>Ms-SQL2000 for DBMS</p> <p>Ultimus Workflow Software required training for programmer, which are time consuming and some budget requirement.</p> <p>Easy to know new process via E-mail with Ms-Exchange Server and Ms-Outlook2000 (Client)</p> <p>Ms-Internet Explorer is the free software and easy to study.</p> <p>System for Medium to Enterprise.</p> <p>Score: 95</p>	<p>Oracle8 incorporates a wealth of technologies in support of data warehousing but required training for programmer, which are time consuming and some budget requirement.</p> <p>System for Enterprise Organization</p> <p>Score: 95</p>
<p>Economic Feasibility</p> <p>Cost to develop:</p> <p>Payback period (discounted):</p> <p>Net present value:</p> <p>Detailed calculations:</p>	30%	<p>347,400 Baht</p> <p>1 Year</p> <p>3,704,926 Baht</p> <p>Appendix A B</p> <p>Score: 85</p>	<p>734,000 Baht</p> <p>1 Year 8 Months</p> <p>4,715,555 Baht</p> <p>Appendix A B</p> <p>Score: 90</p>	<p>1,174,000 Baht</p> <p>3 Years 5 Months</p> <p>2,755,941 Baht</p> <p>Appendix A B</p> <p>Score: 85</p>
<p>Schedule Feasibility</p> <p>An assessment of how long the solution will take to design and implement.</p>	10%	<p>1-3 Months</p> <p>Score: 97</p>	<p>2-5 Months</p> <p>Time acceptable (compare with fastest solution)</p> <p>Score: 95</p>	<p>6-12 Months</p> <p>Waste time for development, time is unacceptable</p> <p>Score: 80</p>
Ranking:	100%	89.2	93.5*	89

* The Highest rank will be picked as our solution. The candidate2 has best price/performance for organization. The candidate2 has lowest price that support fully user requirement.

- Solution1 can develop with low cost and fast develop but it limit by Microsoft Access2000 application. The solution can not increases to Internet Solution, Supply Chain, etc in the future.

- Solution2 develop with Web base architecture and support Internet solution.

- Solution3 develop with high cost, waste time and resource to develop.

3.1.5 Application Architecture

After the existing manual system has been reviewed and analyzed, a computer system was determined to solve those problems iDC requires an effective Sale Information System, which has the following components:

(1) Network Architecture:

iDC applies Network Files Sharing connected by the Local Area Network using Fast Ethernet's Star Topology. The system uses Microsoft Windows2000 Server to store the data. All data will transfer from Distributors to Clients that want to use program. Windows2000 Server has the NTFS format for security and can work with Client OS, Windows2000 Professional in advance mode as directory synchronize.

(2) Data Architecture:

The company uses MS Windows2000 Server with Internet Information Service (IIS) to present Web Application, with MS Exchange2000 Server to distributed E-mail, and with MS SQL2000 Server that can provide management, search, query data, report, backup, recovery, integrity, and security.

(3) Interface Architecture:

The Microsoft Windows2000 Server and Web Application's interface architecture has Graphical User Interface (GUI) which is easy to use and study.

(4) Process Architecture:

The system works on Web Application with MS Internet Explorer. The information is sent to officer who takes care of the next process via E-mail automatically. Officer open E-mail with MS Outlook2000 and click

on message that E-mail provide to connect their process. Officer operates their process and sends to next process until system work complete.

3.2 System Design

After that we start doing a current system investigation, which contained two main processes. Those begin with constructing data model and followed by data flow diagram.

3.2.1 Data Modeling

Data modeling is a technique for defining, organizing and documenting the business data requirements that must be stored in a database. The most popular and simplest logical data modeling techniques involve drawing entity relationship diagrams or ERD (as shown in Figure 3.1.).

- (1) Entity Discovery: The first task in data modeling is to discover those fundamental entities in the system that are or might be described by data.

Discovered entities for our system are:

- (a) CUSTOMER
- (b) OFFICER
- (c) PURCHASE ORDER
- (d) PRUDUCT
- (e) SUPPLIER
- (f) SALES ORDER

All those entity names and definitions should establish an initial glossary of business terminology in "Data Dictionary" (as shown in Appendix G) that will serve both present and future analysts and users for the future.

- (2) The next task is to construct the "Context Model" which contains only fundamental or independent entities that we have previously discovered and nonspecific relationships also should be shown. After completing this task (as shown in Figure 3.1.), this ERD communicates us about the following:

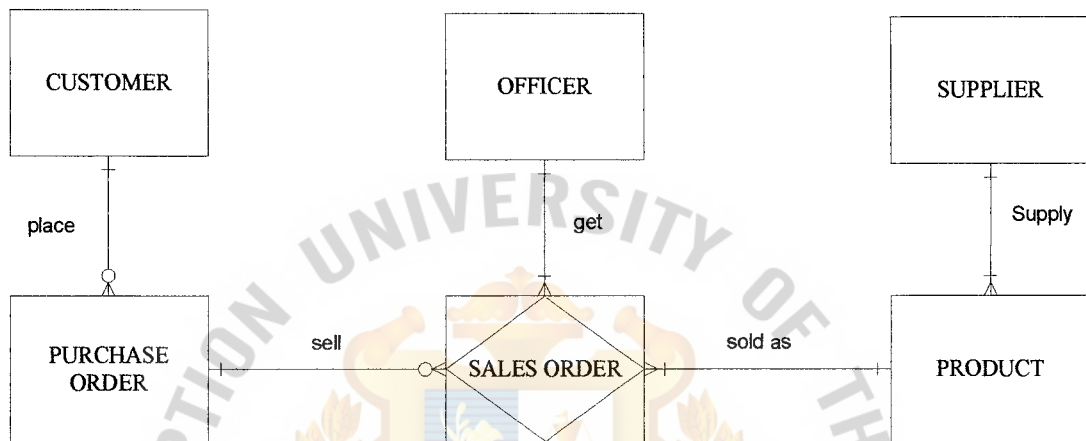


Figure 3.1. Entity Relationship Diagram (ERD) of Sales Information System.



Figure 3.2. ERD - Key Based Model of Sales Information System.

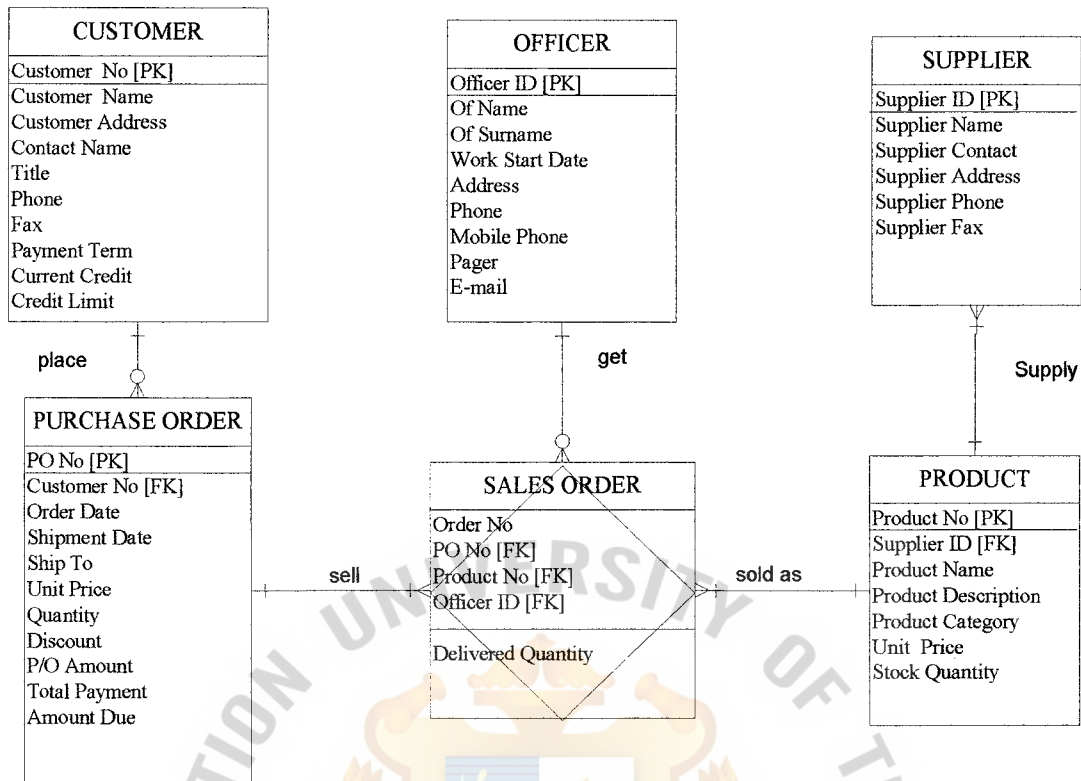


Figure 3.3. ERD - Fully Attributed Data Model of Sales Information System.

- (a) CUSTOMERS order with PURCHASE ORDER. It is one to many since 1 CUSTOMER can issue many WARRANTY CLAIM REPORTS.
- (b) Many PURCHASE ORDER summarized in 1 SALE ORDER.
- (c) One OFFICER takes care of 1 SALE ORDER.
- (d) Each SUPPLIER produces more than 1 PRODUCT.
- (e) Each PRODUCT sells much SALE ORDER.

All relationships are shown in the following model:

- (1) Context Data Model

Firstly we find out the fundamental entities of our system and show them in the context data model. (Figure 3.1.)

(2) Keybased Data Model

The key-based data model (Figure 3.2.) will show more detail about the primary key and the foreign key of each entity. The Claim Application and Payment have many-to-many relationship. Therefore, we decided to create the associative entities in order to join those entities with their primary keys (Customer No., Order No., and Product No.) that exist in each entity. The relationship will be changed to one-to-many relationship.

(3) Fully Attributed Data Model

The completed one is the Fully Attributed Data Model. (Figure 3.3.) All the remaining data attributes will be gathered into the last data model. At the same time we also recorded the description of all attributes.

3.2.2 Data Flow Diagram

Whereas data modeling was concerned with data independently from how that data are captured and used which can be called "data at rest", process modeling shows how the data will be captured and used which can be called "data in motion".

Then it comes up with the systems modeling. It consists of:

- (1) Context Diagram
- (2) Functional Decomposition diagram
 - (a) Process Customer Order
 - (b) Process Credit Control
 - (c) Process Inventory
 - (d) Process Delivery
 - (e) Process Customer Payment

We studied the flow of data through a system and a processing system.

Data Flow Diagram (DFDs) will have the process itself, Data Store, External Entity and the arrow, which represents data flows. The symbol sets for DFDs that we use throughout the project is the Gane and Sarson notation.

The Context Diagram (Figure 3.4.) represents the initial project scope of our system. We focus at the Sales Information System, which are the external entities, main process, and data flow.

Functional Decomposition Diagram (Figure 3.5.) shows the entire system and 2 subsystems: Verify Customer Order Subsystem, Check Customer Credit Subsystem and then they will be the processes in the diagram. The remaining part will show the event diagram of each process. Detail of each process in APPENDIX F

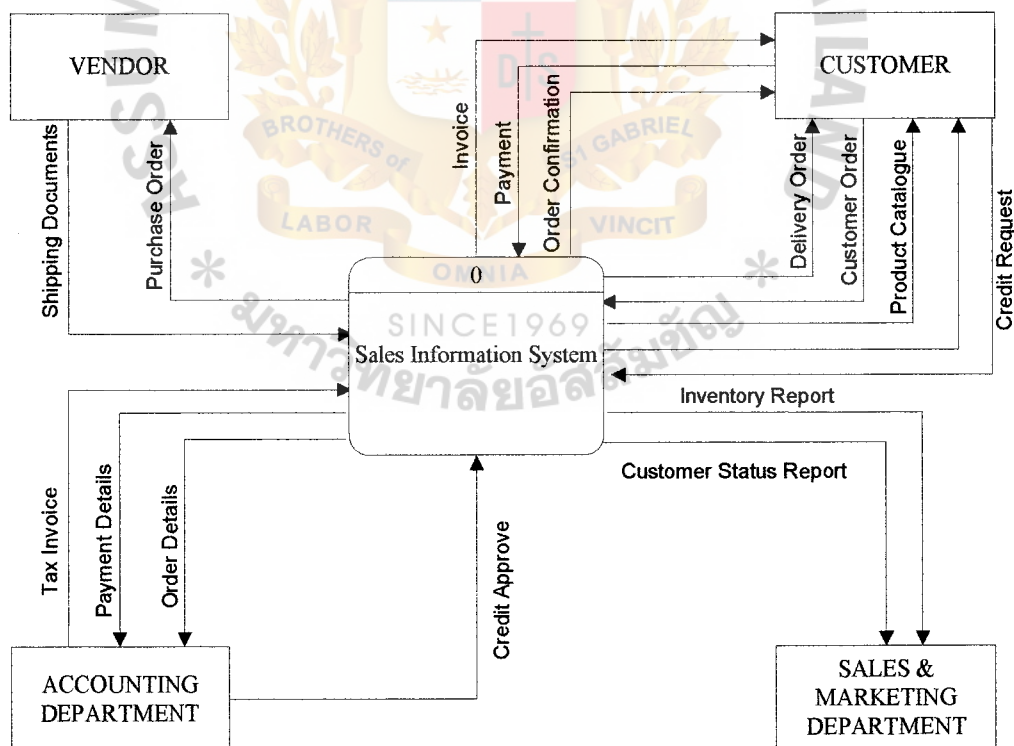


Figure 3.4. Context Diagram of Sales Information System.

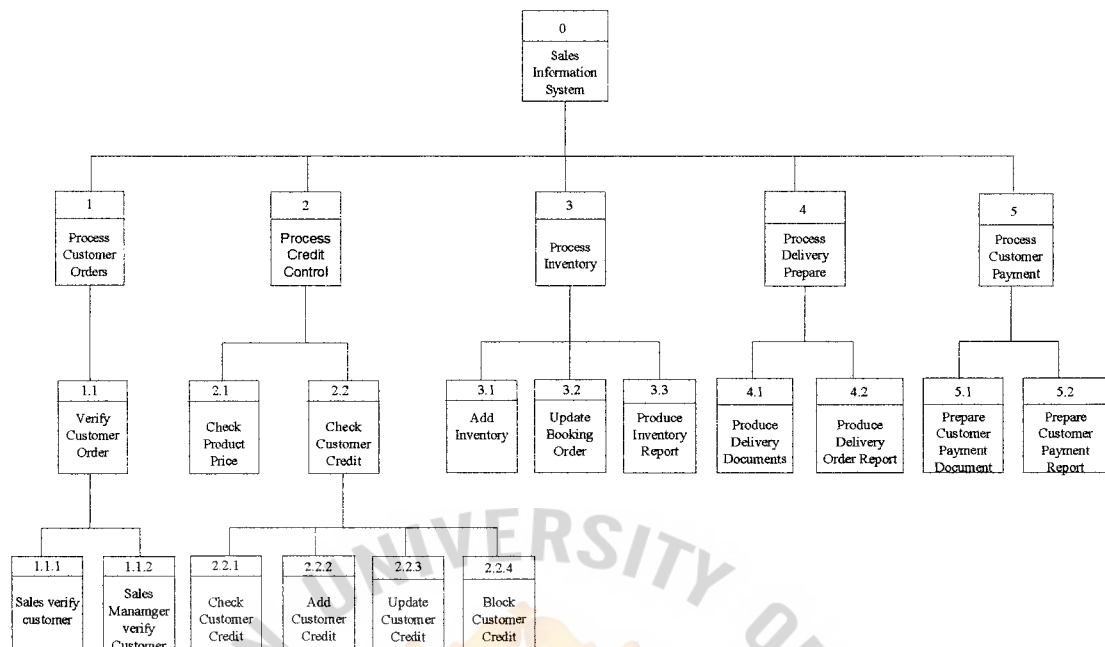


Figure 3.5. Functional Decomposition Diagram of Sales Information System.

System Diagram (Figures 3.6. - 3.12.) is exploded from the single process in the context diagram. A lot of events will be combined into one system diagram that is Claim application process, claim judgment process and claim reimbursement process.

From the above data models and the data flow diagrams, they can effectively communicate business requirements between the users and the programmers. After the Process Model is completed, the system owner and system users in the business side can clarify what they have and what they want the system to be. Therefore the problem that we mention above will not exist.

