



Improving Customer Relationship Management  
of Call Center System

by  
Mr. David Kiatsangsilp

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

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

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Name                                      Mr. David Kiatsangsilp


Project Advisor                      Assoc.Prof.Dr. Suphamit Chittayasothorn


Academic Year                      November 2003


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The Graduate School of Assumption University has approved this final report of the six-credit course, CS 6998 - CS 6999 System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information Systems.

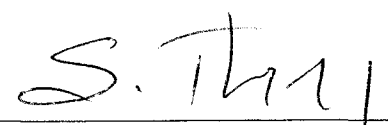
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## ABSTRACT

This system development project presents the analysis and design of Call Center System. The project is developed to solve the problems of requiring too much time to track data for use, and it also faced the general problems of the manual system. The objectives of this project are to study and understand the existing system of the Operation Department, keep track of customer's information, provide services to customers and create customer satisfaction. The Call Center System can provide the information for products, complaints and making orders through the call. It can control and help the management people for analyzing and making a decision in the company.

The study of this project begins with the required definition and analysis of the existing system. Information system analysis and design tools such as context diagrams, data flow diagrams, data dictionaries, entity relationship diagram and structure charts are used to analyze both the existing and proposed systems. Candidate solution matrix is also used to compare various alternatives in order to come with the most effective solution. Capital budgeting models such as the payback method, the cost-benefit ratio, and the net present value are used to evaluate the proposed system.

It was found out that the new computerized system is implemented using Fast Ethernet LAN with 1 server, 6 clients, and 2 printers. Software for the proposed system are Windows 2000, MS Office 2000, Visio 2000, and Delphi6. Based upon payback method, it shows that the initial investment will pay for itself after 1.4 years. In terms of degree of achievement, the proposed system can process data faster than the existing system.

To further improve the proposed system, it is recommended that a Web-based solution should be developed and implemented. The system will have more scalability and flexibility.

## ACKNOWLEDGEMENTS

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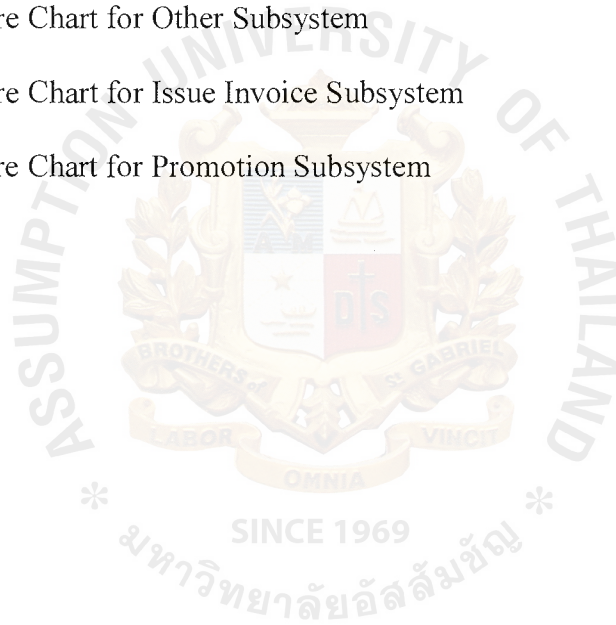
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## **I. INTRODUCTION**

### **1.1 Background of the Project**

Whizz-Bang Book Store by operating Whizz-Bang Public Company is the famous business of Thailand. There are many branches in Bangkok and selected provinces. Whizz-Bang Book Store has been setting up the call center to make the customers convenient and be satisfied with their services. The call center is able to provide information to customers and handle the customer's complaint.

As the number of customers have been growing, the call center , which has been done mainly in manual way, seems to be improper because of overload and lack of efficiency. For example, when the customer call to call center, the customer information will be kept in papers. There are always the problems of losing the customer information. Moreover, it is very difficult to make the report for the manager from the call center, when the manager want to know any information for example the number of calls and detail of complaints from the customer. Computerization can increase efficiency, reduce duplication and reduce the delays involved due to manual work. A lot of paper work can be eliminated and smooth working can be ensured. The main objective of call center system is to keep track of all customers. It also receives the order from customers though the phone. In addition to making reports to manager in order to improve the service and planning the marketing strategy.

### **1.2 Objectives of the Project**

- (1) To study and understand the existing system of call center system.
- (2) To practically apply the knowledge studied from CIS program in designing, developing, and testing the computer-based information system, which is used for call center of Whizz-Bang Book Store.
- (3) To identify and analyze the problems in the existing system.

- (4) To solve the problems which exist in the existing system.
- (5) To improve the effectiveness and efficiency of the business operations.
- (6) To reduce the cost of manual operation.
- (7) To make the reports to management level.

### **1.3 Scope of the Project**

The project will cover the following parts of the Call Center System:

- (1) To analyze, design and develop a computerized system for Call Center System.
- (2) To analyze the hardware and software requirements for Call Center System.
- (3) To analyze and design a database for Call Center System.
- (4) To design screen for agents.
- (5) The system can produce several reliable reports for operation and management.

### **1.4 Deliverables**

The deliverables, which occur in this project of the Call Center System, are as follows:

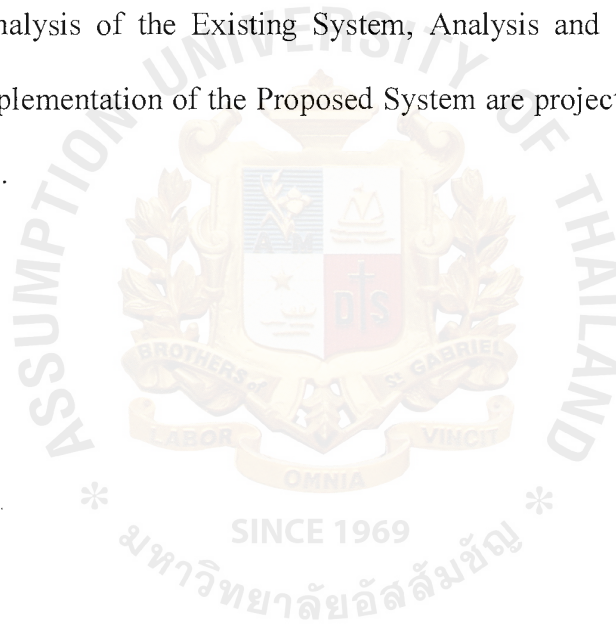
- (1) Results of existing system study
- (2) Design of proposed system
- (3) Analysis of candidate solution
- (4) Cost and Benefit analysis
- (5) System Specification
  - (a) Design Specification
  - (b) Context Diagram
  - (c) Data Flow Diagram
  - (d) Entity Relationships Diagram

- (6) Data dictionary
- (7) Screens comprise of 13 items as follows:
  - (a) Access Security Screen
  - (b) Stand by Screen
  - (c) Calling Pop up Screen
  - (d) Main Page Of Pick up Call Screen
  - (e) Customer Search Screen
  - (f) Customer Search Result Screen
  - (g) History Of Customer Screen
  - (h) Add Customer Screen
  - (i) Information Selection Screen
  - (j) Complaint Selection Screen
  - (k) Other Selection Screen
  - (l) (Order Taking) Search Product Screen
  - (m) (Order Taking) Search Product Result Screen
  - (n) Generated Report Screen
- (8) Report comprises of 12 reports as follows:
  - (a) Call Report
  - (b) Call Traffic Report
  - (c) Summary Report
  - (d) Summary Report By Gender
  - (e) Summary Information Report
  - (f) Summary Complaint Report
  - (g) Inbound Report By Call
  - (h) Information Case Detail Report

- (i) Complaint Case Detail Report
- (j) Other Case Detail Report
- (k) Order Case Detail Report
- (l) Invoice
- (m) Monthly Best Seller Report

### **1.5 Project Plan**

As Shown by Project Gantt Chart in Figure 1.1, the system development project plan is started from January 1, 2004 to April 30, 2004. The project consists of three main tasks: Analysis of the Existing System, Analysis and Design of the Proposed System and Implementation of the Proposed System are project plan can be represented as in Figure 1.1.



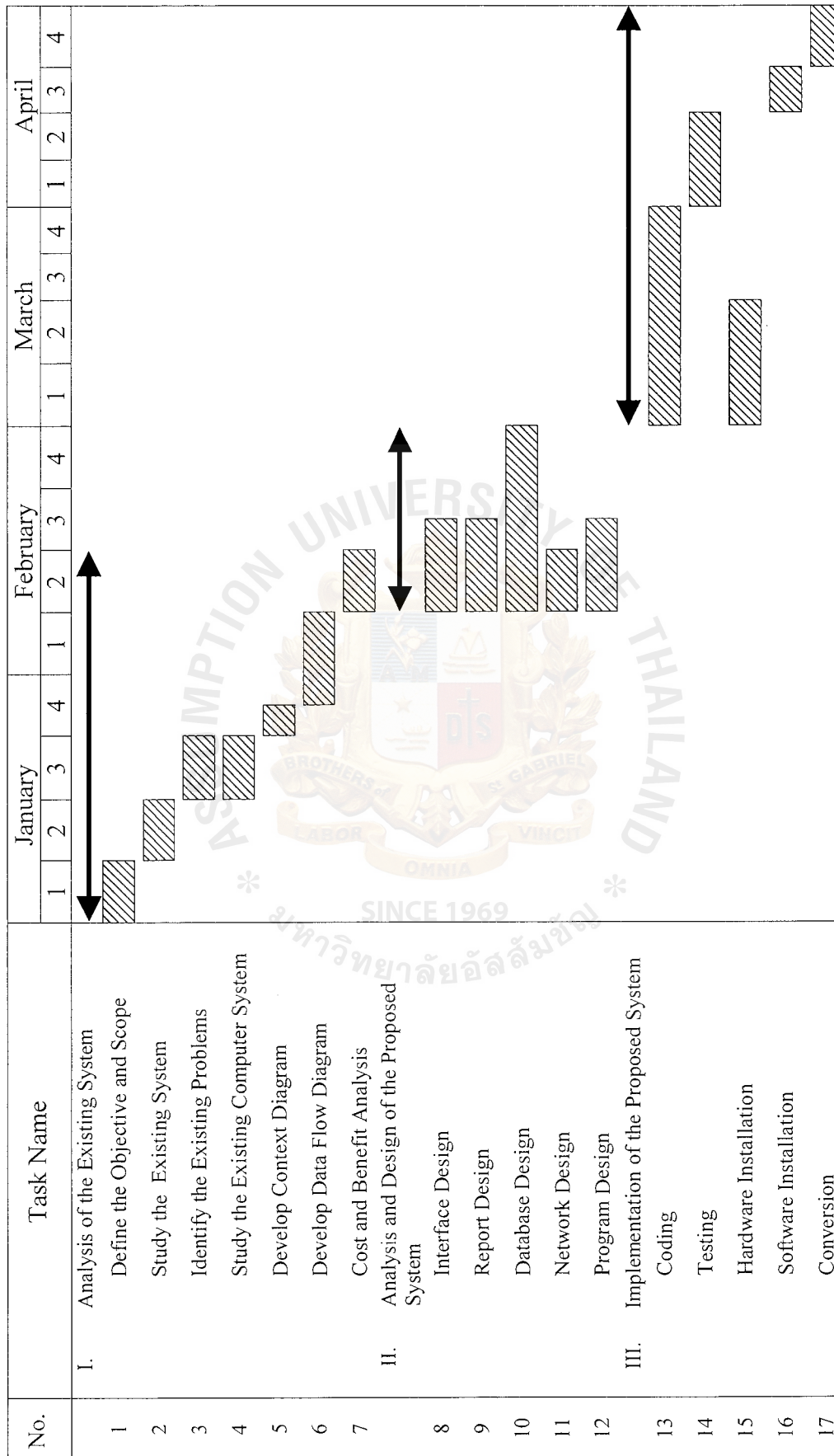


Figure 1.1. Project Plan of Whizz-Bang Company Limited.

## **II. THE EXISTING SYSTEM**

### **2.1 Background of the Organization**

Whizz-Bang Public Company was established as a registered company on July 8, 1982 with a registered of THB 1,000,000. The objective is to do business with the initial registered capital of 2 million baht. The company has three major areas of business as follows :

- (1) Publishing Business by publishing own books, magazines, others' books and advertising products.
- (2) Distribution Business by distributing own books, as well as books from other publishers and organizations to nationwide bookshops.
- (3) Book Store Business by operating Whizz-Bang Book Store both in Bangkok and selected provinces as well as the network expansion and sales area in various forms.