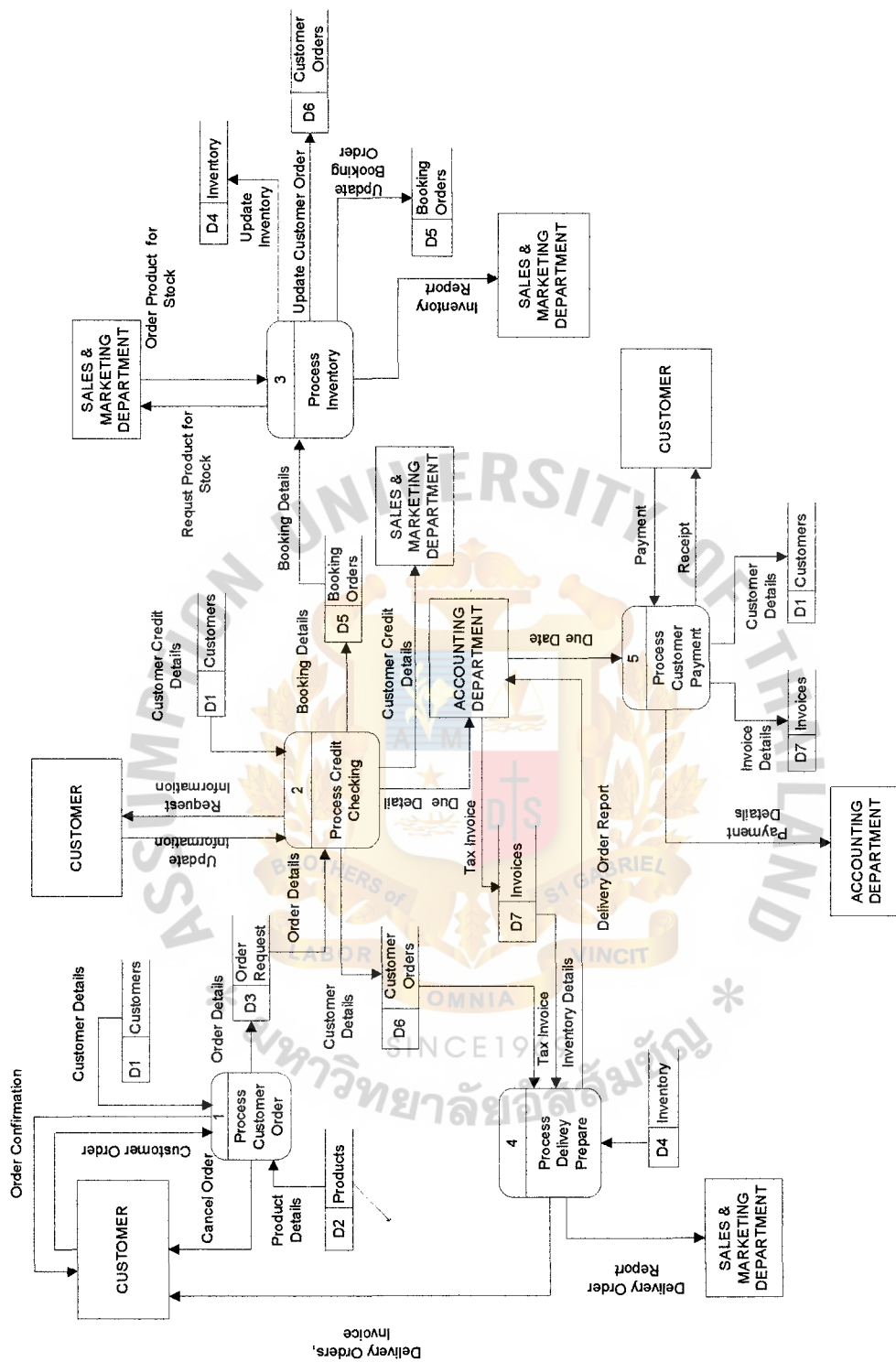


Figure 3.6. Level 1 Data Flow Diagram of Sales Information System.

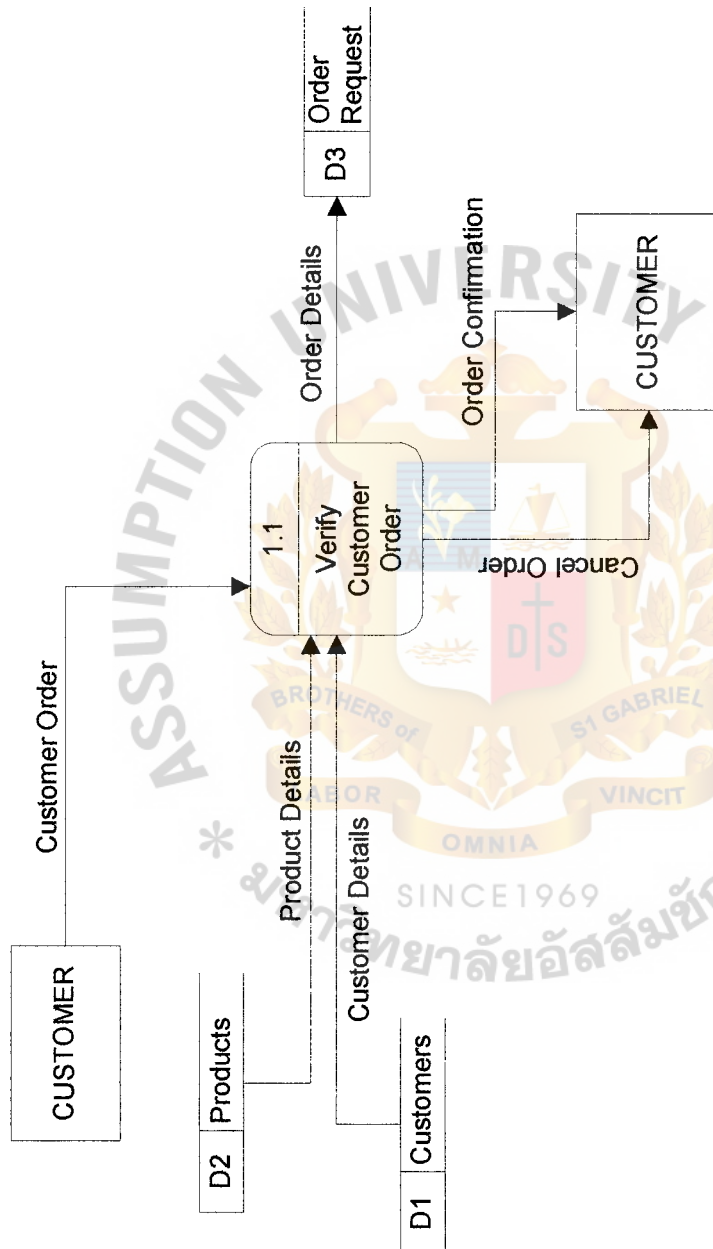


Figure 3.7. Level 2 Data Flow Diagram of Process Customer Order of Sales Information System.

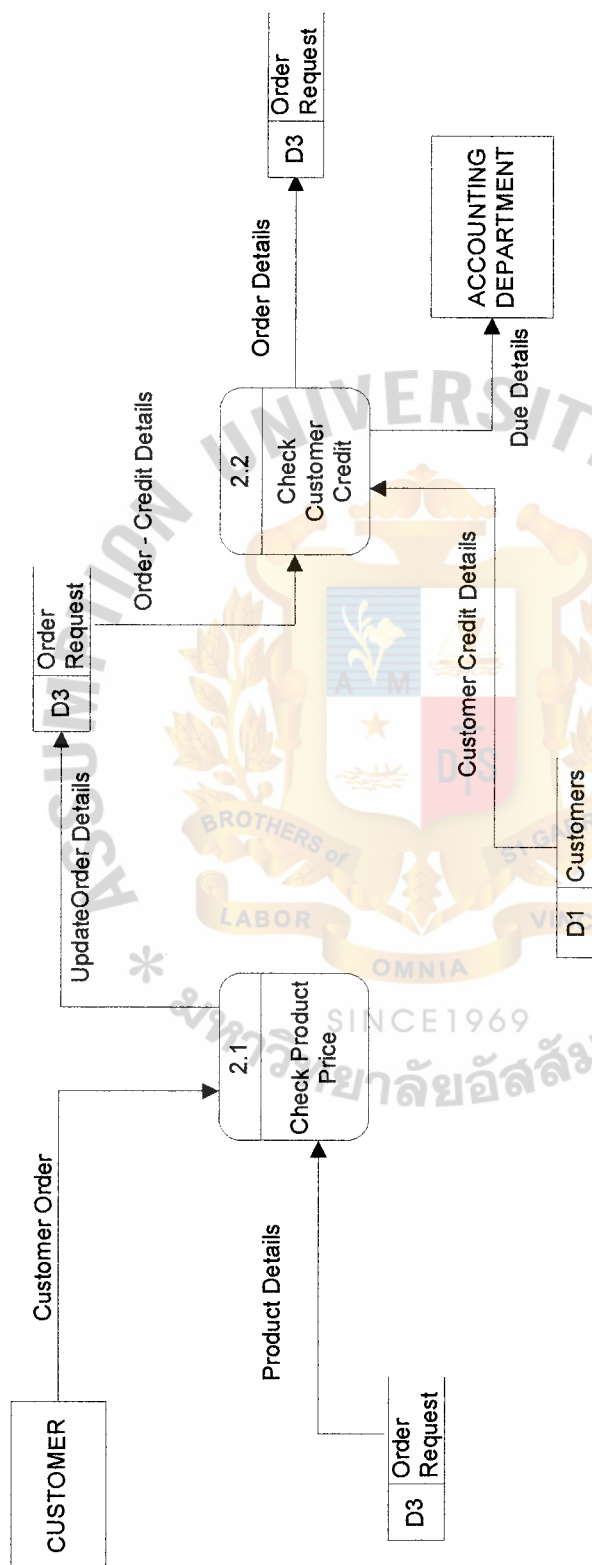


Figure 3.8. Level 2 Data Flow Diagram of Process Credit Checking of Sales Information System.

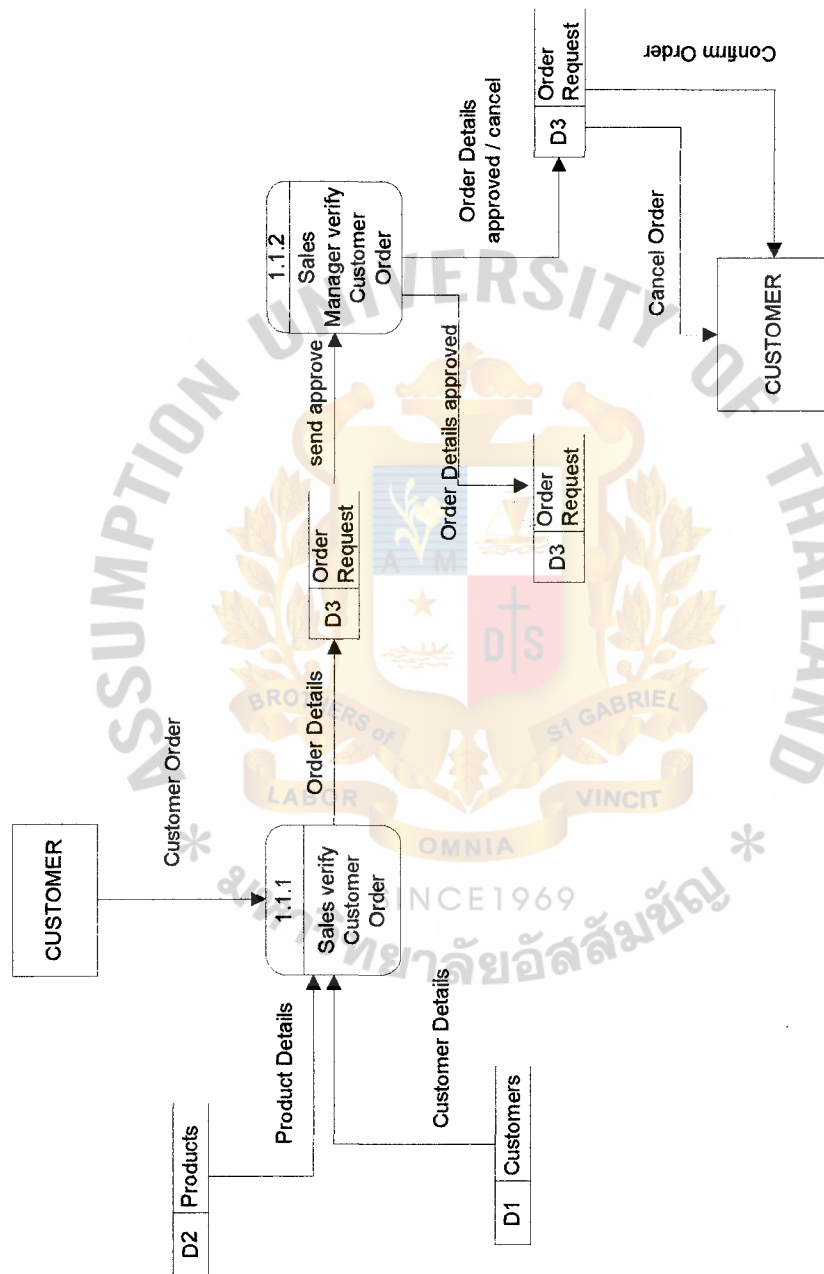
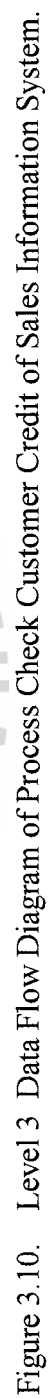


Figure 3.9. Level 3 Data Flow Diagram of Process Customer Order of Sales Information System.



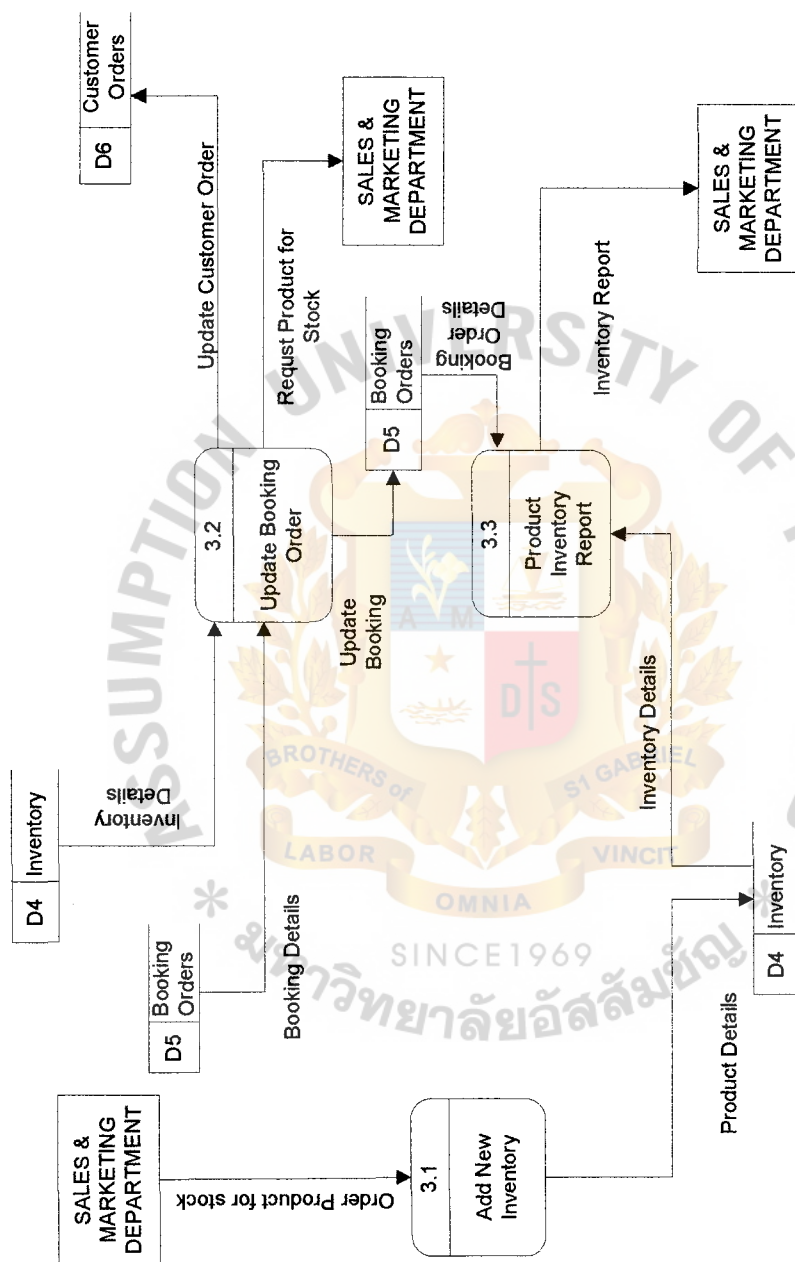


Figure 3.11. Level 2 Data Flow Diagram of Process Inventory of Sales Information System.

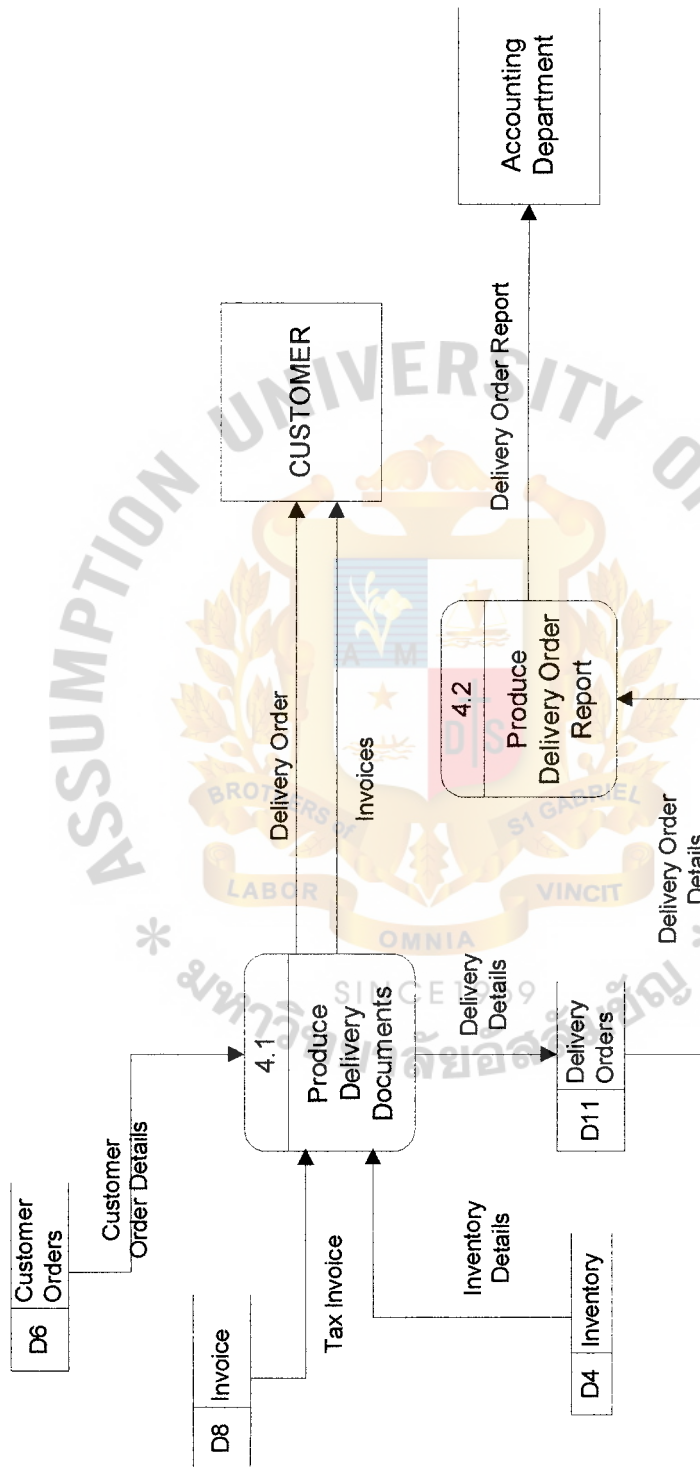


Figure 3.12. Level 2 Data Flow Diagram of Process Delivery Prepare of Sales Information System.