Whizz-Bang Book Store now operates 13 stores in Bangkok and 39 store in selected provinces all over Thailand, with more than 500 employees. Whizz-Bang Book Store is the modern book store with the books around the world to ensure customer need and satisfaction. The Head Office locates in Bangkok. There are 6 major departments as follows. (See Figure 2.1. The Organization Chart of Whizz-Bang Book Store)

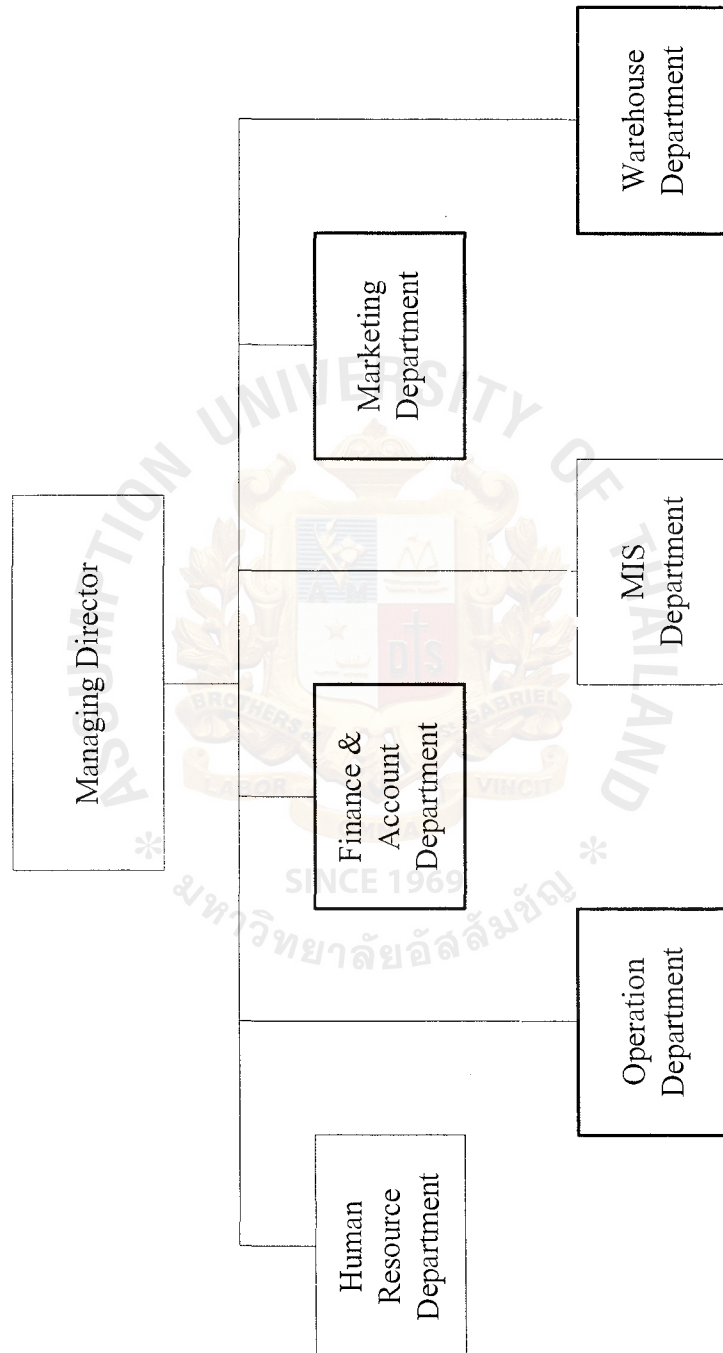


Figure 2.1. Organization Chart of Whizz-Bang Book Store.

- (1) Human Resource Department: The main function of this department is to be responsible to maintain all personnel records and protect their confidentiality, managing and monitoring employees in which working performance is monitored as working history, so that it is further used for evaluating overall employees' performance. HR is also involved in the recruitment and selection of staff.
- (2) Financial and Accounting Department: The main function of this department is responsible for collecting cash payment from the customers. It verifies payment of the customers according to the order. It is also responsible for generating financial documents and issuing financial report. It performs the financial control of the company's cash flow. It also pays tax for the company.
- (3) Marketing Department: The main function of this department is to be responsible to keep track of the business in terms of fulfilling customer satisfaction. Thus, promotional plans are needed to launch at the correct time and penetrate the correct target group of customers. Create positive public relation both internal and external relationships.
- (4) Operation Department: The main function of this department is to increase customer satisfaction. It's also manage agents in call center that includes training, coaching and monitoring to have a standard skill in their responsibilities.
- (5) MIS Department: The main function of this department is to be responsible to maintain hardware and software of the company. It support the user about the computer, hardware, software and network problems. It also maintain database in order to backup and performance tuning.

- (6) Warehouse Department: The main function of this department is to responsible for controlling the inventory of each product items. It updates the inventory stock based upon real time basis.

## **2.2 Existing Business Functions**

The Whizz-Bang Company comprises of 6 departments, which are Human Resource Department, Financial & Accounting Department, Operation Department, MIS Department, Marketing Department, and Warehouse Department.

- (1) Management Level is responsible by the Managing Director.
- (2) Function Level, which is comprised of 6 departments as discuss above.
- (3) Operation Level.

The existing information of Call Center System is processed manually. The context diagram of the existing system is shown in Figure 2.2.

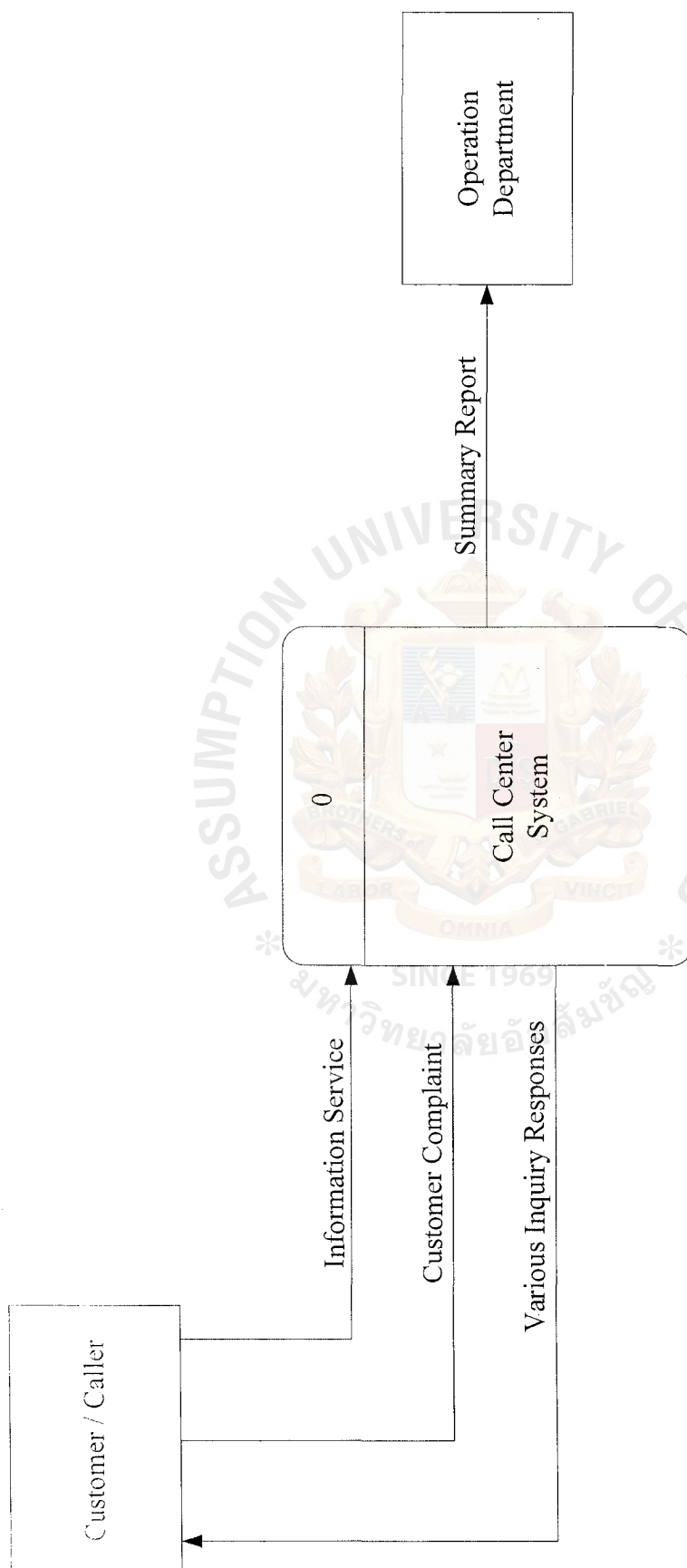


Figure 2.2. Context Level Data Flow Diagram of Existing System.

Figure 2.2 shows the existing Call Center System of Whizz-Bang Company. This system is a manual system, so some departments in the company must contact and participate in this system. The details of all manually processes concerned with the following functions:

(1) Information Service procedure

This function is to provide information of Whizz-Bang Book Store and product's information to customer who calls to call center. Agent will look information from data files and paper to response to customer.

(2) Customer Complaint procedure

This function is to handle complaints of customers for example impolite staff, unavailable books and low member privilege. The customer's complaint will be recorded. At the end of day, week or month, operation department will generate the report and send to related departments.

(3) Generate Report procedure

At the end of day, week or month, operation department will generate the report and send to related department. The report will be generated in two types, that are information services and customer's complaints by getting all types of records from the file or manually.

## 2.3 Current Problems and Areas of Improvement

The current problems and areas of improvement for the Call Center System are categorized in terms of problems, opportunities and directives. Thus, the PIECES framework is used as the main analyzing tool where the analysis of each is shown as follows.

- (1) P (Performance) – the need to improve performance

Performance Problems, Opportunities, and Directives

- (a) Throughput – concerned with very high work loaded of call center in the Operation Department. As the Whizz-Bang's manual system, there are seven functional requirements, which need to be fulfilled.

- (1) Customer Management procedure.
- (2) Order procedure.
- (3) Information procedure.
- (4) Complaint procedure.
- (5) Other Cases procedure.
- (6) Issue Invoice procedure.
- (7) Promotion procedure.

Regarding to the manual system, it cannot handle all works. A computerized system should be replaced.

- (b) Response time – is significantly slow because data are kept on papers. It is complicated and takes much time to generate the result for queries. As concerned with the average delay between a transaction or request and a response to that transaction and request.

- (2) I (Information) – the need to improve information (and data).

Information (and data) Problems, Opportunities, and Directives

- (a) Outputs
  - (1) Inaccurate information delivered.
  - (2) Time-consumed in preparing reports.
  - (3) Difficulty in preparing reports.
  - (4) Late submission of reports
- (b) Inputs
  - (1) Inaccurately captured data plus errors.
  - (2) Missed captured data.
- (c) Data stores
  - (1) The existence of redundancy.
  - (2) Complexity in handling large amount of records.
  - (3) Inaccurately stored data.
  - (4) Data are not secured against unauthorized users.
- (3) E (Economics) – the need to improve economics, control costs, or increase profits.

#### Economics Problems, Opportunities, and Directives

##### (a) Costs

The rising number of customer's information and information service in Call Center result in high cost due to hiring more agents and the waste of paper-based work.

##### (b) Profits

Paper-based work is almost eliminated plus having an efficient and effective way to perform tasks and provide services. Reducing the time in working process, agents can serve more customers.

- (4) C (Control) – the need to improve control and security.

Control (and Security) Problems, Opportunities, and Directives.

- (a) The existing system still uses only a traditional security system. All documents are kept in safes with manual locking thus data might be damaged or be easily lost.
- (b) As using the traditional security system for document collecting, redundancy of documents occur among themselves and this causes data inconsistency.
- (c) There is no security to protect the document from unauthorized persons to take them out as manual of operation.

- (5) E (Efficiency) – the need to improve efficiency of people and processes.

Efficiency Problems, Opportunities, and Directives.

- (a) Agents must be familiar with the computerized system. Therefore, computer training must be set to enhance agent competence.
- (b) Reducing redundant data processing in processes is necessary in terms of cost.
- (c) Some tasks are time-consuming and require a lot of effort to perform.

- (6) S (Service) – the need to improve service to customer.

Service Problems, Opportunities, and Directives.

- (a) The legacy system produces unreliable reports and output to Operation Department.
- (b) The servicing performance of the legacy system is unacceptable due to too much requested services and tasks to perform.
- (c) The legacy system is not suitable to performing database operations in which processing needs them to perform tasks and provide services.

### III. THE PROPOSED SYSTEM

#### 3.1 System Specification

As the Whizz-Bang Company uses the manual system for the Call Center, there has to be a replacement between this legacy system and a new computerized system which can improve the performance, information, economic, control, efficiency and service in all processes. In order to get the complete set of user requirements, all the existing manual system were analyzed and also approaches the users to find out what they really need or want for the new computerized system. This information is collected through interviews, questionnaires, and facilitated meeting. Hence, the new computerized system is designed to have the functional requirements as follows:

- (1) There is a database system to replace handling of paper-based work and records, such as customer information, history of customer records, information services in which the operations on these data is a lot more flexible and efficient including speed and correctness.
- (2) The Call Center System should give the information services to customers in terms of company information, product information.
- (3) The Call Center System should handle the customer's complaints by getting the customer complaint and send to the related departments.
- (4) The Call Center System increases the sales channel by receiving the order from the customers through the call.
- (5) Various kinds of records can be easily produced because all required information needed to prepare the reports are kept in the database. Thus, only queries are to be input to the computer system and it can generate the report for the different purposes.

- (6) All information is kept as records in the database and are computed through the system's functions.

### **3.2 System Design**

The context diagram of the proposed system is used to focus on data flowing both in and out of the system and the processes that perform operations on the data.

The data flow diagram is a modeling tool that enables users to both thoroughly depict and present how the inside of the proposed system works. For the external agent especially, Customer means the person who calls the call center and has a connection with the call center.

An entity-relationship diagram is the analysis of data objects that are used in business or other contexts and the identification of the relationships among these data objects. Data modeling is a first step in designing an object-oriented programming. We can then define the class that provides the templates for program object.

Thus, as following diagrams, the combination of the both data flow and entity-relationship diagram can then explain in details how data are flowed and processed by the system's processes.

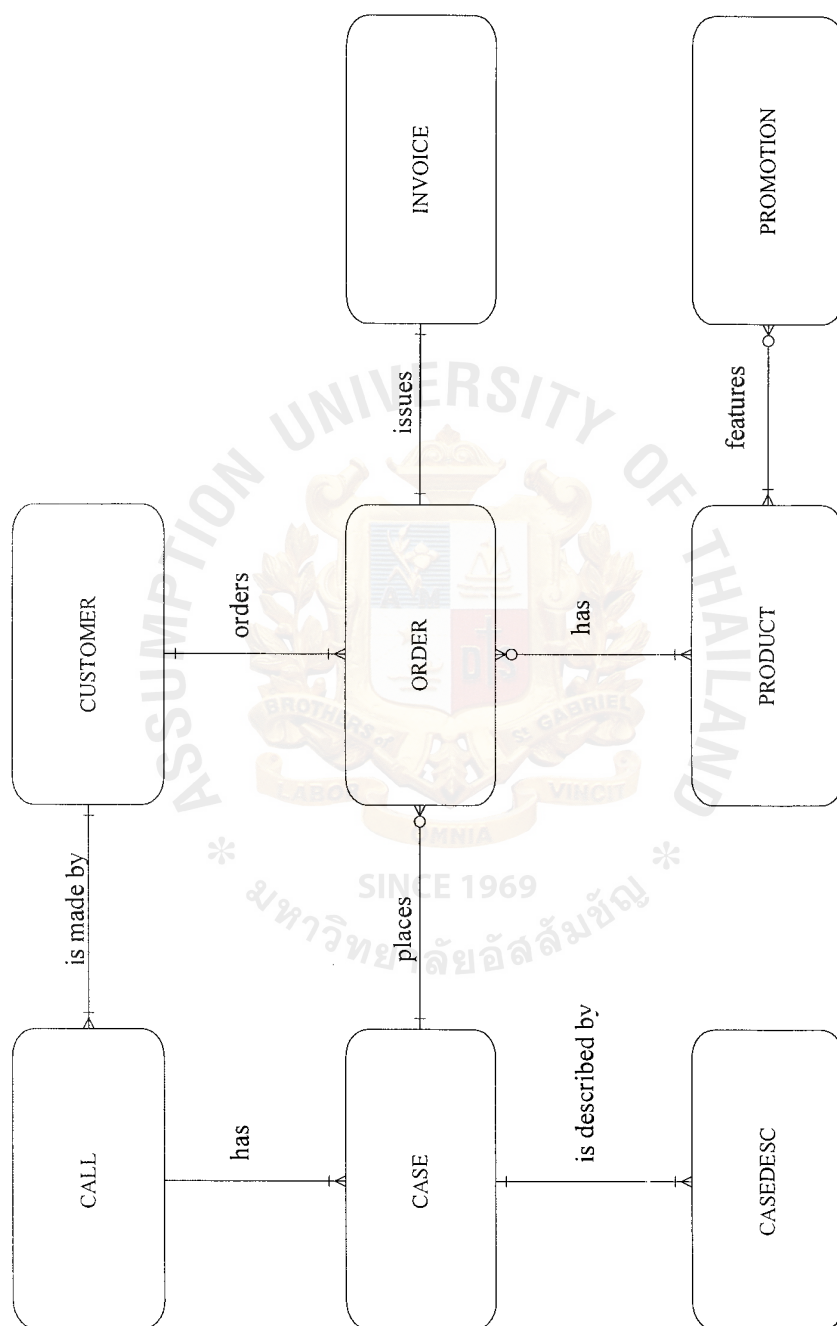


Figure 3.1. Context Level ER Diagram of Call Center System.

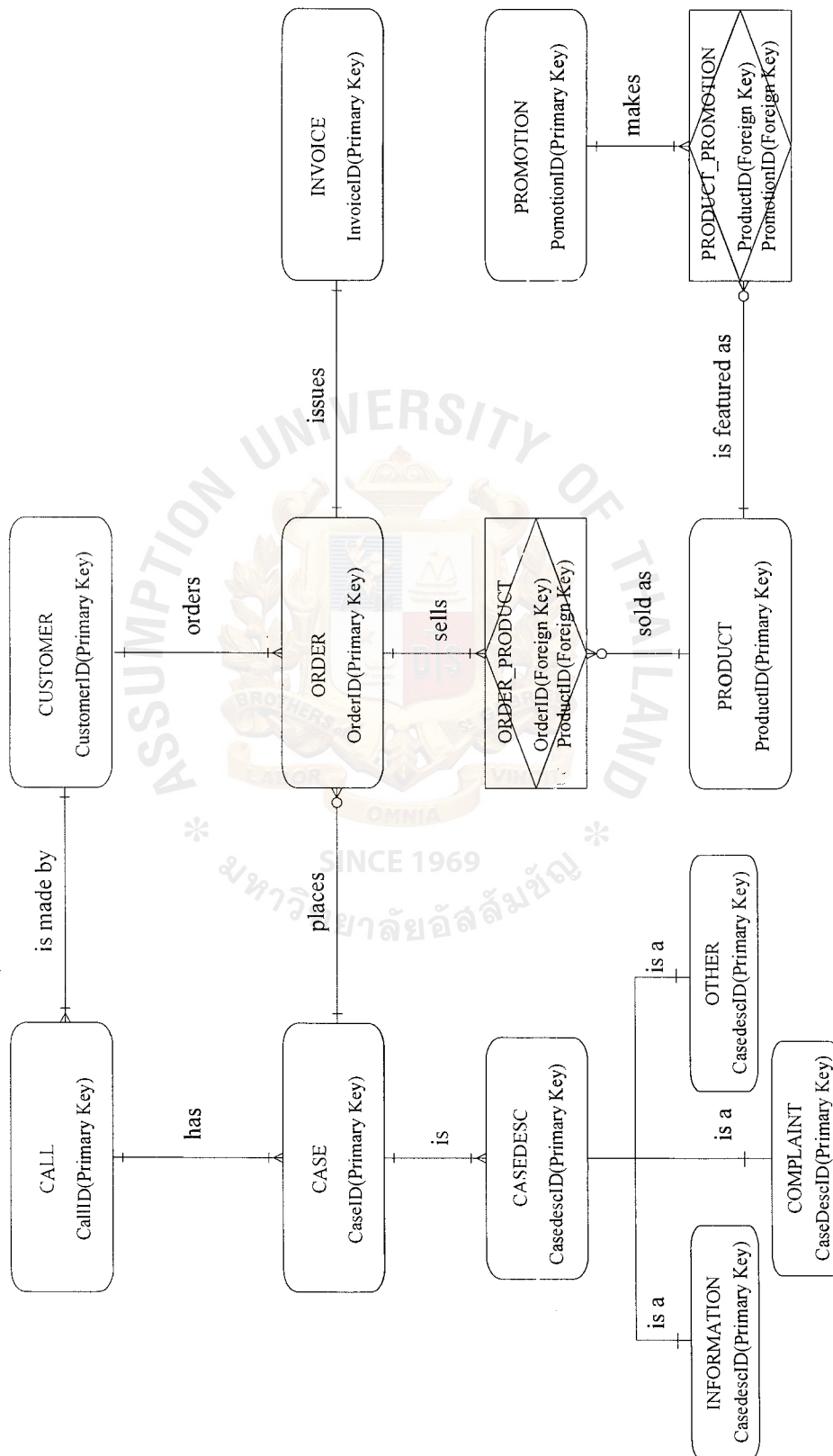


Figure 3.2. Key-Based ER Diagram of Call Center System.

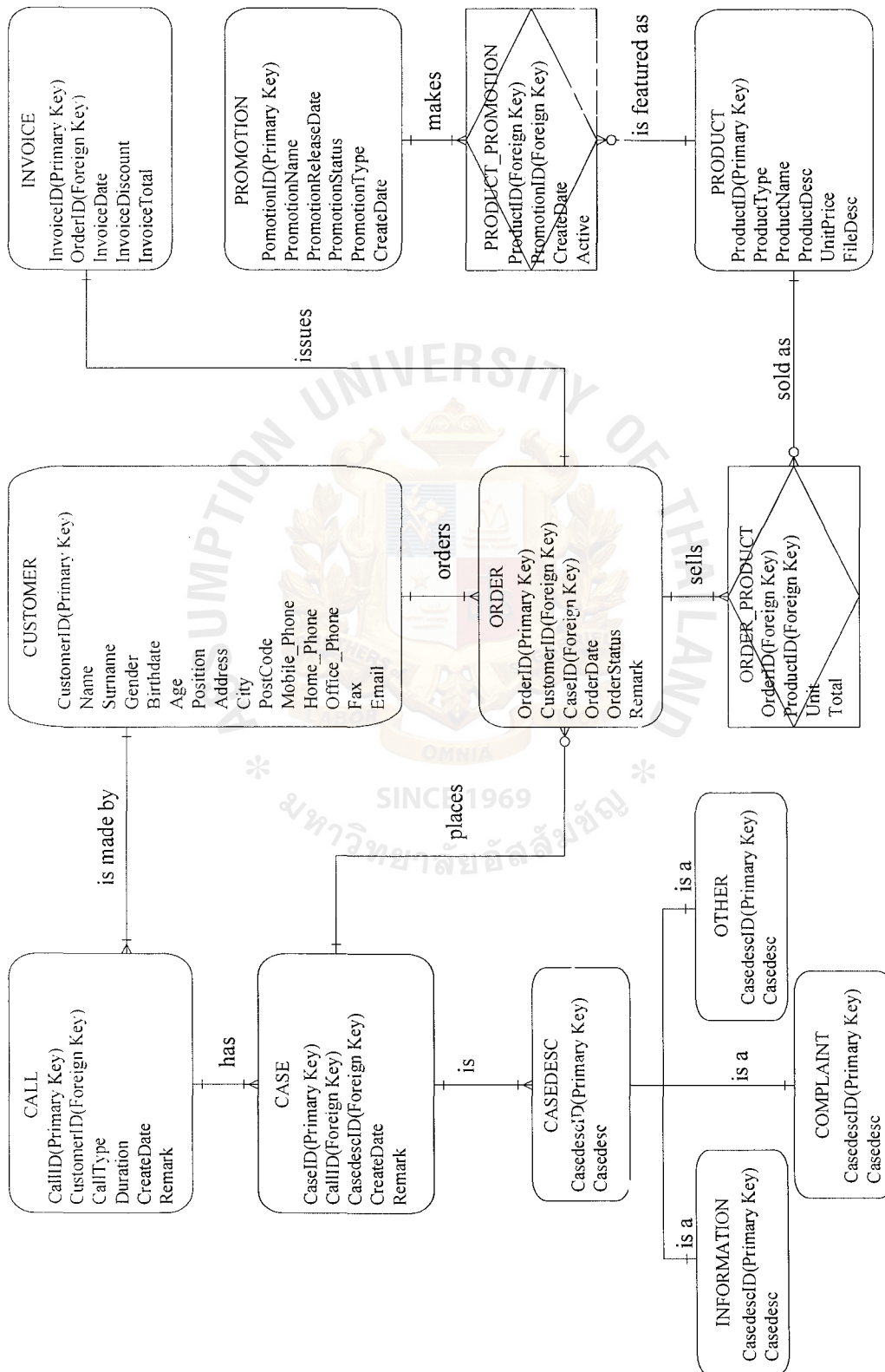


Figure 3.3. Fully Attributed ER Diagram of Call Center System.