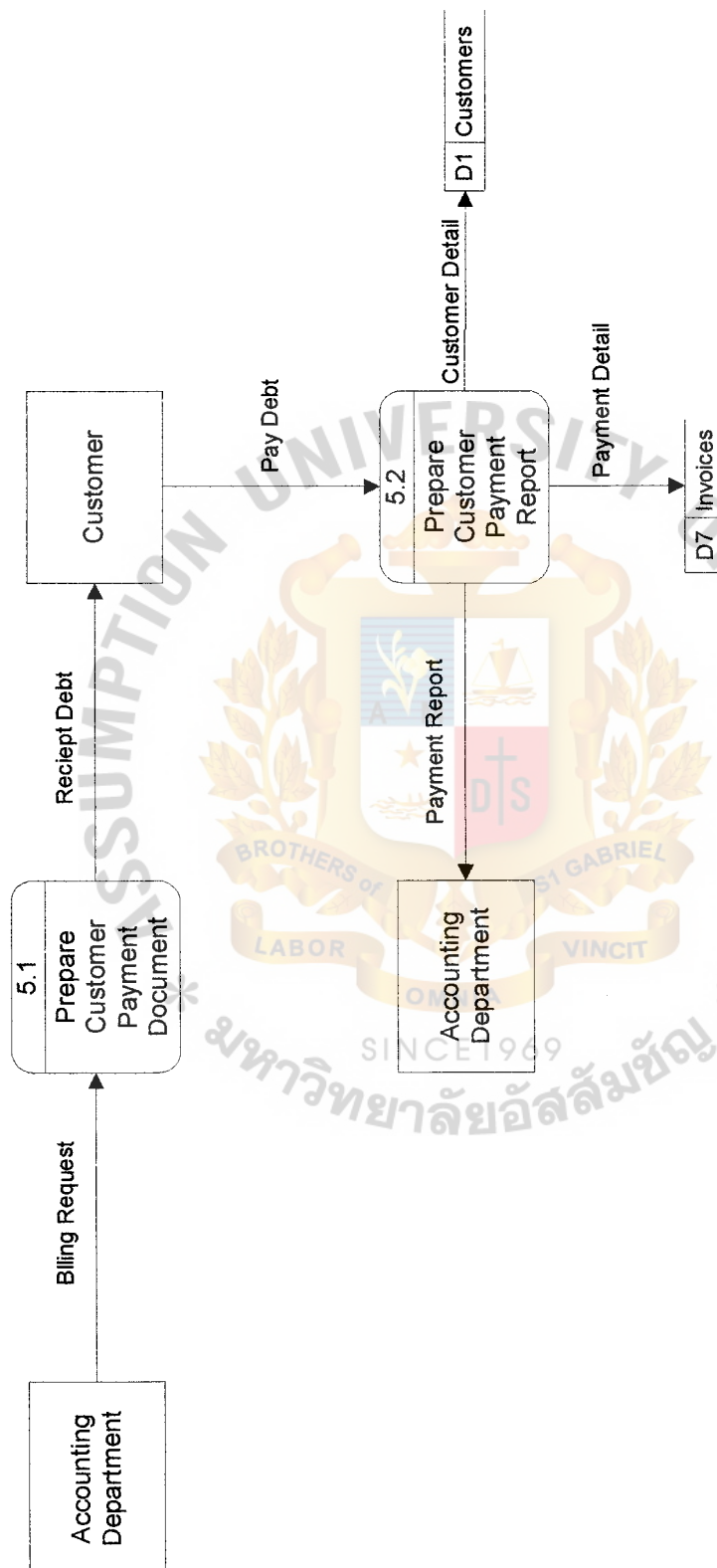


Figure 3.13. Level 2 Data Flow Diagram of Process Customer Payment of Sales Information System.

Hardware and Software Requirement

Since Sales Information System developed under MS-SQL2000 with Ultimus Workflow, the Server should have higher capability with Microsoft Windows2000 and install MS-SQL2000 as database, Ultimus Workflow as Application developer, and MS-IIS (Internet Information System) as Web Server. The hardware and software specifications for the proposed server are shown in the Tables 3.3 and 3.4 respectively.

Table 3.3. The Hardware Specification for the Server.

Hardware	Specification
CPU	Pentium III 700 MHZ, 1 MB
Cache	256 KB or higher
Memory	512 MB (2 X 256 MB)
Hard Disk	9.1 GB (IDE or SCSI)
CD-Rom Drive	4X (min), 40X up (recommend)
Floppy Disk Drive	1.44 MB
Network Adapter	FastEthernet 10/100
Display Adapter	SVGA card (2MB Ram)
Display	15" monitor
Printer	Laser
Tape storage	Travon NS-10/20 GB
Tape Drive	SLR 40 20/40 GB
UPS	APG, 2000VA

Table 3.4. The Software Specification for the Server.

Software	Specification
Operating System	Microsoft Windows2000
Web Server	Microsoft Internet Information System 2.0
Application Server developer	Ultimus Workflow
Database Server	Microsoft SQL2000

Client machines should have hardware specification high enough to run MS-Windows2000 Professional and Microsoft Office2000. The hardware and software specifications for each client machine are shown in the Tables 3.5 and 3.6 respectively.

Table 3.5. The Hardware Specification for Each Client Machine.

Hardware	Specification
CPU	Pentium III 533 MHZ
Cache	512 KB
Memory	128 MB (2 X 64 MB)
Hard Disk	13.6 GB
CD-Rom Drive	48X
Floppy Drive	1.44 MB
Network Adapter	FastEthernet 10/100/1000
Display Adapter	SVGA card (8MB Ram)
Display	14" SVGA monitor
UPS	APG, 500VA

Table 3.6. The Software Specification for Each Client Machine.

Software	Specification
Operating System	MS-Windows2000 Professional
Web browser	Microsoft Internet Explorer 4.0 or higher
Application Software	Microsoft Outlook2000

3.3 Security and Control

In many businesses, computer system is the backbone of business as valuable as cash, so computer information must be protected from loss or theft. The sales information system also has to design the security for these cases:

(1) Loss prevention

Various dangerous points when dealing with the information are the loss of information, fixed disk failure, operation error or disaster. For these reasons, recovery from the loss of information must be addressed.

One way to deal with the risk of information losing is to back-up data at a period of time (daily, weekly) and keep it in the safe place. So if information is lost, staffs will be able to restore the backup data and start to re-process at the last position of backup information.

(2) Theft prevention

Theft prevention is the physical protection from unauthorized disclosure. Normally this kind of security requires guard to take care of the computer at non-work time to protect hardware. In case of data, the security is provided by sales information system that can protect unauthorized user to access data by defining the properties for each user name. The application

MS-SQL2000, the security system of MS-SQL2000 will allow the rights for user group to operate with objects, tables, queries, forms, reports and macro.

By this system, each user has his own password and authority granted by security officer. User who does not know the password cannot access the system.

In controlling for application software, in each menu that specifies only for management level has been controlled by password too, lower level staffs that do not know the password cannot access to the protected area of the system.

3.4.1 Back-up Process

Back-up process is one of the most important parts in computer processing because at the time that any malfunction occurs, the damaged part of information can be recovered. If there is no backup, any damages cannot be recovered and may cause the loss of valuable corporate data.

For the sales information system, we prepared weekly back-up process. Staffs have to save transaction data at the end of every Friday evening onto the tape, and issue the weekly report Friday evening or Monday morning after work start. If some problems occur while processing, the damage will not be great. Staffs can restore backup data and process only change or new data.

Moreover, staffs should also backup the master file as an additional part. The reason why master file is saved at the end of the week is because master file has a few changes between weeks. So once a week is enough.

3.4.2 Recovery Planning

If information was damaged, staffs have to restore the backup data file to computer and reprocessing, after that the user can continue processing without any problem.

3.5 System Cost Analysis

(1) Costs of Manual System

The existing system is a manual one that can be divided into Fixed cost (one time cost) and Operating cost (recurring cost). Our fixed cost consists of one typewriter and two calculators. Operating cost includes the salary cost of 1 manager and 3 staffs and office supplies and Miscellaneous cost, as in Table 3.7. The total accumulated cost for 5 years is 5,246,070 baht. See Table 3.8.

Table 3.7. Manual System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
Fixed Cost					
Typewriter: 1 unit @ 10,000	10,000.00	-	-	-	-
Calculator: 2 units @ 2,000	4,000.00	-	-	-	-
Total Fixed Cost	14,000.00	-	-	-	-
Operating Cost					
Salary Cost:					
Sales Manager: 1 person @ 18,000	216,000.00	237,600.00	261,360.00	287,496.00	316,245.60
Staff:					
Sales Executive: 6persons @ 8,000	576,000.00	633,600.00	696,960.00	766,656.00	843,321.60
Sales Administrator: 3 persons @ 7,000	252,000.00	277,200.00	304,920.00	335,412.00	368,953.20
Total Annual Salary Cost	1,044,000.00	1,148,400.00	1,263,240.00	1,389,564.00	1,528,520.40
Office Supplies & Miscellaneous Cost:					
Stationary Per Annual	36,000.00	39,600.00	43,560.00	47,916.00	52,707.60
Paper Per Annual	84,000.00	92,400.00	101,640.00	111,804.00	122,984.40
Utility Per Annual	60,000.00	66,000.00	72,600.00	79,860.00	87,846.00
Miscellaneous Per Annual	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Total Annual Office Supplies & Miscellaneous Cost	204,000.00	224,400.00	246,840.00	271,524.00	298,676.40
Total Annual Operating Cost	1,248,000.00	1,372,800.00	1,510,080.00	1,661,088.00	1,827,196.80
Total Manual System Cost	1,262,000.00	1,372,800.00	1,510,080.00	1,661,088.00	1,827,196.80

Table 3.8. Five Years Accumulated Manual System Cost, Baht.

Year	Total Manual Cost	Accumulated Cost
1	1,262,000.00	1,262,000.00
2	1,372,800.00	2,634,800.00
3	1,510,080.00	4,144,880.00
4	1,661,088.00	5,805,968.00
5	1,827,196.80	7,633,164.80
Total	7,633,164.80	7,633,164.80

(2) Costs of Computerized System

For the proposed system (computerized system), our Fixed cost are:

- (a) Investment cost (Hardware cost, Software cost and Office equipment cost)
- (b) Implementation cost (Maintenance cost, Implementation cost)

And the operating cost includes the salary cost of 1 manager and 1 staff (reduced from existing system) and office supplies and Miscellaneous cost, as in Table 3.9. The total accumulated cost for 5 years is 4,845,163.55 baht. See Table 3.10.



Table 3.9. Computerized System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
Fixed Cost					
Hardware Cost:					
Computer Server Cost: 1 unit @ 250,000	60,000	60,000	60,000	60,000	60,000
Workstation Cost: 5 units @ 50,000	50,000	50,000	50,000	50,000	50,000
Total Hardware Cost	110,000	110,000	110,000	110,000	110,000
Hardware Maintenance Cost:					
Hardware Maintenance Cost	-	27,500.00	27,500.00	27,500.00	27,500.00
Total Hardware Maintenance Cost	-	27,500.00	27,500.00	27,500.00	27,500.00
Software Cost:					
Computer Server Cost	40,000	40,000	40,000	40,000	40,000
Computer Workstation Cost: 5 units @ 50,000	50,000	50,000	50,000	50,000	50,000
	10,000	10,000	10,000	10,000	10,000
Network Cost	100,000	100,000	100,000	100,000	100,000
Total Software Cost					
Implementation Cost:					
Advanced Training: Cost 2 Admin @ 100,000	200,000	-	-	-	-
Basic Training Cost: 6 Staff @ 20,000 Baht	120,000	-	-	-	-
Development Cost: 2 Programmer @ 5 Month	200,000	-	-	-	-
Total Implementation Cost	520,000				
Office Equipment Cost:					
Calculator 2 Units @ 2,000	4,000	-	-	-	-
Total Office Equipment Cost	4,000	-	-	-	-
Total Fixed Cost (Baht)	1,536,000.00	101,200.00	101,200.00	101,200.00	101,200.00
Operating Cost					
People-Ware Cost:					
Sales Manager 1 person @ 25,000	216,000.00	237,600.00	261,360.00	287,496.00	316,245.60
Staff:					
Sales Executive 4 persons @ 20,000	384,000.00	422,400.00	464,640.00	511,104.00	562,214.40
Sales Administrator 1 person @ 15,000	84,000.00	92,400.00	101,640.00	111,804.00	122,984.40
Total Annual Salary Cost	684,000.00	752,400.00	827,640.00	910,404.00	1,001,444.40
Office Supplies & Miscellaneous Cost:					
Stationary Per Annual	3,600.00	3,960.00	4,356.00	4,791.60	5,270.76
Paper Per Annual	3,600.00	3,960.00	4,356.00	4,791.60	5,270.76
Utility Per Annual	3,600.00	3,960.00	4,356.00	4,791.60	5,270.76
Miscellaneous Per Annual	3,600.00	3,960.00	4,356.00	4,791.60	5,270.76
Annual Office Supplies & Miscellaneous Cost	14,400.00	15,840.00	17,424.00	19,166.40	21,083.04
Total Operating Cost	698,400.00	768,240.00	845,064.00	929,570.40	1,022,527.44
Total Computerized System Cost	1,432,400.00	1,005,740.00	1,082,564.00	1,167,070.40	1,260,027.44

Table 3.10. Accumulated Computerized Cost, Baht.

Year	Total Computerized Cost	Accumulated Cost
1	1,432,400.00	1,432,400.00
2	1,005,740.00	2,438,140.00
3	1,082,564.00	3,520,704.00
4	1,167,070.40	4,687,774.40
5	1,260,027.44	5,947,801.84
Total	5,947,801.84	5,947,801.84

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

After the cost and benefits have been quantified, we can evaluate the proposed computer system against manual system, as in Table 3.11, we can consider that the computer system has lower rate of increasing expense than manual system and the cost of computer system is finally lower than the manual system. The Figure 3.14 illustrates the breakeven point at the value of: The Comparison of the System Costs.

Table 3.11. The Comparison of the System Costs, Baht.

Year	Accumulated Manual Cost	Accumulated Computerized Cost
1	1,646,000.00	1,432,400.00
2	3,441,200.00	2,438,140.00
3	5,415,920.00	3,520,704.00
4	7,588,112.00	4,687,774.40
5	9,977,523.20	5,947,801.84

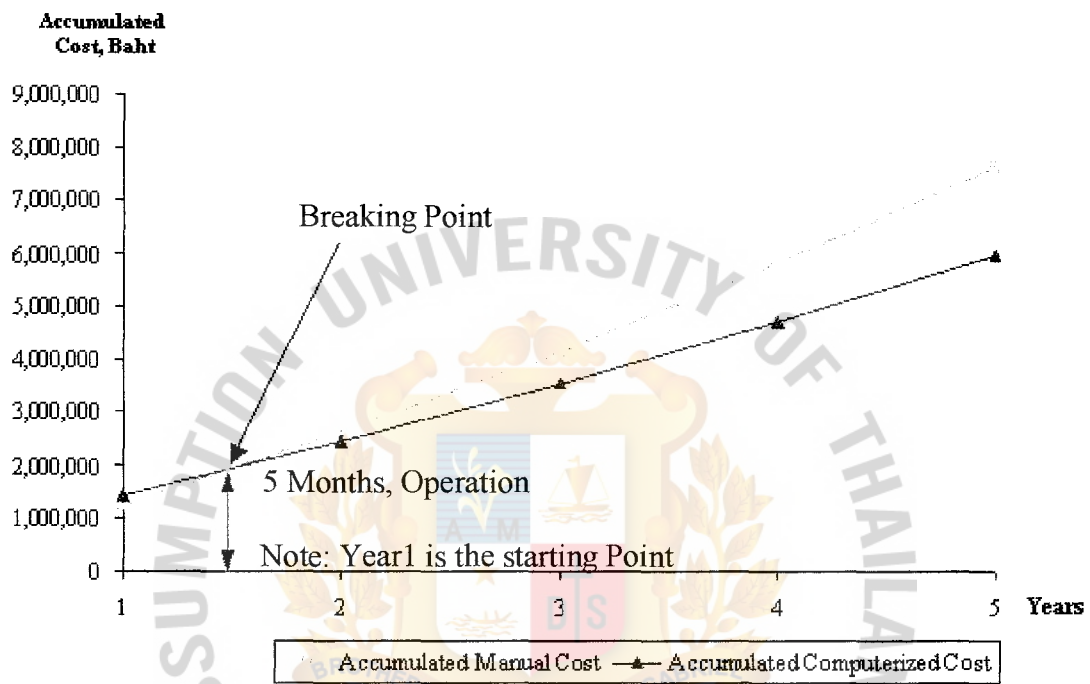


Figure 3.14. The Comparison of the System Costs.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

The implementation process begins after management has accepted the new system. System Implementation is the planned and orderly conversion from a current existing system to the new proposed information system. In this case, it starts from application development, hardware & software installation, and training.

During implementation of system, problems that have not been anticipated are duration of study and design effort that often appears. The solutions for these problems usually require modification to the design.

4.2 Test Plan

During the programming phase of systems development, programs are written according to system specifications and they are individually tested. Although the programs that comprise the application for the system have undergone individual testing and been debugged, there is no guarantee that the program will work properly.

The purpose of the system test is to validate all software, input/output, procedures, and the database. Some errors such as few design errors, programming errors, procedural errors, or oversights had been found during system testing, Minor modifications in design and programming are also required to complete the system test to the satisfaction of the users.

4.2.1 Testing with Test Data

In the first stage of system testing, tests are run for each sub process. This is to ensure that each part was complete separately from other functions. After each sub process was completed, we have to group all sub-processes together to test again. If no

error occurs we can combine all sub-process in-group together for entire system test. The data test cases of the project are illustrated in Appendix H.

4.2.2 Testing with Live Data

The second stage of system testing is done with live data. Live data are actual data that have already been processed through the existing system. Testing with live data provides an extra level of assurance that the system will work properly when implemented.

During system testing with live data, the users get involved. A representative group of users are trained and set loose on the system. It has to be observed while users are entering live data to perform throughout routine transactions. Some modifications have been done and continued until everyone is satisfied with that performance.

4.2.3 Backup and Restart Testing

Throughout the program operation, the program should be backed up periodically in order to prevent the lost data. The concept is to make sure that the files can be down to a value from a previous period of time, that the programs are backed up in case they are destroyed and that the systems can be restored in disaster case.

4.3 Conversion

Since the existing system is operated manually the selected conversion in this case is, direct conversion. That means, to start the new system without parallel running the previous system. After developing process was completed, we have to implement sales information system for users.

4.3.1 Installation

(1) Hardware installation

According to the Cost/Benefit Analysis section in Chapter 3, we need to install the server with Pentium III 700 MHz and memory of 512 MB (4

X 128 MB). The workstations will be upgrade from 64 MB memory to 128 MB memory, this installation process is just adding the Random Access Memory (RAM) into each client.

(2) Software installation

According to the proposed system that recommends using MS-Windows2000 Professional with Internet Explorer 5.5 and MS-Outlook2000, the program will be installed in each workstation.

4.3.2 Users Training

In order that all users will understand this system, the background knowledge of sales information system is required. The team decides to train the user by using on-the-job training method because there are not too many people to operate the system.

Moreover, the computer staff also needs to be trained for any technical issues because they need to support the whole system. The technical analyst will guide them how to monitor and manage the hardware, operating software and DBMS.

The training course comprises the following topics:

- (1) System Overview
- (2) Detailed functions of system
- (3) Application interface
 - (a) Data Entry
 - (b) Data Inquiry
 - (c) Data Assertion (add/ delete/ modify)
 - (d) Output Data in form and reports
- (4) Error and solution
- (5) Problem identifying method

4.3.3 System Maintenance

Periodically, the computer staffs require backup all the data on the database server. This is to prevent the loss or damage of data or any unexpected events. When the system runs slowly the computer staff also has to be in charge for tuning the performance. And if necessary, the computer staff should keep in touch with software and hardware vendors for support.

The original application software must be kept in a safe place and taken care of by the computer department. However, it should be duplicated more than one copy. In case of emergency, the computer staff can re-copy from the original version.



V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This project is designed under the concept of utilizing the computer system to increase company's performance, benefits, reduce human errors and achieve the customer satisfaction. Although the sales information system is only one part of office system, in long term, this will become a contemporary issue to be concerned.

Nowadays, most companies are aware of the advantages of the computer hardware and already invested in that hardware but how they can utilize the computer efficiently, is the matter of consideration. The software that we developed can help our company to utilize the hardware more efficiently. According to the cost and benefit analysis, the pay back period of the proposed system is only 1 year 8 months and the breakeven point is 2 million baht approximately.

Area of improvement is at the output process, which the top management's summary report will be issued as quickly as possible to the management level. The result of the software application that we implement for this system is Ultimus Workflow with MS-SQL2000 so that we have the database of all sales report. Our sales information system project achieves the business solution by reducing time and cost.

Table 5.1 shows the time used in each process of the proposed system compared with the existing system. The existing system requires more time in the manual process of data entry and calculation. The computerized system reduces the time in the manual process from 35 minutes to 6 minutes. In summary, we can conclude that the proposed system is more efficient and effective than the existing system.

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

Process	Existing System	Proposed System
Process Customer Order	10 min	2 min.
Process Credit Control	10 min.	1 min.
Process Inventory	5 min.	1 min.
Process Delivery Prepare	5 min.	1 min.
Process Customer Payment	5 min.	1 min.

(1) Process Customer Order:

The efficiency of entering data is the most critical part in screen and document form design in order to gather the information into the database files. The proposed system will eliminate manual entry of data and provide input screen to enter all necessary data into the system.

(2) Process Credit Control:

The proposed system has complete information for the users to inquire the information faster than the existing system.

(3) Process Inventory:

The proposed system has automatic calculation stock, part to calculate the data for the final result.

(4) Process Delivery Prepare:

The Proposed system has quicker print order than existing system and show real time data.

(5) Process Customer Payment:

The Proposed system automatically calculates for the report.

Sales Information System for IT Distribution Business is the method that can be used to solve that problem. The proposed system will reduce the workload of

manpower, meet the user's objective and meet the customers' satisfaction in fast response and high performance of the service.

5.2 Recommendations

This application was developed from Ultimius Workflow, which is not suitable for the very huge amount of data, which will consume more system resources and reduce the speed. The system can be modified or changed to meet the new requirement easily. The system can add more service in the future as follows:

Expand system to support other departments: System can develop to support more department as Accounting Department, Marketing Department, Research & Development Department, and Management. Whole department in organization can use only one program for work.

Barcode: Barcode system for fast tracking and reducing time of stock checking, packaging, and read/write product serial number. System supports all types of Barcode system example "3 of 9".

Off-line work: System supports off-line work solution. System works with Web Base and E-mail. The salesperson can visit customer with PDA (Personal Digital Assistant as Palm, Pocket PC, etc) and put their order in PDA. When salesperson come back to office and synchronizes his PDA with PC the sales order will work automatically. Management Level can synchronize the main report to his PDA and read when he has free time.

Mobile service: the system can develop WAP (Wireless Application Protocol). Sales person can update / search information update with his / her mobile.

Remote On-line work: System already works Web Base system so it is easy to develop system to support Remote Access and Internet Access. Salesperson,

Management, System admin, etc. can access system everywhere, every time via Internet.

E-Commerce: System can develop to “Business to Business” (B2B) solution. We can provide more service to customer. Customer (Dealer) can access to our E-Business web site, login to check price, order product, download product datasheet. New system can automatically send purchase request to salesperson and process can automatically work with current system.

Network Security: We recommend splitting computer server to security zone in the future. The network security solution must re-design, add firewall and move whole servers to secure zone, sometimes we call secure zone as DMZ. We recommend adding more than one server to avoid single point of failure (load balance or redundant).

Backup Data: We recommend storing database as RAID for real time backup and record DBMS to Tape backup at least once a week.

Redundancy: Server can use Layer4 switch to add more servers in system. The Layer4 switch of Avaya can Load Balance server for redundancy and more powerful.

Electric problem: UPS can solve problem of Electric down. We recommend the UPS size 500VA for Client/Workstation can help PC and Printer work more than 5 minutes, it's enough to save data and close PC. As for USP for Server room, we recommend size 2000VA. Server room may waste more time for back-up and don't shut-up the server if not necessary because server wastes more time to re-start system.



APPENDIX A
PAYBACK ANALYSIS

Table A.1. Payback Analysis for Client-Server System Alternative: 1, Baht.

Cost Items	Years				
	0	1	2	3	4
Development cost:	- 347,400				
Operation & Maintenance cost:		- 1,319,400	- 1,585,000	- 1,344,520	- 1,462,132
Discount factors for 9 %	1.0000	0.9174	0.8417	0.7722	0.7084
Time-adjusted costs (adjusted to present value):	- 347,400	- 1,210,418	- 1,334,095	- 1,038,238	- 1,034,319
Cumulative time-adjusted costs over lifetime:	- 347,400	- 1,557,818	- 2,891,912	- 3,930,150	- 4,965,925
Benefits derived from operation of new system:	0	1,700,000	1,853,000	2,019,770	2,201,549
Discount factors for 9 %:	1.0000	0.9174	0.8417	0.7722	0.7084
Time-adjusted benefits (adjusted to present value):	0	1,559,580	1,559,670	1,559,666	1,559,578
Cumulative time-adjusted benefits over lifetime:	0	1,559,580	3,119,250	4,678,916	6,238,494
Cumulative lifetime time-adjusted costs + benefits:	- 347,400	1,762	227,338	748,766	1,272,569
					1,797,808

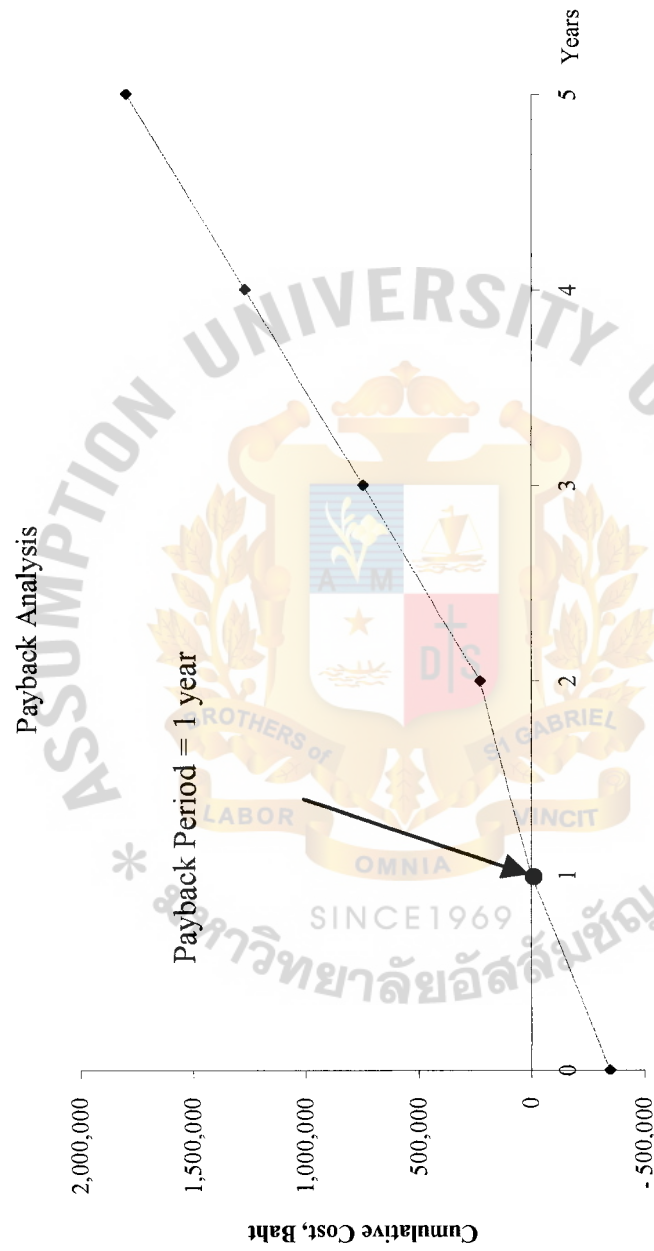


Figure A.1. Payback Analysis for Client-Server System Alternative: 1.

Table A.2. Payback Analysis for Client-Server System Alternative: 2, Baht.

Cost Items	Years					
	0	1	2	3	4	5
Development cost:	- 734,000					
Operation & Maintenance cost:		- 1,432,400	- 1,005,740	- 1,082,564	- 1,167,070	- 1,260,027
Discount factors for 9 %	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Time-adjusted costs (adjusted to present value):	- 734,000	- 1,314,084	- 846,531	- 835,956	- 826,753	- 818,892
Cumulative time-adjusted costs over lifetime:	- 734,000	- 2,048,084	- 2,894,615	- 3,730,571	- 4,557,324	- 5,376,216
Benefits derived from operation of new system:	0	1,700,000	1,853,000	2,019,770	2,201,549	2,399,689
Discount factors for 9 %:	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Time-adjusted benefits (adjusted to present	0	1,559,580	1,559,670	1,559,666	1,559,578	1,559,558
Cumulative time-adjusted benefits over lifetime:	0	1,559,580	3,119,250	4,678,916	6,238,494	7,798,052
Cumulative lifetime time-adjusted costs + benefits:	- 734,000	- 488,504	224,635	948,345	1,681,170	2,421,836

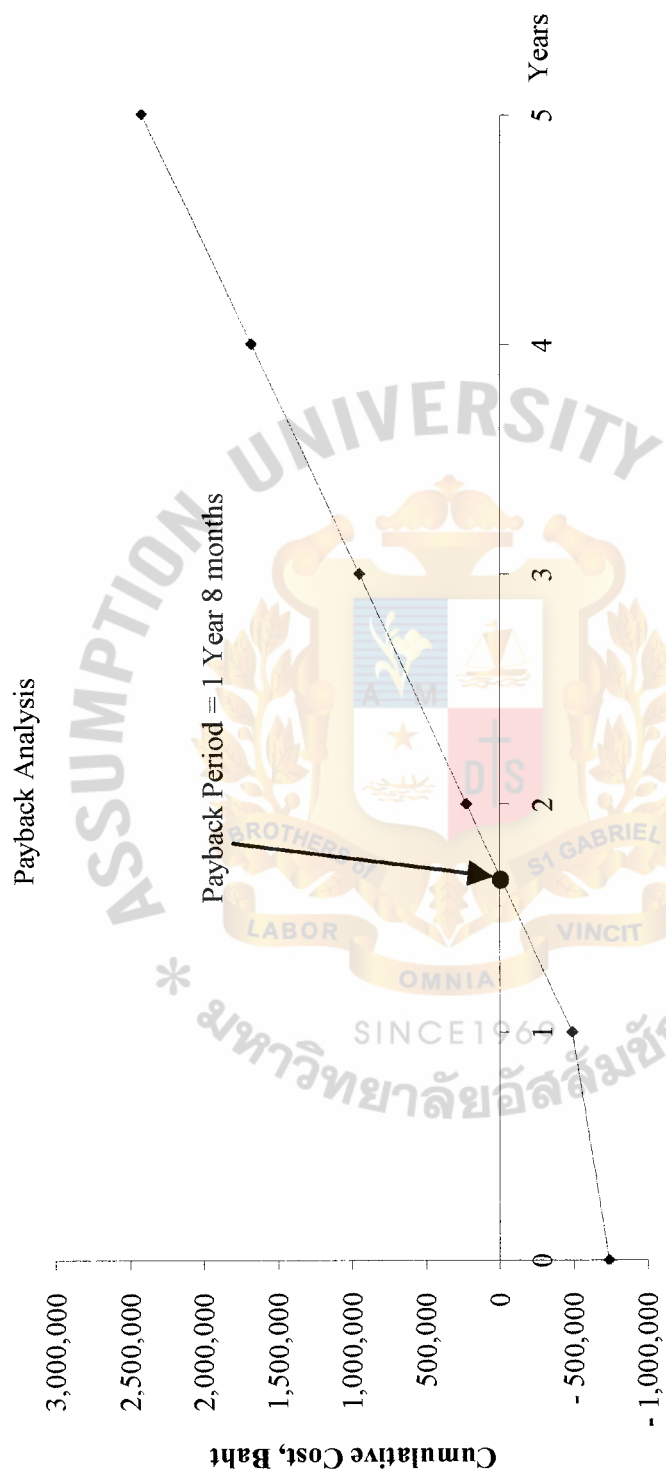


Figure A.2. Payback Analysis for Client-Server System Alternative: 2.

Table A.3. Payback Analysis for Client-Server System Alternative: 3, Baht.