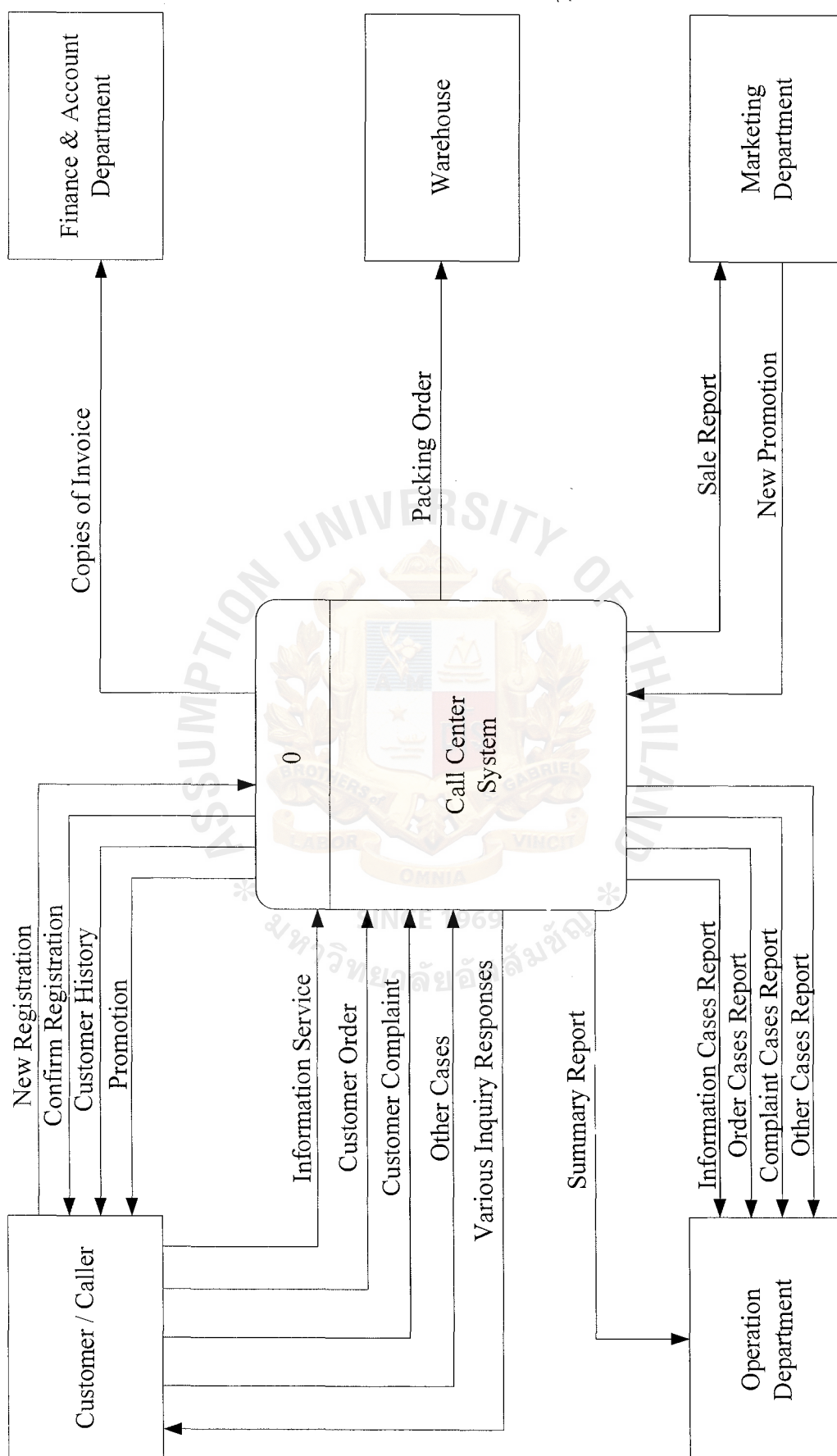


Figure 3.4. Context Level Data Flow Diagram of Call Center System.



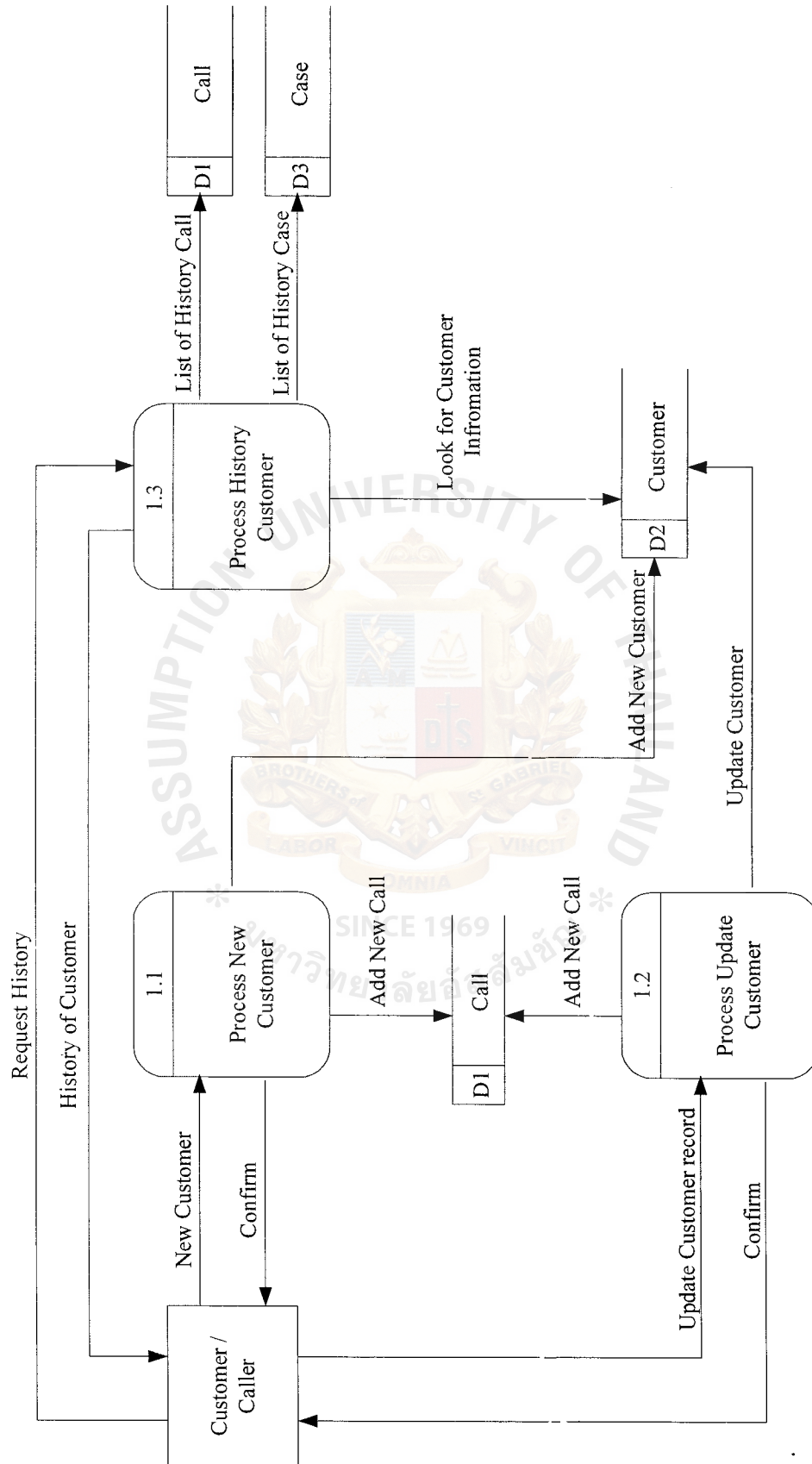


Figure 3.6. Level 1 Data Flow Diagram of Customer Management Subsystem of Call Center System.

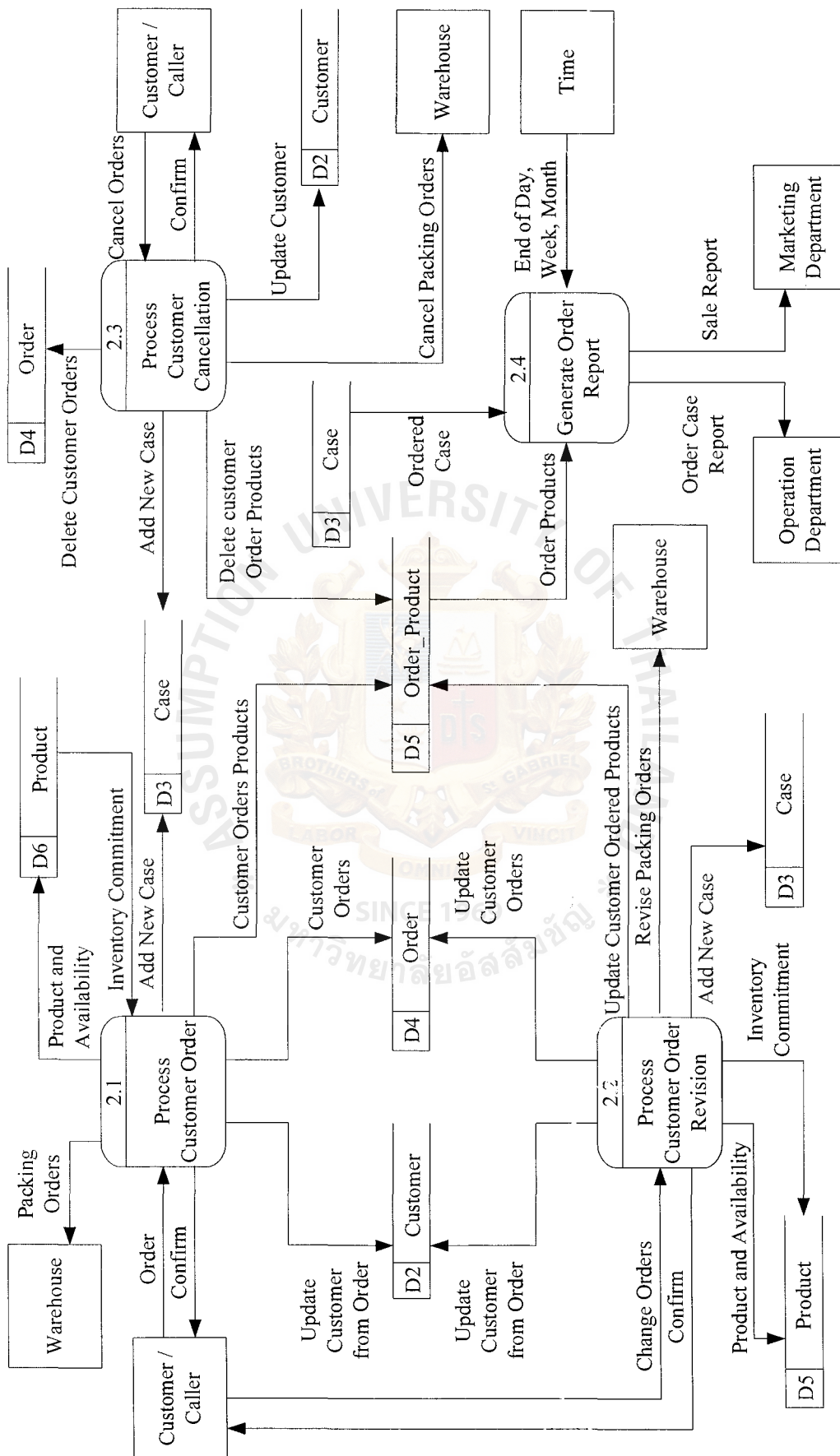


Figure 3.7. Level 1 Data Flow Diagram of Order Subsystem of Call Center System.

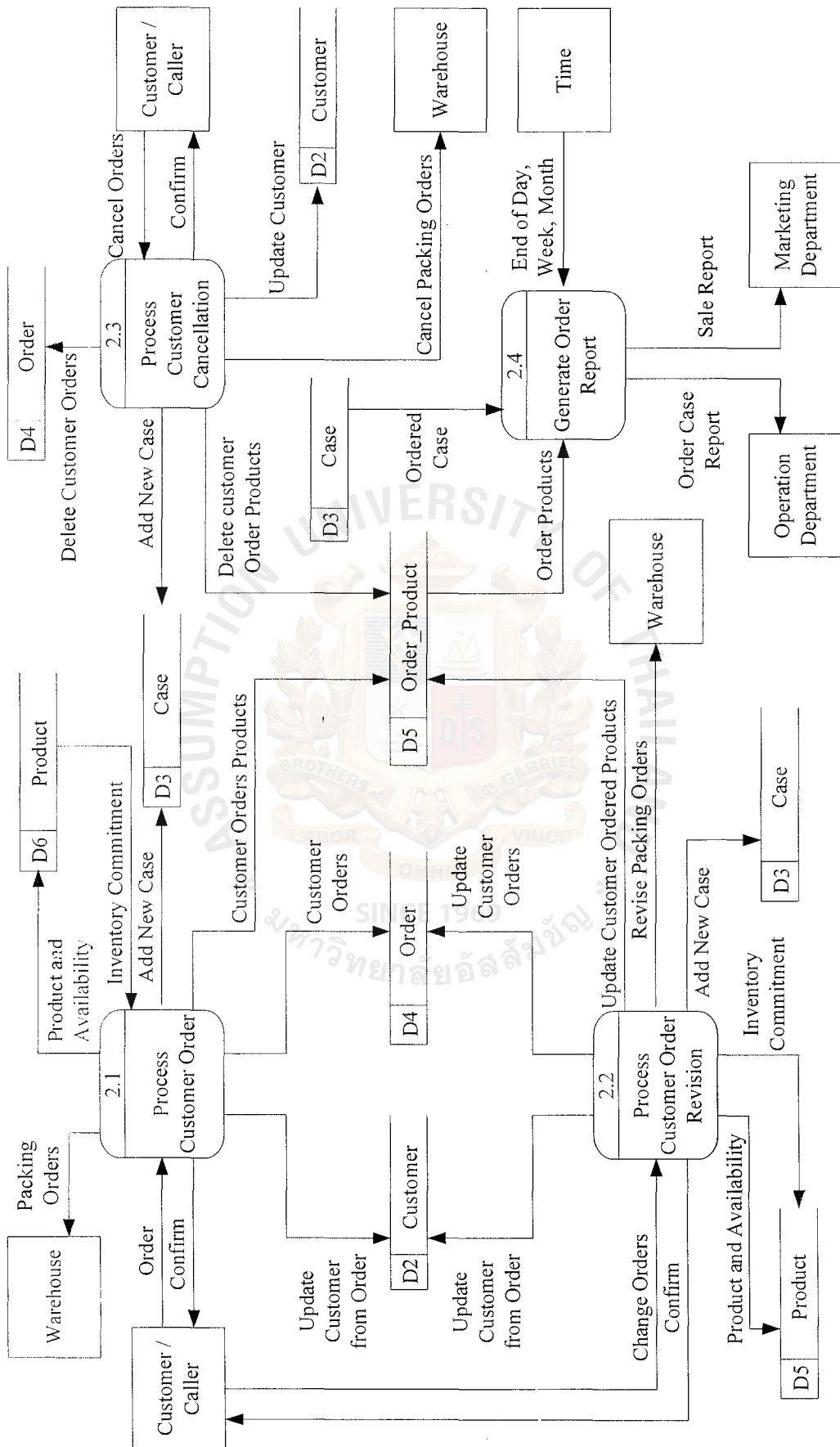


Figure 3.7. Level 1 Data Flow Diagram of Order Subsystem of Call Center System.

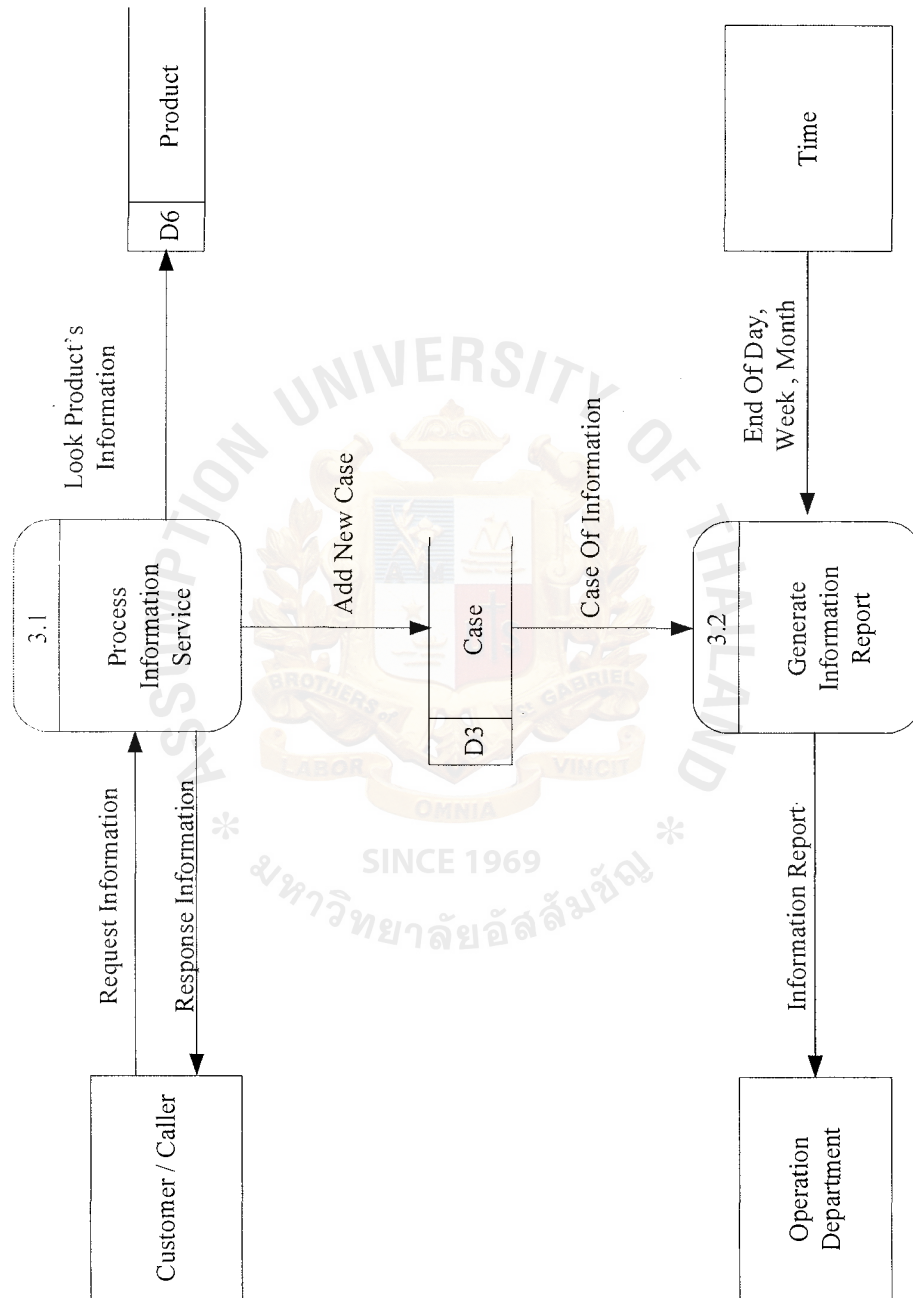


Figure 3.8. Level 1 Data Flow Diagram of Information Subsystem of Call Center System.

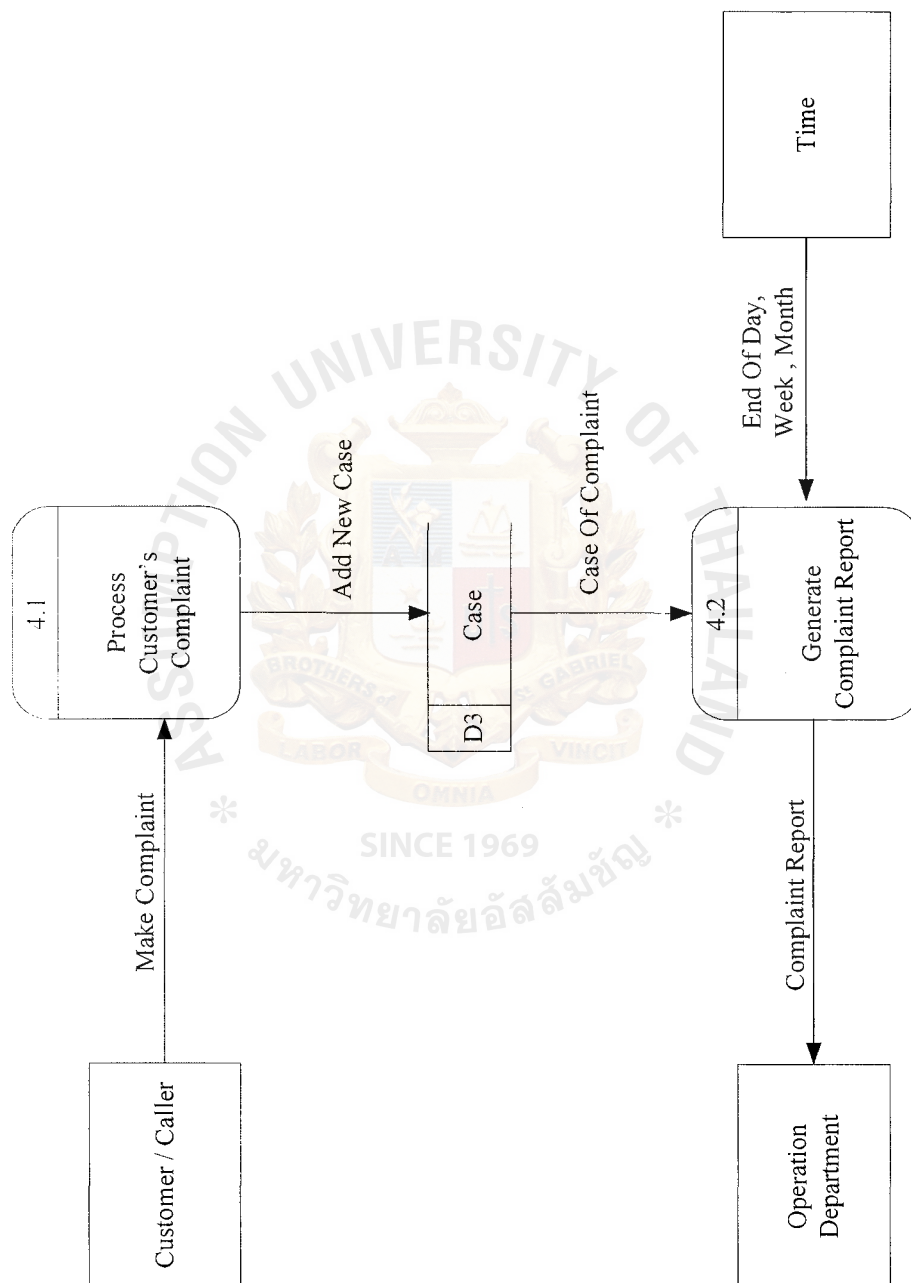


Figure 3.9. Level 1 Data Flow Diagram of Complaint Subsystem of Call Center System.

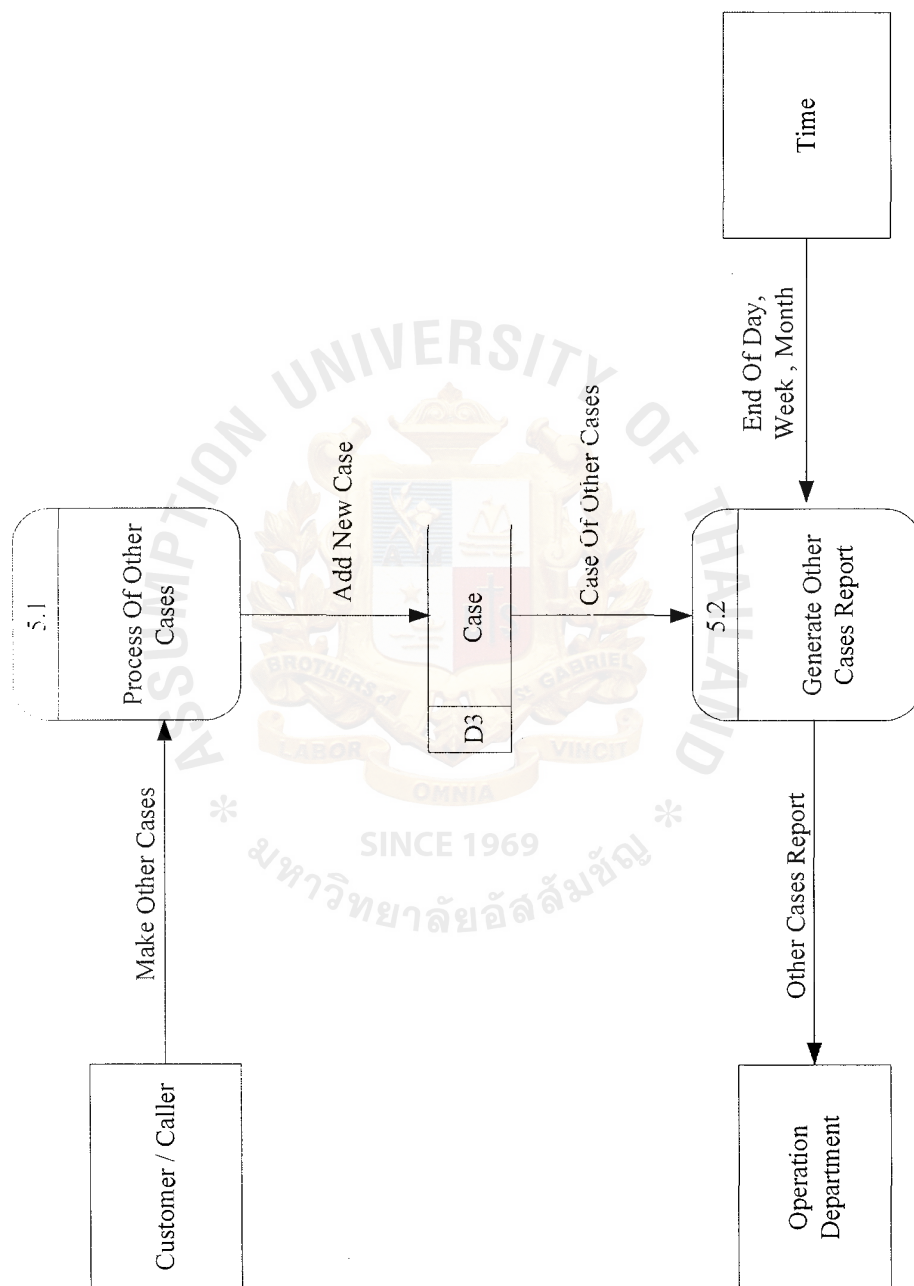


Figure 3.10. Level 1 Data Flow Diagram of Other Cases Subsystem of Call Center System.