Cost Items	Years					
	0	1	2	3	4	5
Development cost:	- 1,174,000					
Operation & Maintenance cost:		- 1,984,000	- 1,163,500	- 1,252,600	- 1,350,610	- 1,458,421
Discount factors for 9 %	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Time-adjusted costs (adjusted to present value):	- 1,174,000	- 1,820,122	- 979,318	- 967,258	- 956,772	- 947,828
Cumulative time-adjusted costs over lifetime:	- 1,174,000	- 2,994,122	- 3,973,440	- 4,940,697	- 5,897,469	- 6,845,297
Benefits derived from operation of new system:	0	1,700,000	1,853,000	2,019,770	2,201,549	2,399,689
Discount factors for 9 %:	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Time-adjusted benefits (adjusted to present value):	0	1,559,580	1,559,670	1,559,666	1,559,578	1,559,558
Cumulative time-adjusted benefits over lifetime:	0	1,559,580	3,119,250	4,678,916	6,238,494	7,798,052
Cumulative lifetime time-adjusted costs + benefits:	- 1,174,000	- 1,434,542	- 854,189	- 261,781	341,025	952,755

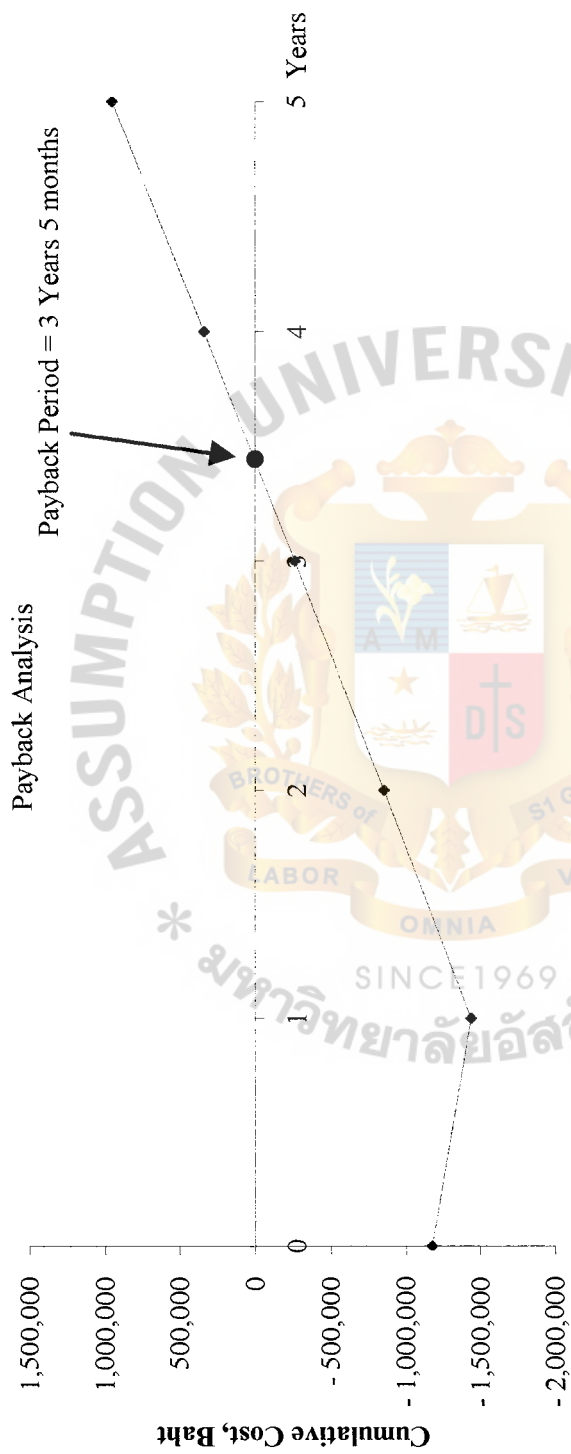
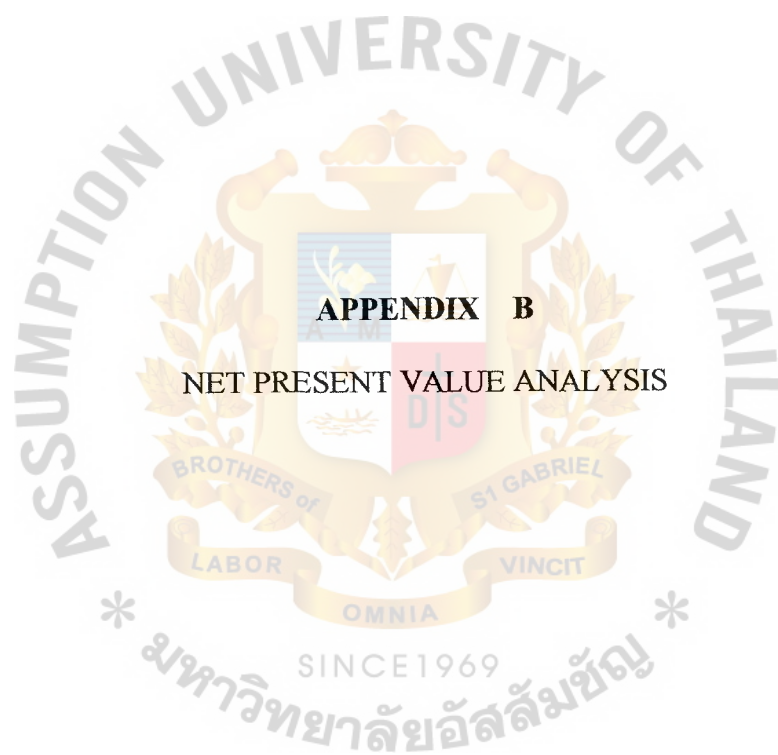


Figure A.3: Payback Analysis for Client-Server System Alternative: 3.



APPENDIX B

NET PRESENT VALUE ANALYSIS

Table B.1. Net Present Value Analysis for Client-Server System Alternative: 1, Baht.

Cost Items	Years					Total
	0	1	2	3	4	5
Development cost:	0					
Operation & Maintenance cost:		- 1,319,400	- 1,585,000	- 1,344,520	- 1,462,132	- 1,591,505
Discount factors for 9 %:	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Present value of annual costs:	0	- 1,210,418	- 1,334,095	- 1,038,238	- 1,035,774	- 1,034,319
Total present value of lifetime costs:						- 5,652,844
Benefits derived from operation of new	0	1,700,000	1,853,000	2,019,770	2,201,549	2,399,689
Discount factors for 9 %:	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Present value of annual benefits:	0	1,559,580	1,559,670	1,559,666	1,559,578	1,559,558
Total present value of lifetime benefits:						9,357,770
Net Present Value of this Alternative: 1						3,704,926

Table B.2. Net Present Value Analysis for Client-Server System Alternative: 2, Baht.

Cost Items	Years					Total
	0	1	2	3	4	5
Development cost:	0					
Operation & Maintenance cost:		- 1,432,400	- 1,005,740	- 1,082,564	- 1,167,070	- 1,260,027
Discount factors for 9 %:	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Present value of annual costs:	0	- 1,314,084	- 846,531	- 835,956	- 826,753	- 818,892
Total present value of lifetime costs:						- 4,642,216
Benefits derived from operation of new	0	1,700,000	1,853,000	2,019,770	2,201,549	2,399,689
Discount factors for 9 %:	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Present value of annual benefits:	0	1,559,580	1,559,670	1,559,666	1,559,578	1,559,558
Total present value of lifetime benefits:						9,357,770
Net Present Value of this Alternative: 2						4,715,555

Table B.3. Net Present Value Analysis for Client-Server System Alternative: 3, Baht.

Cost Items	Years					Total
	0	1	2	3	4	5
Development cost:	0					
Operation & Maintenance cost:		- 1,984,000	- 1,163,500	- 1,252,600	- 1,350,610	- 1,458,421
Discount factors for 9 %:	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Present value of annual costs:	0	- 1,820,122	- 979,318	- 967,258	- 956,772	- 947,828
Total present value of lifetime costs:						- 6,601,830
Benefits derived from operation of new	0	1,700,000	1,853,000	2,019,770	2,201,549	2,399,689
Discount factors for 9 %:	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Present value of annual benefits:	0	1,559,580	1,559,670	1,559,666	1,559,578	1,559,558
Total present value of lifetime benefits:						9,357,770
Net Present Value of this Alternative: 3						2,755,941



APPENDIX C

INPUT DESIGN

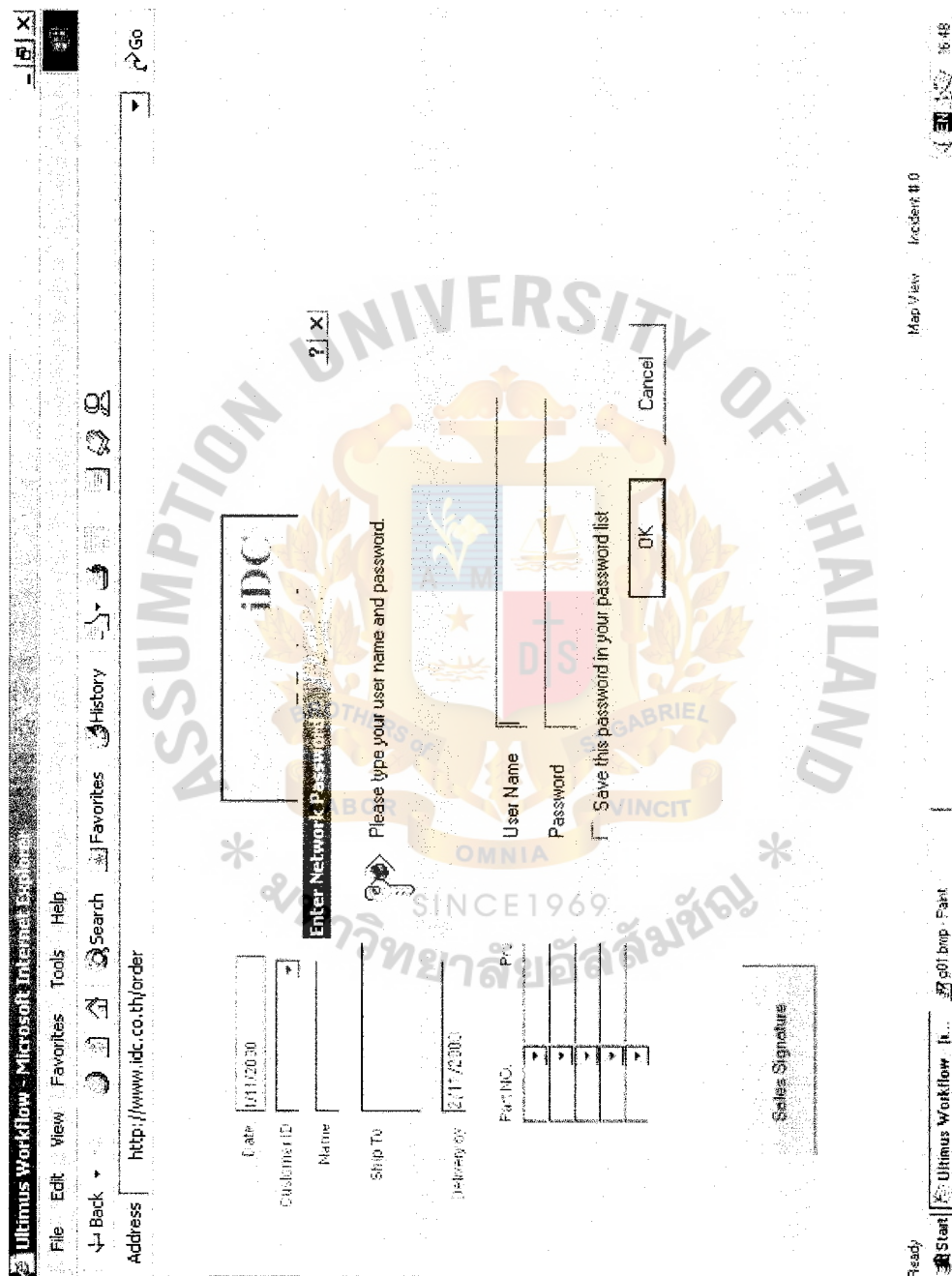


Figure C.1. Login Page.



Figure C.2. Login Error.

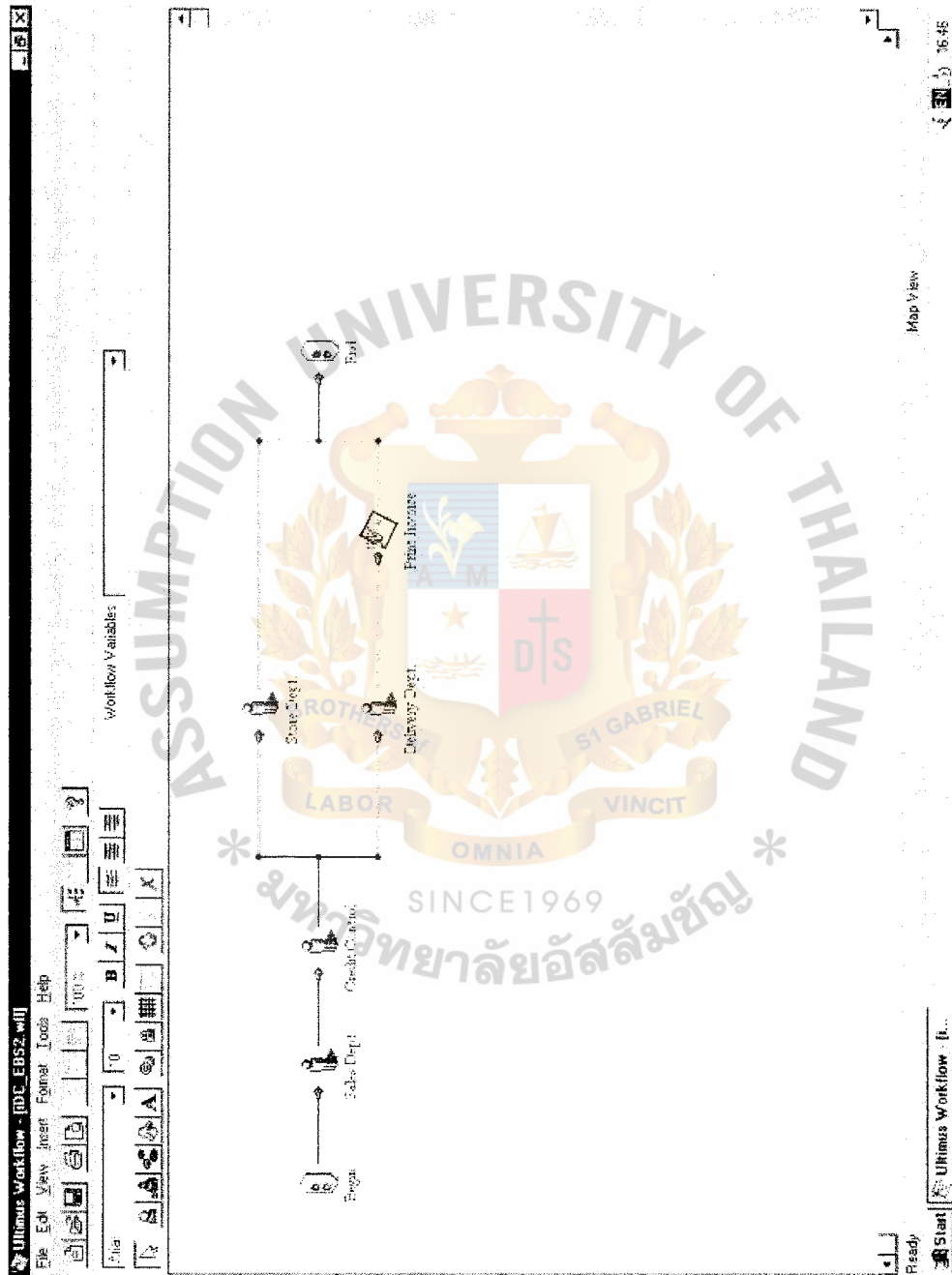


Figure C.3. Work Flow of System.

Ultimus Workflow - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites History

Address <http://www.idc.co.th/order>

IDC
E-Business System

Date: 01/12/00

Customer ID:

Name:

Ship To:

Delivery day: 01/12/00

Current Credit:

Credit Limit:

Part No.

Unit Price	Quantity	Total
0.00	0	0.00
0.00	0	0.00
0.00	0	0.00
0.00	0	0.00
0.00	0	0.00
Grand Total		0.00

Sales Signature

Ready

Ultimus Workflow It... g01.bmp Part

Map View Incident # 0

16:48


Figure C.4. Sales Form.

Ultimus Workflow - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search History Favorites

Address <http://www.idc.co.th/order> Go



iDC
E-Business System

Date: 1/11/2000

Customer ID: 0001

Name: Power Computer

Ship To: 12 Thongpachan E14 Bangkok Bangkok

Business Back: 11/200

Delivery: 2/11/2000

Current Credit: 16,300.000.00

Credit Limit: 1,000,000.00

Part NO.	Product Name	Unit Price	Quantity	Total
M0001	MS Windows 2000 Professional	4,500.00	5	22,500.00
M0002	MS Windows 2000 Server	6,000.00	3	18,000.00
M0005	MS Medical Keyboard	1,800.00	13	23,400.00
F0001	Full Camera 2000	1,500.00	8	12,000.00
F0002	Full Camera 2000	2,200.00	17	37,400.00
Grand Total				113,300.00

Sales Signature

Ready

Ultimus Workflow 16... 502.bmp - Print

Map View Incident # 0

Figure C.5. Sales Input Data.

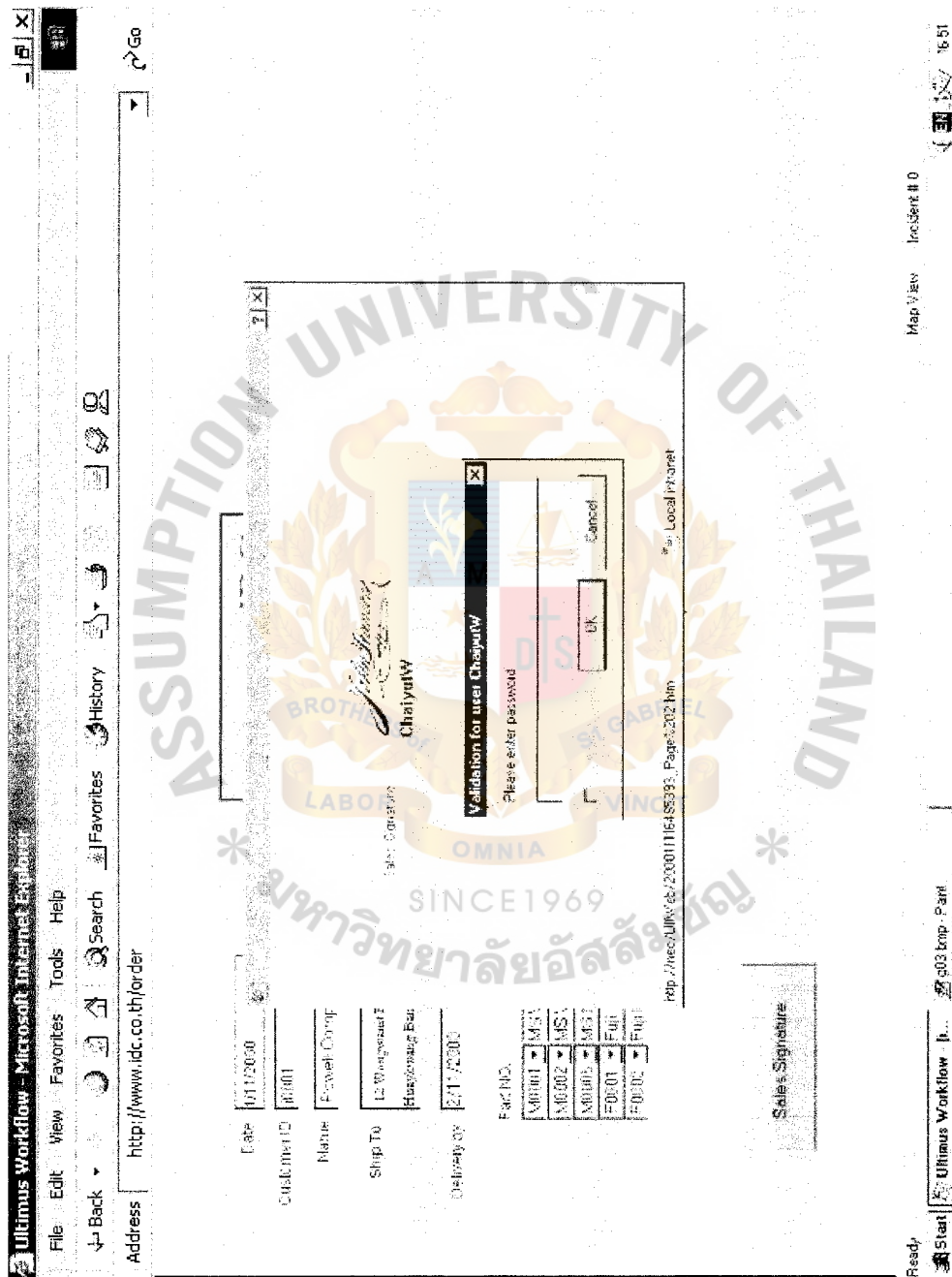


Figure C.6. Sales Confirm System.