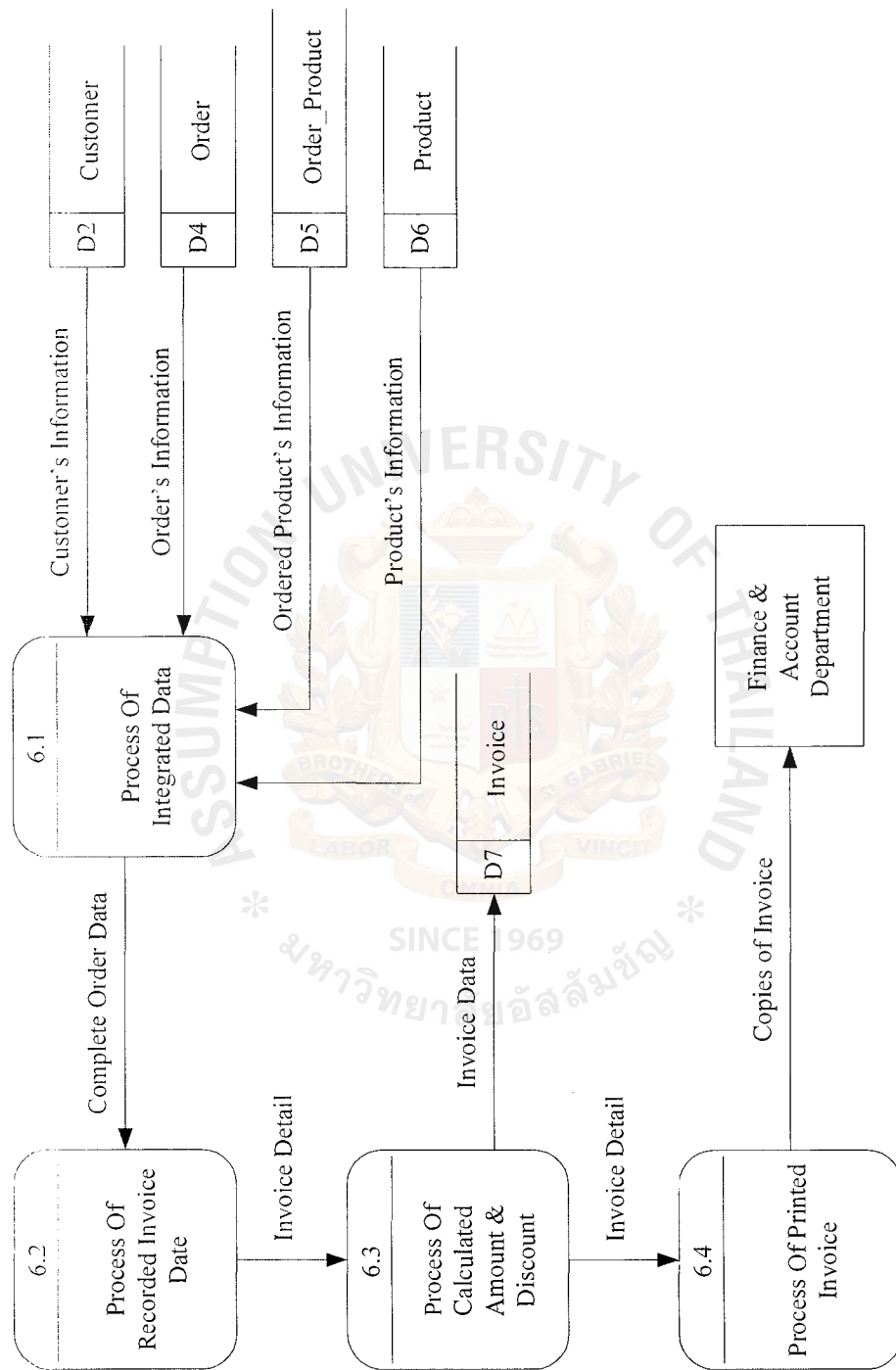


Figure 3.11. Level 1 Data Flow Diagram of Issue Invoice Subsystem of Call Center System.

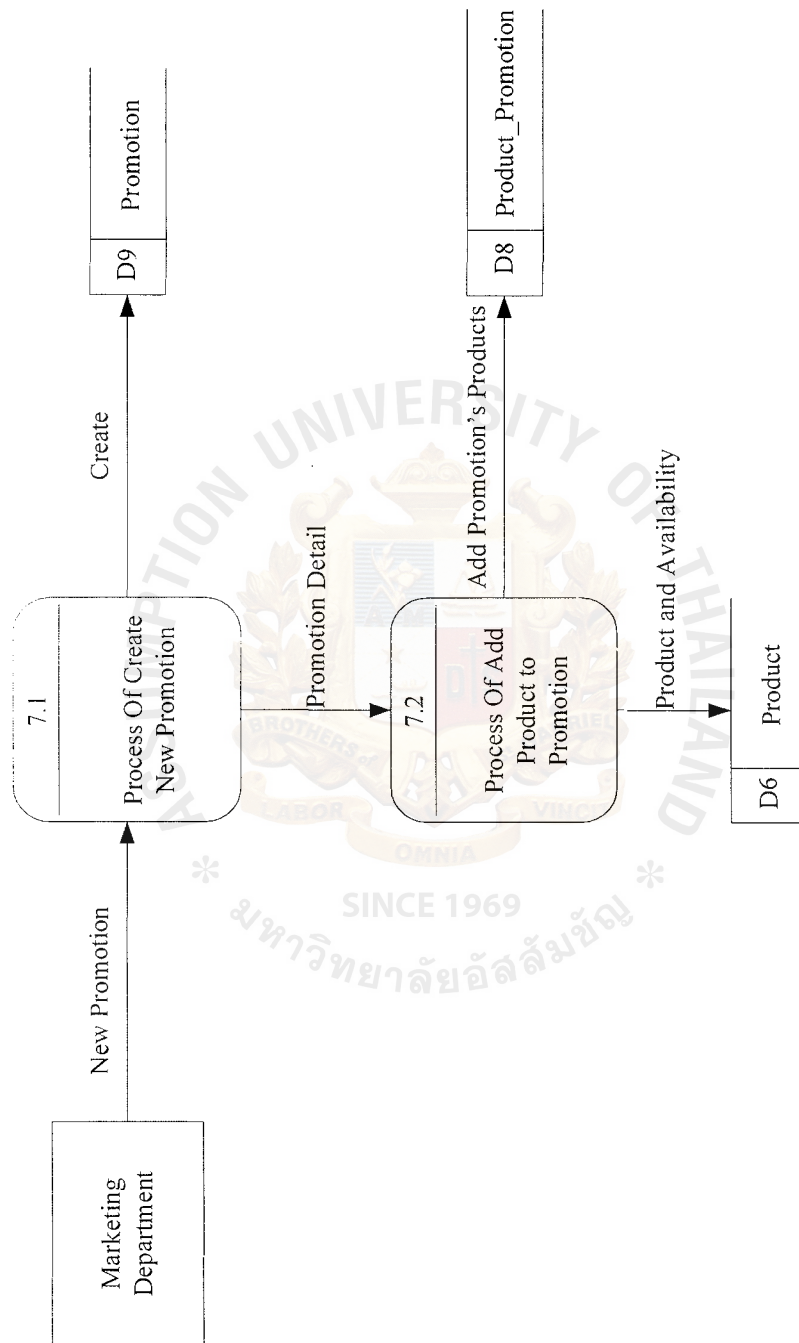


Figure 3.12. Level 1 Data Flow Diagram of Promotion Subsystem of Call Center System.

### 3.3 Candidate Solutions and Feasibility Analysis

Table 3.1. Candidate Systems Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized Brief description of the business benefits that would be computerized for this candidate.	Fully supports user requirements Of Call Center System	Same as candidate 1	Same as candidate 1
Benefits Brief description of the business benefits that would be realized for this candidate.	Fully supports user requirements Of Call Center System	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 Pentium IV MS Windows 2000 class server, MS Windows 2000 workstations (Clients)	Same as candidate 1	Technically architecture dictates Pentium IV, MS Windows 2003 class servers, MS Windows 2000 workstations (Clients)
Software Tools Needed Software Tools needed to design and build the candidate (e.g., database management system, emulators, operating systems, languages, etc.). Non general packages are to be purchased.	Delphi 6 Visio 2000	Delphi 6 Visio 2000	MS Visual C++ 6.0 Visio 2000

Table 3.1. Candidate Systems Matrix (Continued).

Characteristics	Candidate 1	Candidate 2	Candidate 3
<p>Application Software</p> <p>A description of the software to be purchased, built, accessed, or some combination of these techniques</p>	Custom Solution	Same as candidate 1	Same as candidate 1
<p>Method of Data Processing</p> <p>Generally some combination of online, batch, deferred batch, remote batch, and real time.</p>	2 Tiered Client/Server	Same as candidate 1	Same as candidate 1
<p>Out Devices and Implications</p> <p>A description of output devices that would be used, special out put requirement (e.g., network, preprinted forms, etc), and output considerations (e.g., constraints)</p>	<p>(1) HP Laser 1000 Laser printers</p> <p>(1) OKI ML380 Dot-matrix printers</p>	Same as candidate 1	Same as candidate 1
<p>Input Devices and Implications</p> <p>A description of input devices for work that use input devices (e.g., key board, mouse, etc). special input requirements.</p>	Keyboard & Mouse	Keyboard & Mouse	Keyboard & Mouse
<p>Storage Devices and Implications</p> <p>Brief description of 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.</p>	<p>MS SQL Server</p> <p>2000 DBMS</p> <p>with 100 GB</p> <p>capability</p>	<p>Oracle 9i Database</p> <p>With 500 GB</p> <p>capability</p>	Same as candidate 2

Table 3.2. Feasibility Analysts Matrix.

Feasibility Criteria	Weight	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 both user management, user and organization perspective</p>	30%	<p>Fully supports user requirements and current business processes would have to be modified to take advantages of software functionality</p> <p>Score: 100</p>	Same as candidate 1 Score: 100	<p>Same as candidate 1</p> <p>Score: 100</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 of the technical expertise needed to develop, operate, and maintain the candidate system.</p>	30%	<p>Delphi 6 Demonstration and presentation have agreed the transition will be simple and finding programmers will be easier than Visual C++</p> <p>Score: 100</p>	Same as candidate 1 Score: 100	<p>Required to hire or train Visual C++ expertise to perform modification for integration requirements</p> <p>Score: 85</p>

Table 3.2. Feasibility Analysts Matrix (Continued).

Feasibility Criteria	Weight	Candidate 1	Candidate 2	Candidate 3
Economic Feasibility	30%			
Cost to develop:		Approximately 415,000 Baht	Approximately 550,000 Baht	Approximately 580,000 Baht
Payback period (discounted):		Approximately 1.3 year	Approximately 1.7 year	Approximately 2.1 year
Net present values:		Approximately 1,128,944 Baht	Approximately 1,028,407 Baht	Approximately 233,359 Baht
		Score: 90	Score: 80	Score: 70
Schedule Feasibility	10%	10 months	Same as candidate 1	12-14 months
An assessment of how long the solution will take to design and implement.		Score: 100	Score: 100	Score: 60
Ranking	100%	91.50	88	77.56

### 3.4 Security and Control

The security and control in the proposed system is considered as one of the critical parts that needed to be in the system. Access to the program by unauthorized persons can destroy the whole system. Therefore, access should be controlled by username and password for login to the system at each level because the personnel data is a very sensitive one. Security and control are divided into three types as follow:

- (1) Operational security
- (2) Data security
- (3) User security

#### Operational Security

This type of security protects hardware and software from either international or inadvertent threats. At this level of security can be classified into three types as follows:

- (1) Password security
  - (a) Before entering the system, the user must be log in with username and password. The username can identify the status of the user and the password can verify through the computer system if you are the person who has requested access, and whether you have the authority to see or change the information associated with that account. For example, users can add or edit their information in some areas as attendance, leave and, etc. Unauthorized persons are not allowed to enter into the system.
  - (b) Never, ever share your password with anyone. If you believe someone else has gotten access to your password, please change it immediately.
  - (c) Select a password that is easy to remember, but hard to figure out. One good way to create a secure password is to choose a phrase of two or

three words and add a 2 or 3 digit number to the end of the phrase.  
Avoid choosing obvious words or dates such as a nickname or birth date.