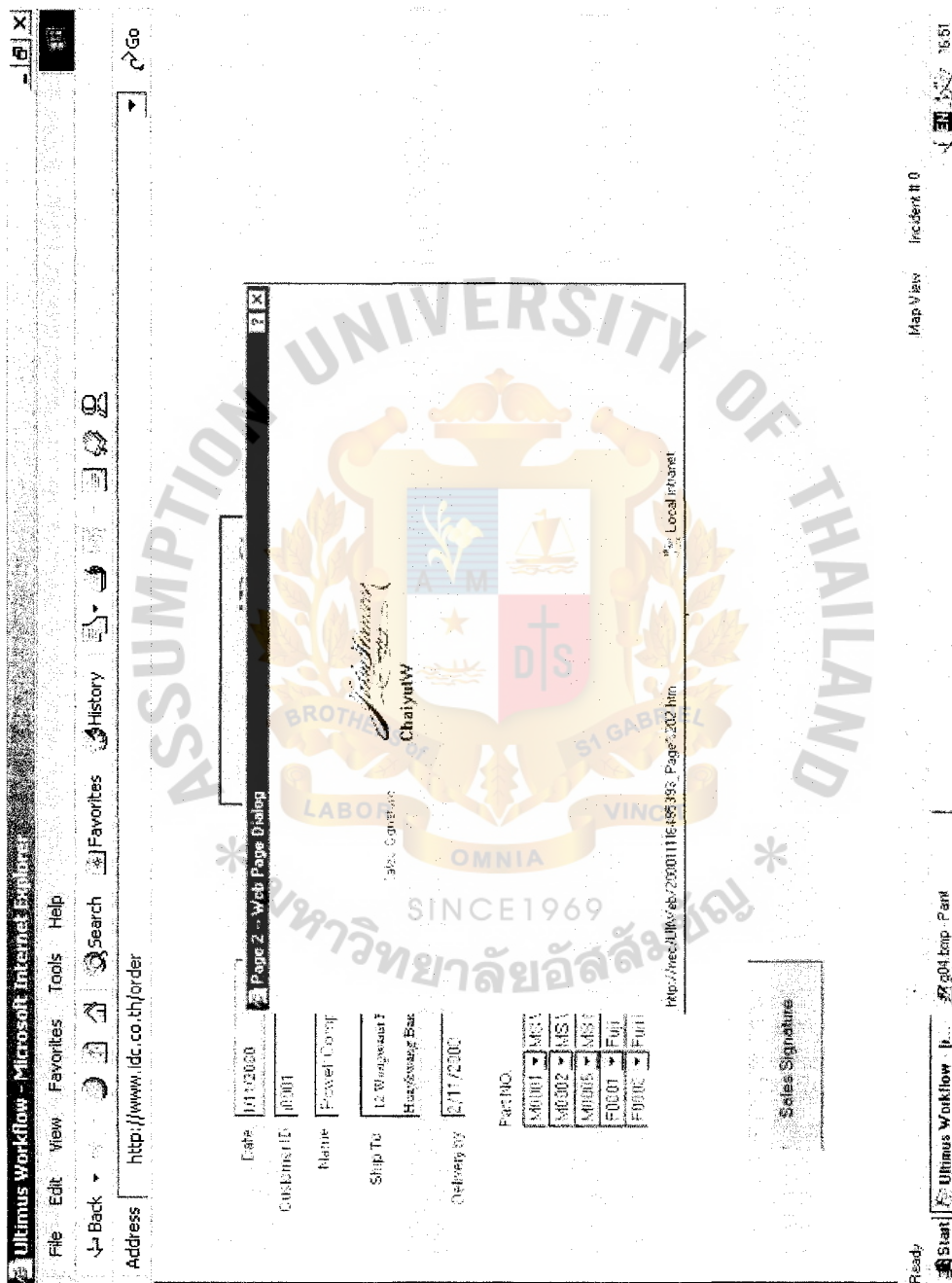


Figure C.7. Sales Confirm System with Signature.

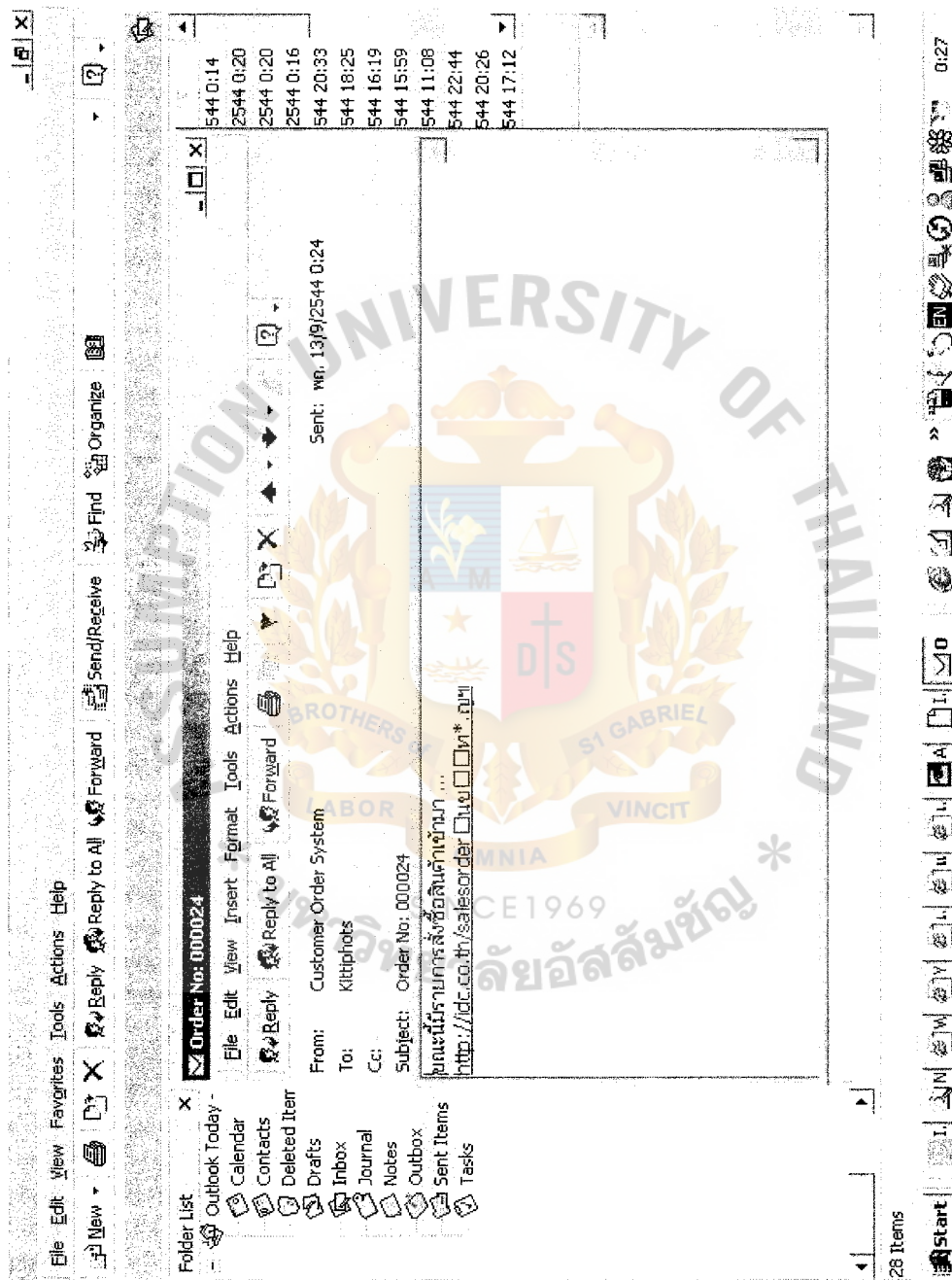


Figure C.8. Order mail to Sales Manager.

Ultimus Workflow - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Search History

Address <http://www.idc.co.th/order>

IDC
E-Business System

Date: 01/12/2000

CustID: 00001

Name: Pongrat Computer

Ship To: 12 Wangsom Ekk. Road, Bangkok 1

Delivery by: 01/12/2000

Current Order: 16,000.00.00

Credit Limit: 1,000,000.00

Part NO.	Product Name	Unit Price	Quantity	Total
M0001	MS Windows 2000 Professional	4,500.00	5	22,500.00
M0002	MS Windows 2000 Server	6,000.00	3	18,000.00
M0003	MS Natural Keyboard	1,600.00	13	20,800.00
F0001	Full Camera 2.0	1,500.00	8	12,000.00
F0002	Full Camera 2.0	2,200.00	17	37,400.00
Grand Total:				112,700.00

Sales Signature

Sales Manager

Figure C.9. Sales Manager Check Order.

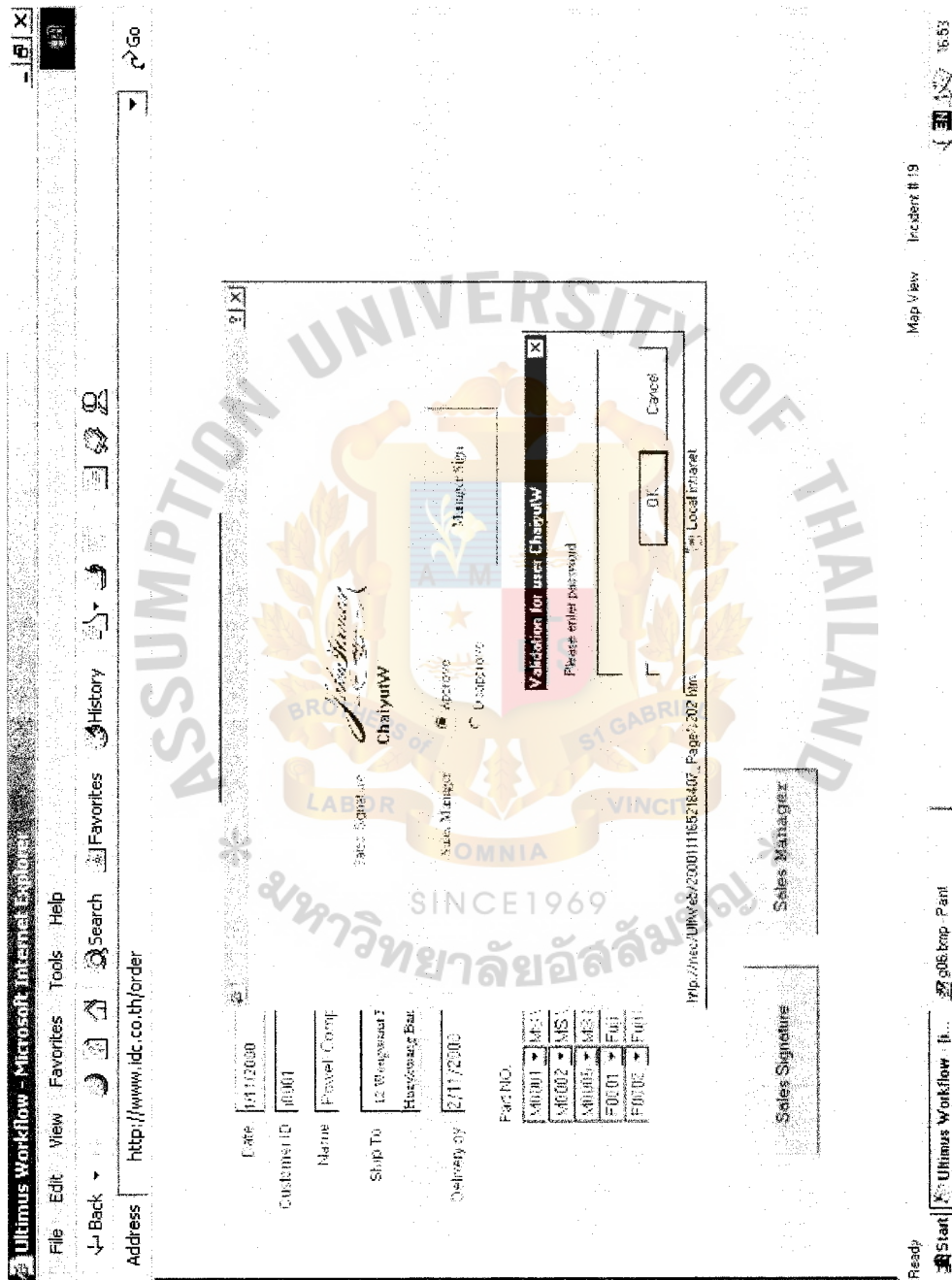


Figure C.10. Sales Manager Approve Order.



Figure C.11. Order mail to Credit Control.

Ultimus Workflow - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites History

Address <http://www.idc.co.th/order>

IDC
E-Business System

Date: 01/12/2000

CustID: 00001

Name: Power Computer

Ship To: 12 Wangsommit Rd. Pochanong Bangkok 10300

Delivery by: 01/12/2000

Current Credit: 630,000.00

Credit Limit: 1,000,000.00

Part No.	Product Name	Unit Price	Quantity	Total
M0001	MS Windows 2000 Professional	4,500.00	5	22,500.00
M0002	MS Windows 2000 Server	6,000.00	3	18,000.00
M0005	MS Natural Keyboard	1,800.00	13	23,400.00
F0001	Full Computer 2300	1,500.00	8	12,000.00
F0002	Full Computer 2400	2,200.00	17	37,400.00
Grand Total				113,300.00

Sales Signature

Sales Manager

Credit Control Signature

Ready

Start Ultimus Workflow In... 07:50 PM - Print

Map View Incident # 19

16:54

Figure C.12. Credit Control Check Order.

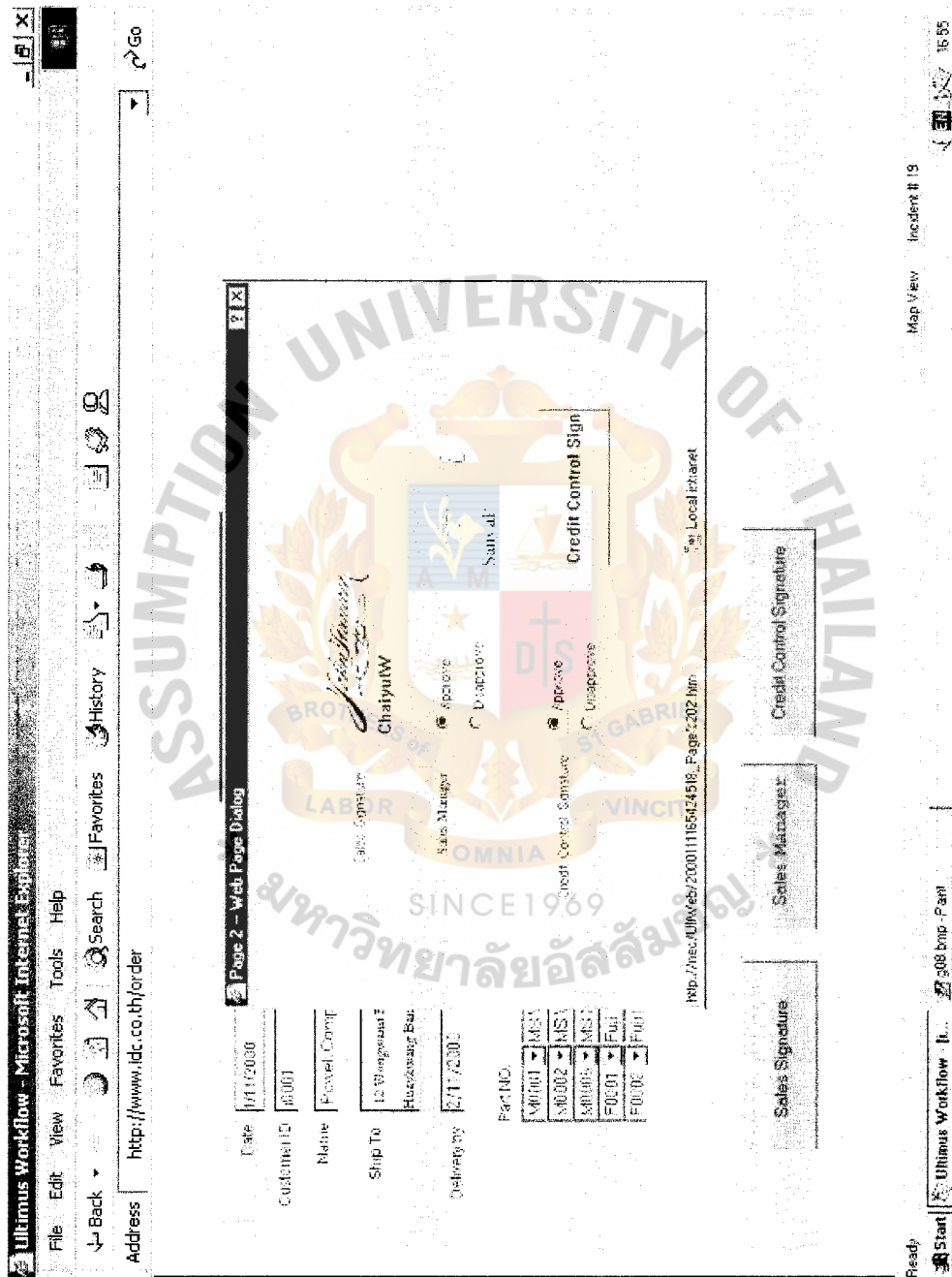


Figure C.13. Credit Control Approve Order.