- (d) To keep your passwords secure, the users should change their passwords regularly (at least every 3 months).

## (2) Hardware security

The computer should be turned off after use.

- (a) Always keep doors locked after use and restrict visitors' access to personnel room.
- (b) The UPS is used to smooth the current and prevent damages that may occur from electricity problems.

## (3) Software security

- (a) Always keep the system programs in a safe place in order to protect from unauthorized access or modification.

## Data Security

- (1) Restrict accesses to certain data items, such as read only data access.
- (2) Backup data every day in order to prevent data lost and to make a recovery when data is damaged. All backups should be stored in a safe place, such as in a fireproof.
- (3) Security logs of all changes made to data items.

## User Security

- (1) In the new system, the user managing the user rights access for each user to access only permission area. The permission has been granted or denied for each user.

- (2) Personnel staff should be trained with the skills in using some hardware in order to prevent human errors.
- (3) Inform users about the danger of computer viruses and the procedures to recognize and prevent them.
- (4) Monitor behavior at irregular intervals in order to ascertain that proper procedures are being followed.

### 3.5 Hardware and Software Requirement

The Call Center System will be designed based on 2-tier architecture, which is composed of thin clients and a fat server. The client computers are used as terminal computers and are connected to the server through the network. The server comprises of both application and database in which the main function is to provide requested services from clients. The details of both each client and the server computers are as shown as follows:

Table 3.3. The Hardware Specification for the Server.

Hardware	Specification
CPU	Pentium IV 2.53 GHz, or higher
Cache	512 KB or higher
Memory	512 MB or higher
Hard Disk	100 GB or higher
CD-Rom Drive	50X or higher
Floppy Drive	1.44 MB
Network Adapter	Fast Ethernet
Display Adapter	SVGA card
Display	17" SVGA monitor
UPS	1000VA

Table 3.4. The Software Specification for the Server.

Software	Specification
Operating System	Microsoft Windows 2000 Advanced Server
Database Server	Microsoft SQL Server 2000

Table 3.5. The Hardware Specification for Each Client Machine.

Hardware	Specification
CPU	Celeron II 1.2 GHz, or higher
Cache	256 KB or higher
Memory	256 MB or higher
Hard Disk	40 GB or higher
CD-Rom Drive	50X or higher
Floppy Drive	1.44 MB
Network Adapter	Fast Ethernet
Display Adapter	SVGA card
Display	15" SVGA monitor

Table 3.6. The Software Specification for Each Client Machine.

Software	Specification
Operating System	Microsoft Windows 2000 Professional
Application Software	Microsoft Office 2000

Table 3.7. The Printer for Client Machine.

Printer	Specification
Laser	HP Laser 1000
Dot-matrix	OKI ML 380



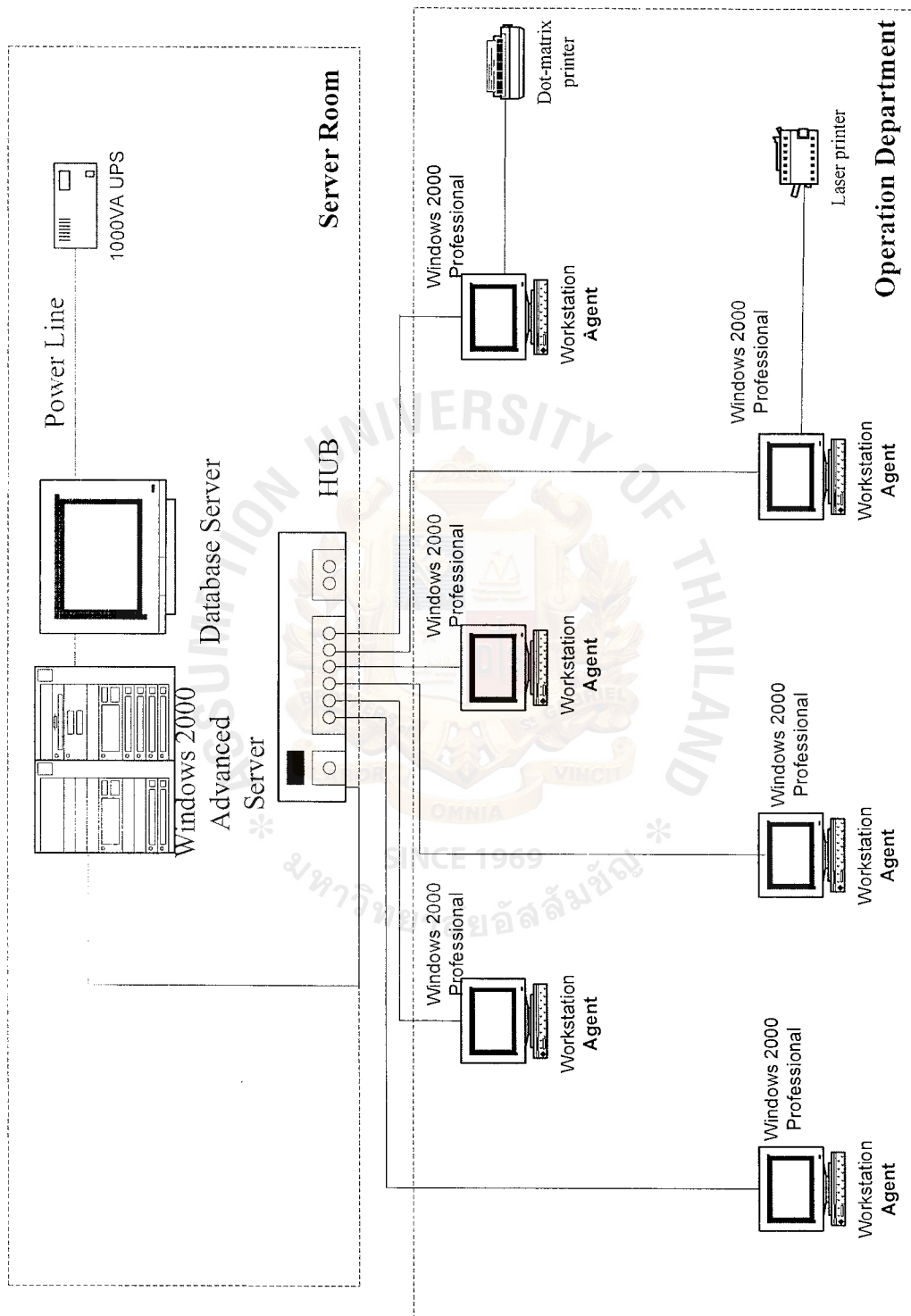


Figure 3.13. The Hardware Configuration of the Call Center System.

### 3.6 Cost and Benefit Analysis

#### 3.6.1 System Costs

##### (1) Costs of Manual System

Table 3.8. Manual System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
<u>Fixed Cost</u>					
Typewriter 2 units @ 8,500	17,000.00	—	—	—	—
Telephone 10 units @ 1,150	10,000.00	—	—	—	—
Calculator 10 units @ 1,000	11,500.00	—	—	—	—
Total Fixed Cost	38,500.00	—	—	—	—
<u>Operating Cost</u>					
<u>Salary Cost:</u>					
Manager 1 person @ 12,000	12,000.00	13,500.00	16,000.00	19,000.00	22,500.00
<u>Staff:</u>					
Agent 5 persons @ 6,500	32,500.00	36,950.00	41,495.00	45,919.00	50,511.00
Total Monthly Salary Cost	44,500.00	50,450.00	57,495.00	64,919.00	73,011.00
Total Annual Salary Cost	534,000.00	605,400.00	689,940.00	779,034.00	876,137.00
<u>Office Supplies &amp; Miscellaneous Cost:</u>					
Paper Per Annual	90,000.00	118,000.00	130,000.00	150,000.00	165,000.00
Stationary Per Annual	12,000.00	12,000.00	16,500.00	20,500.00	25,000.00
Utility Per Annual	60,000.00	60,000.00	60,000.00	60,500.00	60,050.00
Miscellaneous Per Annual	50,000.00	55,900.00	73,000.00	97,000.00	99,000.00
Total Annual Office Supplies & Miscellaneous Cost	212,000.00	245,900.00	279,500.00	328,000.00	349,050.00
Total Annual Operating Cost	746,000.00	851,300.00	969,440.00	1,107,034.00	1,225,187.00
Total Manual System Cost	784,500.00	851,300.00	969,440.00	1,107,034.00	1,225,187.00

Table 3.9. Five Years Accumulated Manual System Cost, Baht.

Year	Total Manual Cost	Accumulated Cost
1	784,500.00	784,500.00
2	851,300.00	1,635,800.00
3	969,440.00	2,605,240.00
4	1,107,034.00	3,712,274.00
5	1,225,187.00	4,937,461.00
Total	4,937,461.00	—

## (2) Costs of Computerized System

Table 3.10. Computerized System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
<u>Fixed Cost</u>					
Hardware Cost:					
Computer Server Cost	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00
Workstation Cost	89,000.00	89,000.00	89,000.00	89,000.00	89,000.00
Printer	8,200.00	8,200.00	8,200.00	8,200.00	8,200.00
UPS	2,450.00	2,450.00	2,450.00	2,450.00	2,450.00
Other equipment	4,750.00	4,750.00	4,750.00	4,750.00	4,750.00
Total Hardware Cost	154,400.00	154,400.00	154,400.00	154,400.00	154,400.00
Maintenance Cost:					
Maintenance Cost	—	—	—	33,894.00	33,894.00
Total Maintenance Cost	—	—	—	33,894.00	33,894.00
Software Cost:					
Software Cost	47,400.00	47,400.00	47,400.00	47,400.00	47,400.00
Network Cost	45,000.00	45,000.00	45,000.00	45,000.00	45,000.00
Total Software Cost	92,400.00	92,400.00	92,400.00	92,400.00	92,400.00
Implementation Cost:					
Training Cost	80,000.00	—	—	—	—
Set up Cost	75,000.00	—	—	—	—
Total Implementation Cost	155,000.00	—	—	—	—
Office Equipment Cost:					
Telephone 5 Units @ 2,640	13,200.00	—	—	—	—
Total Office Equipment Cost	168,200.00	—	—	—	—
Total Fixed Cost	415,000.00	246,800.00	246,800.00	280,694.00	280,694.00
<u>Operating Cost</u>					
People Cost:					
Agent 5 person @ 6,500	27,500.00	31,000.00	33,500.00	36,250.00	41,890.00
Total Monthly Salary Cost	27,500.00	31,000.00	33,500.00	36,250.00	41,890.00
Total Annual Salary Cost	330,000.00	372,000.00	402,000.00	435,000.00	502,680.00
Office Supplies & Miscellaneous Cost:					
Stationary	11,000.00	10,500.00	8,000.00	7,500.00	8,109.00
Paper	51,000.00	50,500.00	48,040.00	46,000.00	36,500.00
Utility	66,000.00	66,000.00	64,000.00	67,000.00	69,500.00
Miscellaneous	48,000.00	47,900.00	39,000.00	38,500.00	36,000.00
Annual Office Supplies & Miscellaneous Cost	176,000.00	174,900.00	159,040.00	159,000.00	150,109.00
Total Operating Cost	403,800.00	546,900.00	561,040.00	594,000.00	652,789.00
Total Computerized System Cost	818,800.00	793,700.00	807,840.00	874,694.00	933,483.00

Table 3.11. Five Years Accumulated Computerized Cost, Baht.

Year	Total Computerized Cost	Accumulated Cost
1	818,800.00	818,800.00
2	793,700.00	1,612,500.00
3	807,840.00	2,420,340.00
4	874,694.00	3,295,034.00
5	933,483.00	4,228,517.00
Total	4,228,517.00	—

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

Table 3.12. The Comparison of the System Costs, Baht.