APPENDIX D
REPORT DESIGN

INVOICE LISTING REPORT				DATE	10/2/2001	
ITEM	CUSTOMER ID	CUSTOMER NAME	INVOICE NO.	PAYMENT TERM	TOTAL AMOUNT	SALES ID
1	2098	Com. Center Co., Ltd.	1042972	Cash	8,231.51	41046
2	4360	Ittiphat Technology Co., Ltd.	1042973	Cash	8,466.91	41063
3	8056	Tech Link Co., Ltd.	1042974	Cash	3,429.35	41046
4	1039	J & B Computer Co., Ltd.	5060243	30 PDC	18,612.65	41009
5	3031	K.U. Telecom Co., Ltd.	5060244	30 PDC	9,017.96	41009
6	4463	Integrated Advance Co., Ltd.	5060245	30 PDC	34,226.09	39024
7	5691	Micro System Co., Ltd.	5060246	30 PDC	66,440.29	39024
8	2123	Compute & More Co., Ltd.	8030123	60 PDC	306,622.11	39051
9	5646	Master World Co., Ltd.	8030124	60 PDC	166,402.44	39051
TOTAL CASH				20,127.77		
TOTAL 30 PDC				128,296.99		
TOTAL 60 PDC				473,024.55		
TOTAL INVOICE AMOUNT					621,449.31	

Figure D.1. Invoice Listing Report.

ORDER LISTING REPORT							DATE
ITEM	CUSTOMER ID	CUSTOMER NAME	ORDER NO.	PAYMENT TERM	TOTAL AMOUNT	PURCHASE ORDER NO.	SALES ID
1	2098	Com. Center Co., Ltd.	342305	Cash	8,231.51	P 01/038	41046
2	4360	Ittiphat Technology Co., Ltd.	344549	Cash	8,466.91	PO 1011	41063
3	8056	Tech Link Co., Ltd.	344551	Cash	3,429.35	PO 01-066	41046
4	1039	J & B Computer Co., Ltd.	345400	30 PDC	18,612.65	JB-0188	41009
5	3031	K.U. Telecom Co., Ltd.	345418	30 PDC	9,017.96	PI 136-02	41009
6	4463	Integrated Advance Co., Ltd.	346230	30 PDC	34,226.09	PO 0236	39024
7	5691	Micro System Co., Ltd.	346231	30 PDC	66,440.29	M-0883	39024
8	2123	Compute & More Co., Ltd.	346242	60 PDC	306,622.11	CM 258/02	39051
9	5646	Master World Co., Ltd.	346531	60 PDC	166,402.44	MW-0204	39051
TOTAL CASH					20,127.77		
TOTAL 30 PDC					128,296.99		
TOTAL 60 PDC					473,024.55		
TOTAL ORDER AMOUNT					621,449.31		

Figure D.2. Order Listing Report.

BOOK ORDER REPORT						
			PRODUCT CODE	P4-02-39036		
			PRODUCT NAME	MS WIN2000 OEM SRV		
			AS OF	10/2/2001		
ITEM	CUSTOMER NO.	CUSTOMER NAME	BOOK ORDER NO.	BOOKING DATE	QUANTITY	SALES ID
1	4490	Isonet Co., Ltd.	B 25529	5/1/2001	5	41046
2	6050	Net Smart Co., Ltd.	B 25581	9/1/2001	20	41063
3	0014	Advance Data Network Co., Ltd.	B 25610	11/1/2001	10	41046
4	1117	Base Wicom (Thailand) Co., Ltd.	B 25635	14/1/2001	30	41009
5	3101	Digitron Solution Co., Ltd.	B 25648	15/1/2001	5	41009
6	4584	Intech Computer Co., Ltd.	B 25674	18/1/2001	10	39024
7	2085	Computer Consultant Co., Ltd.	B 25680	20/1/2001	40	39024
TOTAL BOOK QUANTITY					120	UNITS

Figure D.3. Book Order Report.

TOP 10 CUSTOMER							FOR THE MONTH : JANUARY	
ITEM	CUSTOMER NO.	CUSTOMER NAME	ORDER	DATE	TOTAL AMOUNT	SALES ID		
1	4463	Loxley Public Co., LTd.	4	5/1/2001	1,545,336.00	41063		
2	1039	Computech Micro System Co., Ltd.	1	5/1/2001	1,352,400.00	41009		
3	2085	Metro System Corporation Co., Ltd.	12	4/1/2001	423,458.00	39024		
4	6050	Bara Advance Infotech Co., Ltd.	6	5/1/2001	245,500.00	41009		
5	4490	Tech Link Co., Ltd.	7	5/1/2001	242,247.00	41046		
6	0158	Network Resource Co., Ltd.	6	5/1/2001	222,407.50	39051		
7	5691	Siam Tel Tech Co., Ltd.	8	4/1/2001	178,260.00	41046		
8	4584	Intech Computer Co., Ltd.	4	4/1/2001	116,580.00	39024		
9	6039	Compute & More Co., Ltd.	1	4/1/2001	92,043.70	39051		
10	8056	SVOA	3	4/1/2001	54,055.00	41009		
11	2123	Advance Information Technology Co., Ltd.	1	4/1/2001	21,810.00	41063		
Page 1 of 25								

Figure D.4. Quotation Report.

INVENTORY REPORT						
FOR THE MONTH : JANUARY						
ITEM	PRODUCT NO.	PRODUCT DESCRIPTION	QUANTITY	UNIT PRICE	WARRANTY	PRINCIPAL NAME
1	01-SMC-1N028	SMC 6X25 LW/F	320	900.00	24 MONTH	SMC
2	01-SMC-1N076	SMC 6425 LW/TT	17	7,000.00	24 MONTH	SMC
3	01-SMC-1N344	SMC 9432 TX/MP	370	1,160.00	24 MONTH	SMC
4	01-TWA-2C117	CASE SERVER YY0330XK2400RE	5	30,000.00	24 MONTH	YING YANG
5	01-TWA-2C701	P2L-N/P2E-N/BB2 CASE	690	1,500.00	12 MONTH	YING YANG
6	02-VGA-1B136	ASUSTEK AGP-V3800 COMBAT 16MB VGA	540	1,960.00	12 MONTH	ASUSTEK
7	07-DVD-1B004	ASUSTEK DVD-ROM 8X/40X	340	3,400.00	12 MONTH	ASUSTEK
8	07-ZIP-1B105	ZIP DRIVE PARALLEL W/CD TOOL	220	3,000.00	12 MONTH	IOMEGA
9	07-ZIP-1B106	ZIP DRIVE 250 PARALLEL	195	4,000.00	12 MONTH	IOMEGA
10	07-ZIP-1B107	ZIP DRIVE SCSI W/CD TOOL	880	1,500.00	12 MONTH	IOMEGA
11	07-ZIP-1B108	CLIK DRIVE (N/P)	230	4,000.00	12 MONTH	IOMEGA

Page 1 of 40

Figure D.5. Inventory Report.



APPENDIX E
DATABASE DESIGN

Table E.1. Customer.

No.	Field Name	Field Type	Index	Unique	Nullable	Key Type	Remark
1	Customer No	Integer (6)	Y	Y		Primary Key	
2	Customer Name	Char(30)		Y		Attribute	
3	Customer Address	Char(50)				Attribute	
4	Contact Name	Char(30)				Attribute	
5	Title	Char(30)				Attribute	
6	Phone	Char(10)				Attribute	
7	Fax	Char(10)				Attribute	
8	Payment Term	Integer (3)				Attribute	

Table E.2. Officer.

No.	Field Name	Field Type	Index	Unique	Nullable	Key Type	Remark
1	Officer ID	Integer (6)	Y	Y		Primary Key	
2	Of Name	Char(30)				Attribute	
3	Of Surname	Char(30)				Attribute	
4	Work Start Date	Date		Y		Attribute	
5	Address	Char(50)				Attribute	
6	Phone	Char(10)				Attribute	
7	Mobile Phone	Char(10)				Attribute	
8	Pager	Char(10)				Attribute	
9	E-mail	Char(30)				Attribute	

Table E.3. Purchase Order.

No.	Field Name	Field Type	Index	Unique	Nullable	Key Type	Remark
1	PO No	Integer (6)	Y	Y		Primary Key	
2	Customer No	Integer (6)		Y		Foreign Key	
3	Product No	Integer (6)		Y		Foreign Key	
4	Order Date	Date		Y		Attribute	
5	Shipment Date	Date		Y		Attribute	
6	ShipTo	Char(50)				Attribute	
7	Unit Price	Integer (10)				Attribute	
8	Quantity	Integer(7)				Attribute	
9	Discount	Integer (10)				Attribute	
10	P/O Amount	Integer (5)				Attribute	
11	Total Payment	Integer (10)				Attribute	
12	Amount Due	Integer (3)		Y		Attribute	

Table E.4. Product.

No.	Field Name	Field Type	Index	Unique	Nullable	Key Type	Remark
1	Product No	Integer (6)	Y	Y		Primary Key	
2	Supplier ID	Integer (6)		Y		Foreign Key	
3	Product Name	Char (10)		Y		Attribute	
4	Product Description	Char (30)		Y		Attribute	
5	Product Category	Char (5)				Attribute	
6	Unit Price	Integer(10)				Attribute	
7	Stock Quantity	Integer(7)		Y		Attribute	

Table E.5. Supplier.

No.	Field Name	Field Type	Index	Unique	Nullable	Key Type	Remark
1	Supplier ID	Integer (6)	Y	Y		Primary Key	
2	Supplier Name	Char(30)		Y		Attribute	
3	Supplier Contact	Char(30)				Attribute	
4	Supplier Address	Char(50)				Attribute	
5	Supplier Phone	Char(10)				Attribute	
6	Supplier Fax	Char(10)				Attribute	

Table E.6. Sales Order.

No.	Field Name	Field Type	Index	Unique	Nullable	Key Type	Remark
1	Order No	Integer (6)	Y			Primary Key	
2	PO No	Integer (6)		Y		Foreign Key	
3	Product No	Integer (6)		Y		Foreign Key	
4	Officer ID	Integer (6)		Y		Foreign Key	
5	Delivered Quantity	Integer (5)				Attribute	



APPENDIX F

PROCESS SPECIFICATION

Table F.1. Process Specification of Process 0.

Item.	Description.
Process Name:	Sales Information System
Data In:	Shipping Document Tax Invoice Credit Approve Payment Customer Order Credit Request
Data Out:	Purchase Order Payment Details Order Details Inventory Report Customer Status Report Invoice Order Confirmation Delivery Order Purchase Catalogue
Process:	(1) Get necessary data from customer, Sales Department, exchange credit information with credit control department and send order product from vendor.
Attachment:	(1) Vendor (2) Account Department (3) Customer (4) Sales & Marketing Department

Table F.2. Process Specification of Process 1.

Item.	Description.
Process Name:	Customer Order
Data In:	Customer Order Product Detail Customer Detail
Data Out:	Order Detail Order Confirmation Cancel Order
Process:	(1) Get order from customer (2) Check product details (3) Check stock (4) Verify customer order
Attachment:	(1) Customer (2) Datastore: Order Request

Table F.3. Process Specification of Process 1.1.

Item.	Description.
Process Name:	Verify Customer Oder
Data In:	Customer Order Product Detail Customer Details
Data Out:	Order Details Order Confirmation Cancel Order
Process:	(1) Get necessary data from customer. (2) Get product code, customer history and verify order information.
Attachment:	(1) Customer (2) Datastore: Order request

Table F.4. Process Specification of Process 1.1.1.

Item.	Description.
Process Name:	Sale Verify Order
Data In:	Customer Order Product Detail Customer Details
Data Out:	Send approve
Process:	(1) Get necessary data from customer. (2) Get product code, customer history and verify order information. (3) Create Order Request
Attachment:	(1) Order request

Table F.5. Process Specification of Process 1.1.2.

Item.	Description.
Process Name:	Sale Manager Verify Order
Data In:	Send approve
Data Out:	Order details approve Order detail cancel
Process:	(1) Get necessary data from sale officer. (2) Approve order request (3) Cancel order request
Attachment:	(1) Customer (2) Datastore: Order request

Table F.6. Process Specification of Process 2.

Item.	Description.
Process Name:	Credit checking
Data In:	Order request Customer detail Product detail
Data Out:	Customer credit detail Booking detail Due date
Process:	(1) Checking customer status in database (2) Send the result to sale department (3) Send the result to stock department (4) Send the result to delivery department
Attachment:	(1) Accounting department (2) Customer (3) Datastore: Booking Order

Table F.7. Process Specification of Process 2.1.

Item.	Description.
Process Name:	Checking Product Price
Data In:	Customer order Product detail
Data Out:	Update order detail
Process:	Compare price in order request and price list
Attachment:	(1) Datastore: Order request

Table F.8. Process Specification of Process 2.2.

Item.	Description.
Process Name:	Check customer credit
Data In:	Customer credit detail Update order detail
Data Out:	Order detail Due detail
Process:	Verify customer payment date
Attachment:	(1) Accounting department (2) Datastore: Order request

Table F.9. Process Specification of Process 2.2.1.

Item.	Description.
Process Name:	Check Customer credit
Data In:	Customer detail Order date
Data Out:	Request information Order detail Approved Update customer detail
Process:	(1) Compare customer order and customer credit (2) Update customer credit detail
Attachment:	(1) Datastore: Customer (2) Datastore: Order request

Table F.10. Process Specification of Process 2.2.2.

Item.	Description.
Process Name:	Add Customer Credit
Data In:	Update Information
Data Out:	Information Updated
Process:	(1) Update customer detail in Datastore: Customer
Attachment:	(1) Datastore: Customer

Table F.11. Process Specification of Process 2.2.3.

Item.	Description.
Process Name:	Block customer credit
Data In:	Block customer credit Factory
Data Out:	Block customer credit report
Process:	(1) Send customer credit report to Sales Department
Attachment:	(1) Sales&Marketing Department

Table F.12. Process Specification of Process 3.1.

Item.	Description.
Process Name:	Add New Inventory
Data In:	Order Product for stock
Data Out:	Product detail
Process:	Add new product in Datastore: Inventory and the payment information from the factory
Attachment:	(1) Datastore: Inventory

Table F.13. Process Specification of Process 3.2.

Item.	Description.
Process Name:	Update booking order
Data In:	Booking detail Inventory detail
Data Out:	Update booking order Request product for stock Update customer order
Process:	Update booking order
Attachment:	(1) Sales&Marketing department (2) Datastore: Booking order (3) Datastore: Customer order

Table F.14. Process Specification of Process 3.3.

Item.	Description.
Process Name:	Product inventory report
Data In:	Booking order detail Inventory detail
Data Out:	Inventory report
Process:	Create inventory report
Attachment:	(1) Sales&Marketing Manager

Table F.15. Process Specification of Process 4.1.

Item.	Description.
Process Name:	Produce delivery document
Data In:	Customer order detail Inventory detail Tax invoice
Data Out:	Delivery order Invoice Delivery detail
Process:	Create delivery document
Attachment:	(1) Customer (2) Datastore: Delivery order

Table F.16. Process Specification of Process 4.2.

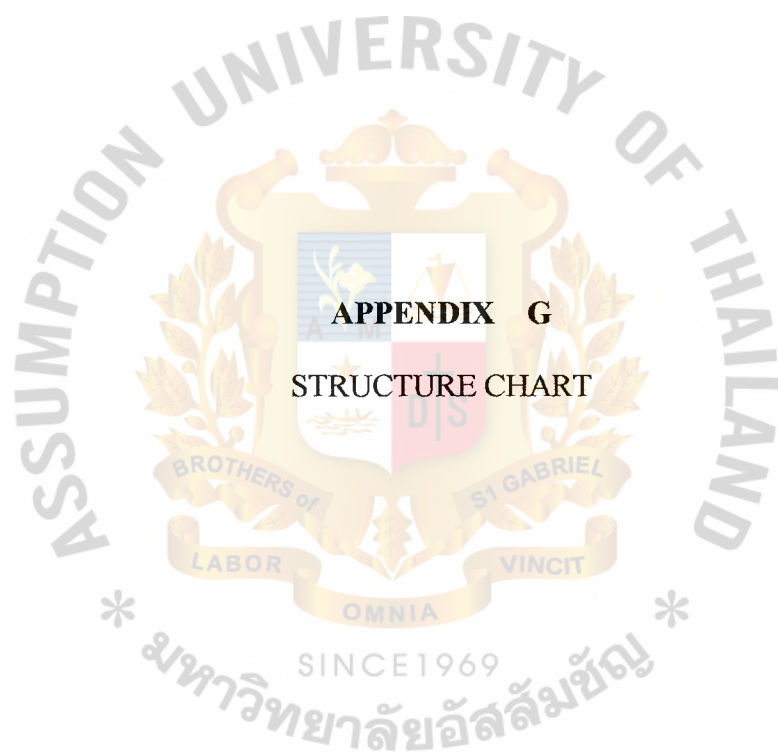
Item.	Description.
Process Name:	Produce delivery order report
Data In:	Delivery order detail
Data Out:	Delivery order report
Process:	Crede delivery order report
Attachment:	(1) Account department

Table F.17. Process Specification of Process 5.1.

Item.	Description.
Process Name:	Prepare customer payment document
Data In:	Billing request
Data Out:	Reciept debt
Process:	Create cutomer payment document Get customer payment
Attachment:	(1) Customer

Table F.18. Process Specification of Process 5.2.

Item.	Description.
Process Name:	Prepare customer payment report
Data In:	Pay debt
Data Out:	Payment report Customer detail Payment detail
Process:	Create customer payment report
Attachment:	(1) Account department (2) Datastore: Invoice (3) Datastore: Customer



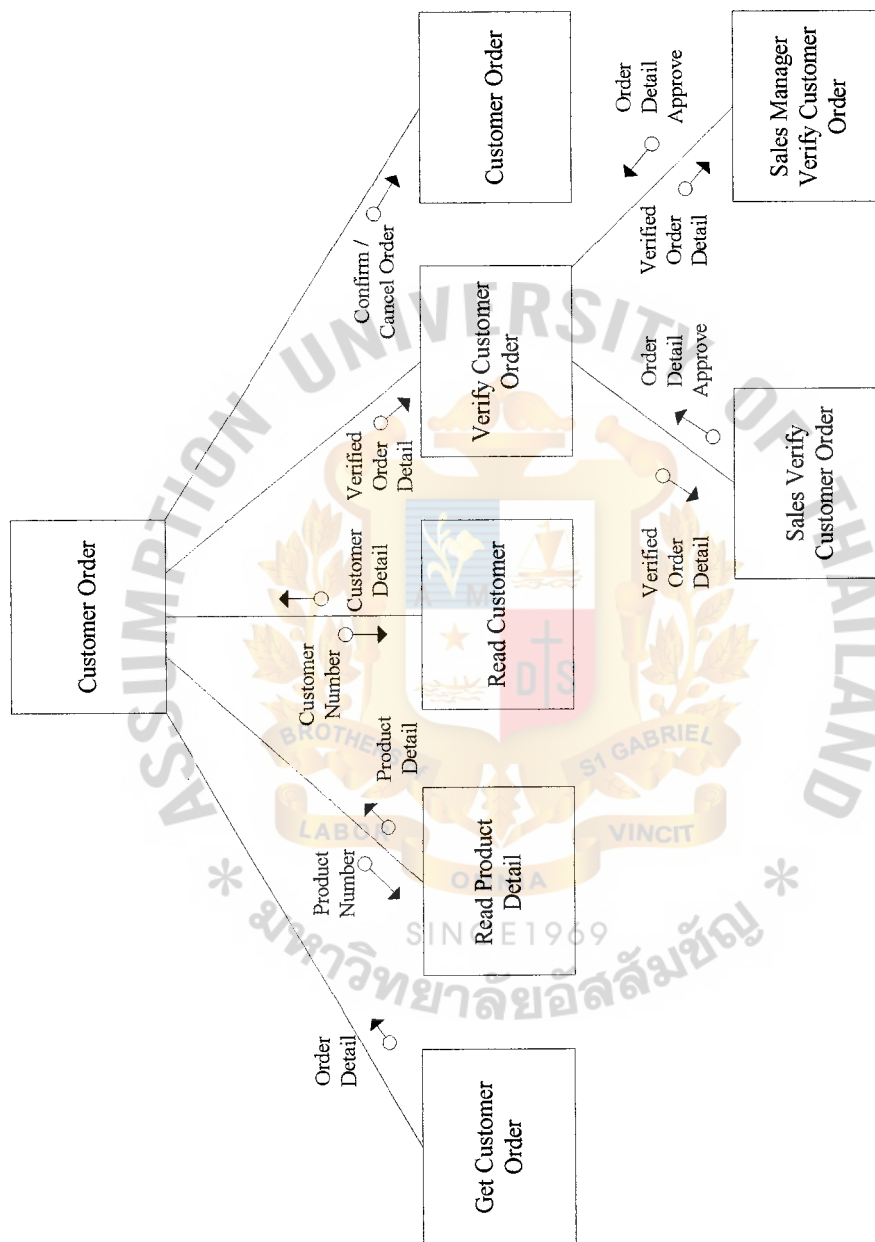


Figure G.1. Structure Chart of Verify Customer Order.

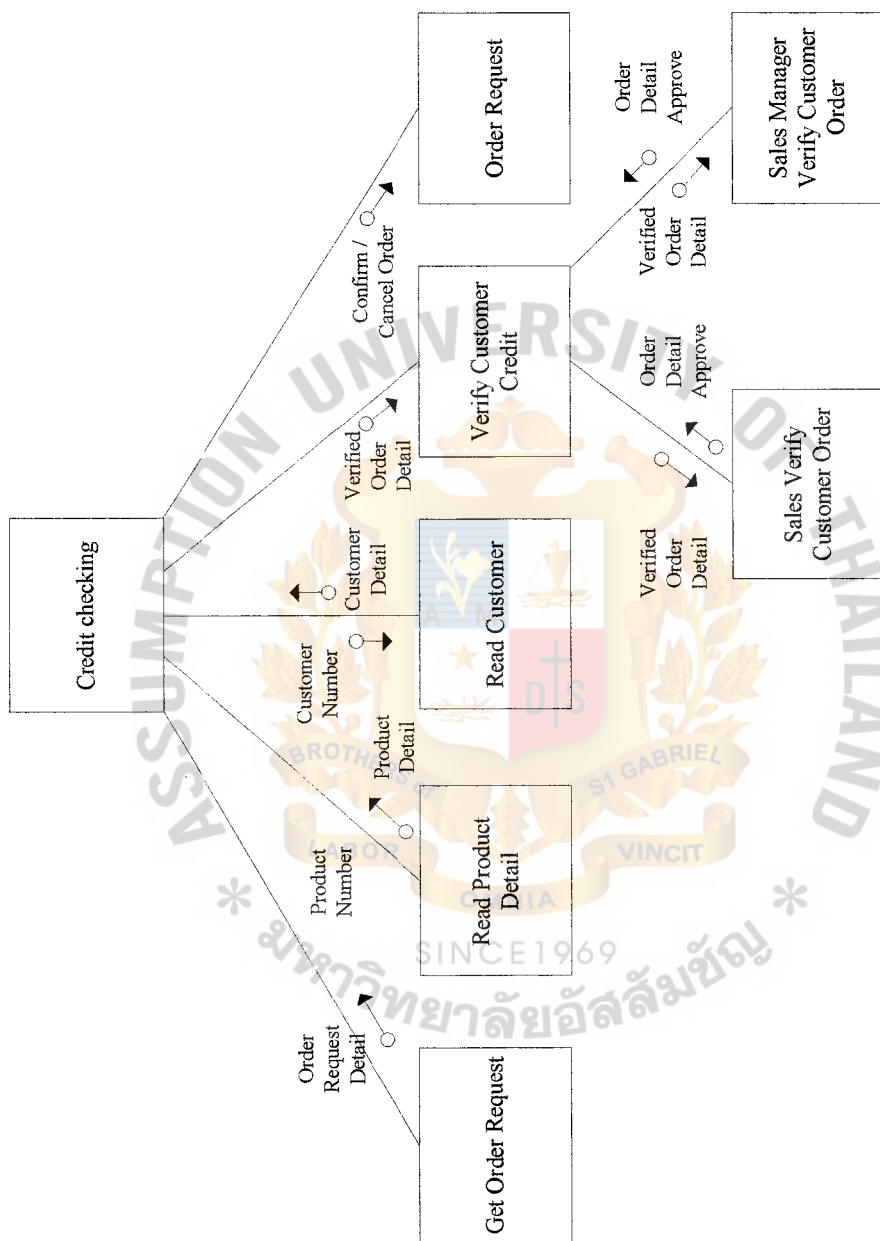


Figure G.2. Structure Chart of Checking Credit.

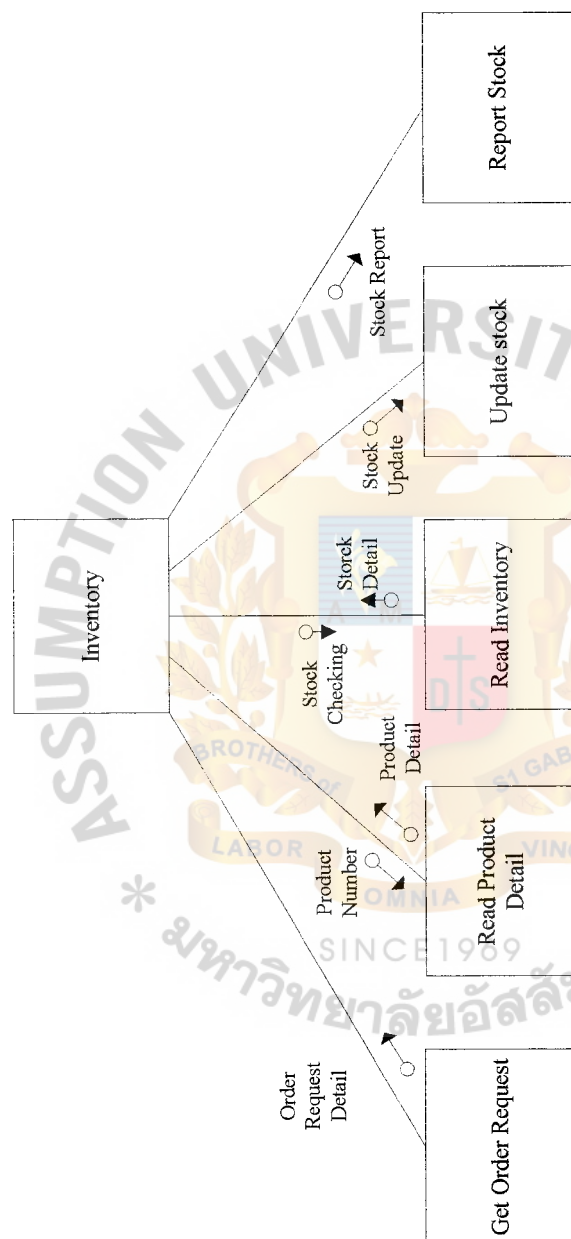


Figure G.3. Structure Chart of Inventory.

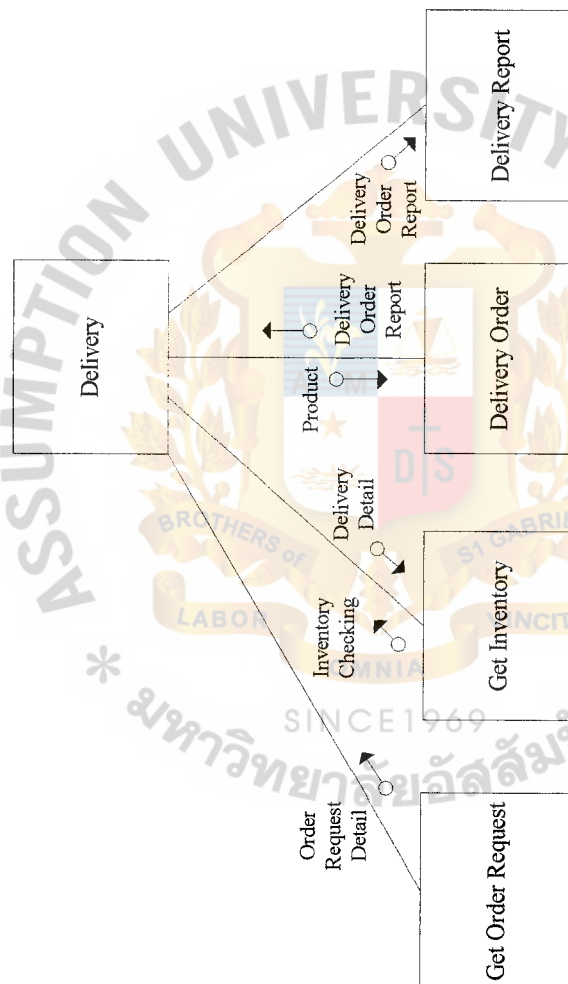


Figure G.4. Structure Chart of Delivery.

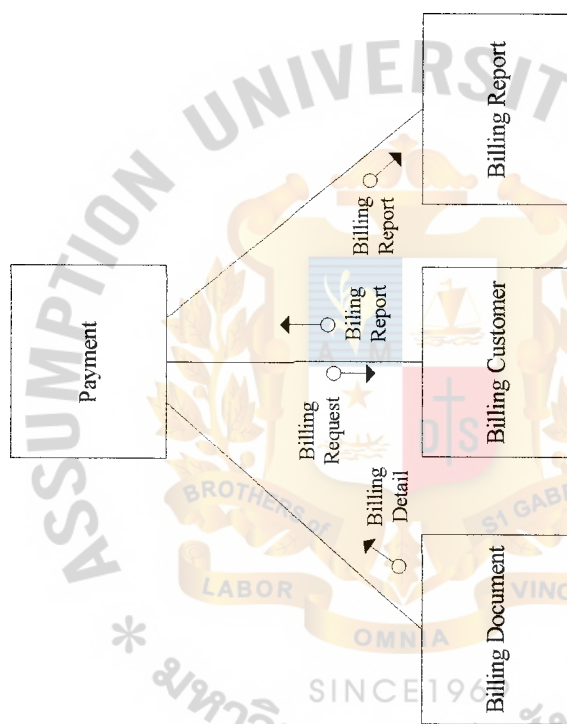


Figure G.5. Structure Chart of Billing.



APPENDIX H
DATA DICTIONARY

DATA DICTIONARY

Table H.1. Data Dictionary of Sales Information System.

Field Name	Meaning
Address	Officer's address
Amount Due	Total day of due date
Contact Name	Contact name of customer
Customer Address	Address of customer
Customer Name	Name of customer company
Customer No	Customer ID number
Delivered Quantity	Total unit of sale order
Discount	Money that discount for customer
E-mail	Officer's E-mail
Fax	Customer's fax number
Mobile Phone	Officer's mobile phone number
Of Name	Officer's name
Of Surname	Officer's surname
Officer ID	Officer's ID number
Order Date	Date that get purchase order from customer
Order No	Order's ID number
P/O Amount	Total unit of purchase order
Pager	Officer's pager number
Payment Term	Maximum day that customer can delay payment
Phone	Customer's phone number
PO No	Purchase order's ID number
Product Category	Kind of product
Product Description	Product's description
Product Name	Product's name
Product No	Product's ID number
Quantity	Product's Quantity
Shipment Date	Date that customer need to shipment
Ship To	Address that customer need to shipment to
Stock Quantity	Unit of stock
Supplier Address	Supplier's address
Supplier Contact	Supplier's contact name
Supplier Fax	Supplier's fax number
Supplier ID	Supplier's ID number
Supplier Name	Supplier's name
Supplier Phone	Supplier's phone number
Title	Customer contact's title
Total Payment	Total price of customer purchase order
Unit Price	Price of unit
Work Start Date	Date that officer join company



APPENDIX I
PROJECT PLAN

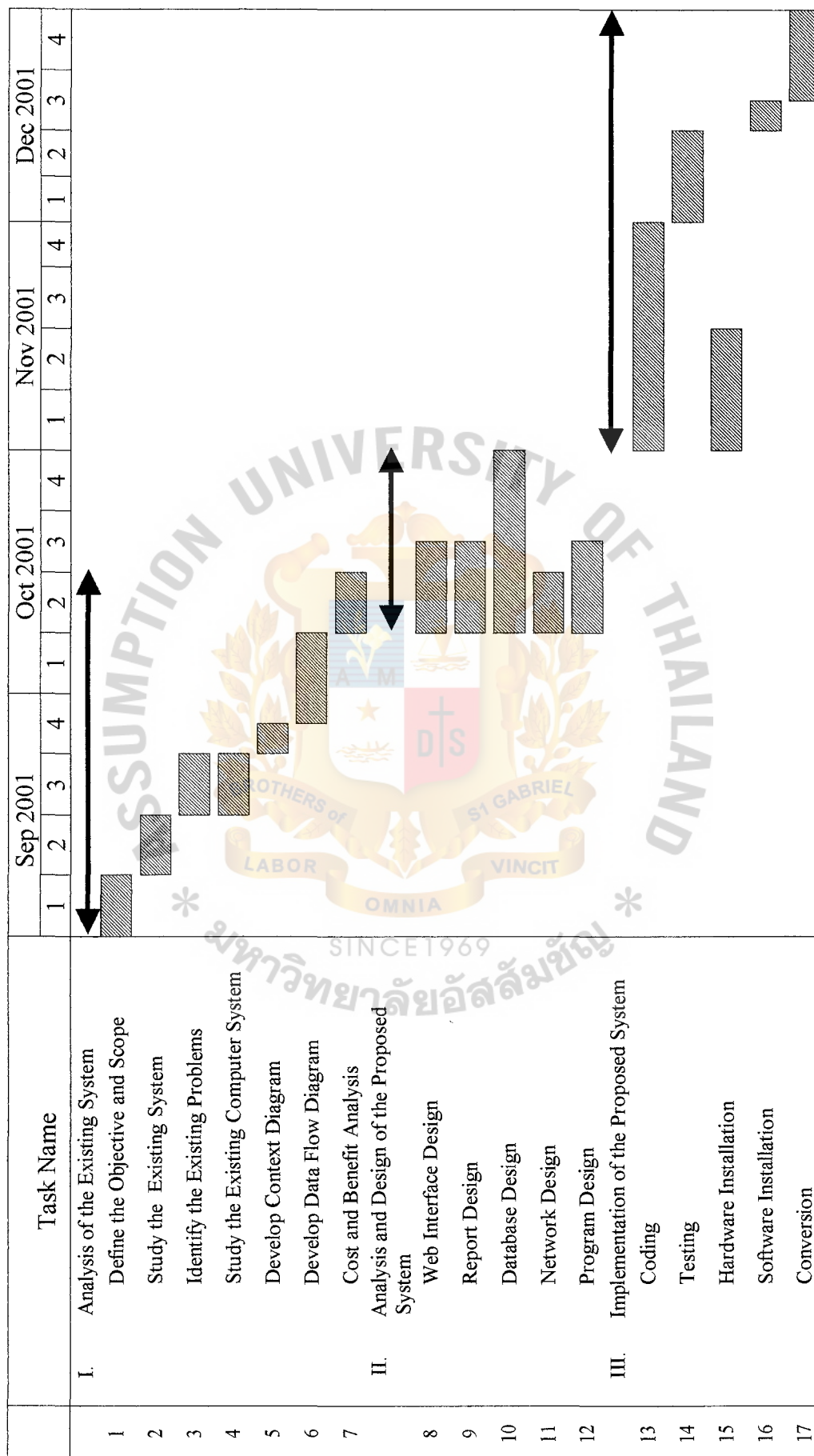


Figure I.1. Project Plan of Sales Information System.

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