Year	Accumulated Manual Cost	Accumulated Computerized Cost
1	784,500.00	818,800.00
2	1,635,800.00	1,612,500.00
3	2,605,240.00	2,420,340.00
4	3,712,274.00	3,295,034.00
5	4,937,461.00	4,228,517.00

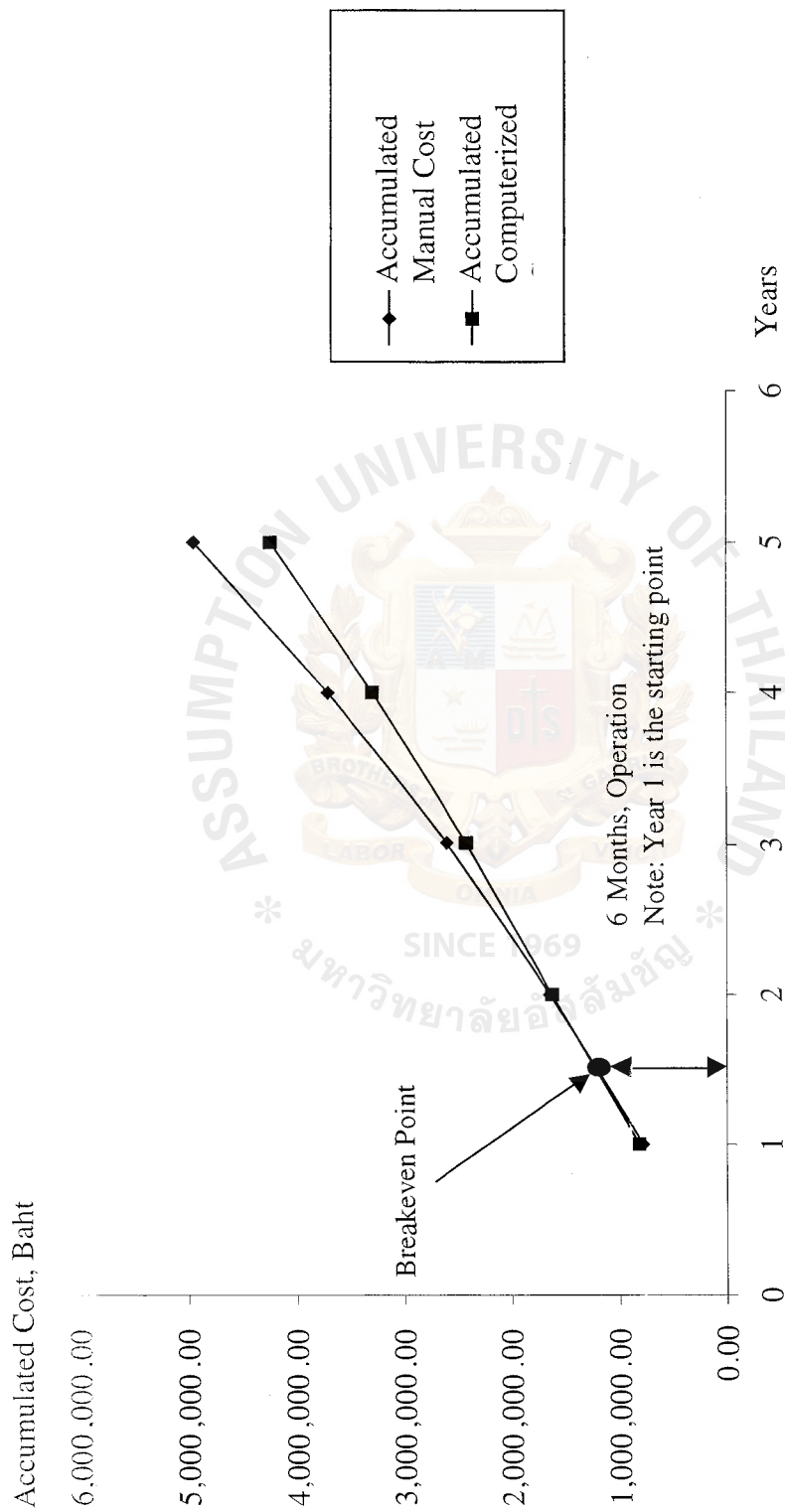


Figure 3.14. Cost Comparison between Manual and Computerized System.

### 3.6.2 System Costs

#### (1) Payback Analysis for Computerized System

As shown in Table 3.13, it will take approximately 1.3 years to pay back for the initial investment for candidate 1, approximately 1.7 years for candidate 2, and approximately 2.1 for candidate 3. Assuming that the payback period guideline states that all investment must have a payback period of less than or equal to 5 years. As a result both candidates 1 and 2 are worthy of to investment in. Besides, the net present values of both candidates are determined. The candidate 1 yields a net present value of 1,128,944 and 1,028,407 for the candidate 2. When comparing the candidate 1 with the candidate 2, the candidate 1 identifies greater positive net present value. This shows that the candidate 1 is the best investment and means that if we invest 415,000 at 12 percent for five years, we will earn the same profit that we would make by implementing this information system solution.

Table 3.13. Payback Analysis for Candidate Solution 1, Baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-415,000					
Operations & maintenance cost:		-43,600	-47,960	-52,756	-58,032	-63,835
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted costs (adjusted to present value):	-415,000	-38,935	-38,224	-37,562	-36,908	-36,194
Cumulative time-adjusted costs over lifetime:	-415,000	-453,935	-492,159	-529,721	-566,629	-602,824
Benefit derived from operation of new system:	0	402,000	442,200	486,420	535,062	588,568
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (current of present value):	0	358,986	352,433	346,331	340,299	333,718
Cumulative time-adjusted benefits over lifetime:	0	358,986	711,419	1,057,750	1,398,050	1,731,768
Cumulative lifetime Time adjusted costs +benefits:	-415,000	-94,949	219,260	528,029	831,421	1,128,944
The Payback Period is approximately 1.3 years						

## Payback Analysis

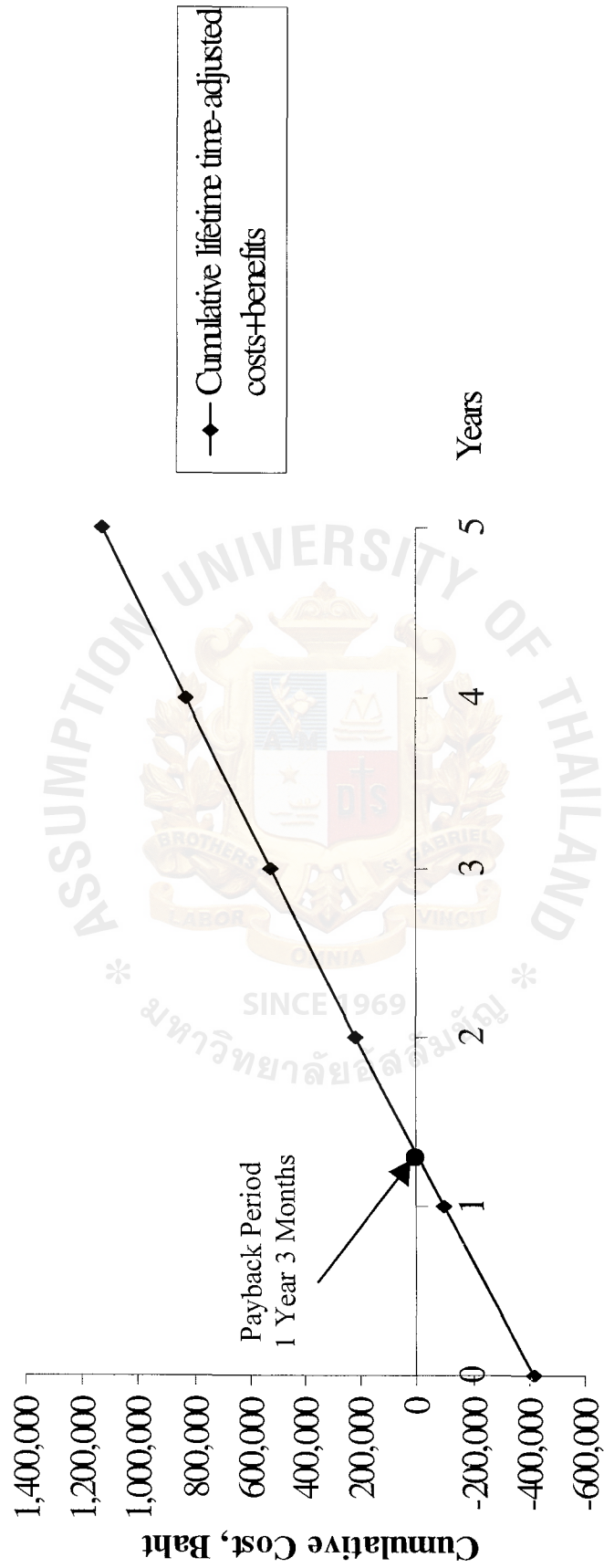


Figure 3.15. Payback Analysis Graph for Candidate Solution 1.

Table 3.14. Payback Analysis for Candidate Solution 2, Baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-550,000					
Operations & maintenance cost:		-43,600	-47,960	-52,756	-58,032	-63,835
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted costs (adjusted to present value):	-550,000	-38,935	-38,224	-37,562	-36,908	-36,194
Cumulative time-adjusted costs over lifetime:	-550,000	-588,935	-627,159	-664,721	-701,629	-737,824
Benefit derived from operation of new system:	0	410,000	451,000	496,100	545,710	600,281
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (current of present value):	0	366,130	359,447	353,223	347,072	340,359
Cumulative time-adjusted benefits over lifetime:	0	366,130	725,577	1,078,800	1,425,872	1,766,231
Cumulative lifetime Time adjusted costs +benefits:	-550,000	-222,805	98,418	414,079	724,242	1,028,407
The Payback Period is approximately 1.7 years						

## Payback Analysis

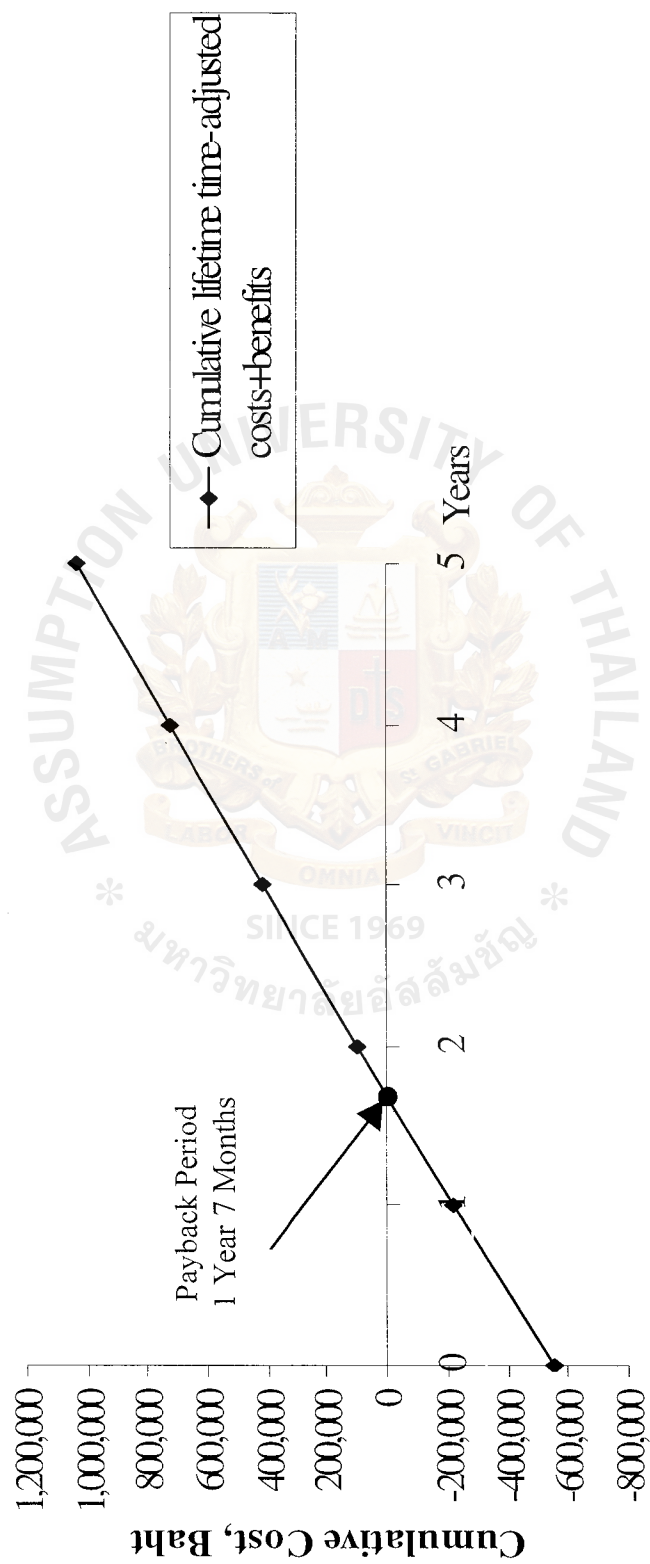


Figure 3.16. Payback Analysis Graph for Candidate Solution 2.

Table 3.15. Payback Analysis for Candidate Solution 3, Baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-580,000					
Operations & maintenance cost:		-43,600	-47,960	-52,756	-58,032	-63,835
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted costs (adjusted to present value):	-580,000	-38,935	-38,224	-37,562	-36,908	-36,194
Cumulative time-adjusted costs over lifetime:	-580,000	-618,935	-657,159	-694,721	-731,629	-767,823
Benefit derived from operation of new system:	0	350,000	385,000	423,500	465,850	512,435
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (current of present value):	0	312,550	306,845	301,532	296,281	290,551
Cumulative time-adjusted benefits over lifetime:	0	312,550	619,395	920,927	1,217,208	1,507,759
Cumulative lifetime Time adjusted costs + benefits:	-580,000	-306,385	-37,764	226,206	485,579	739,936
The Payback Period is approximately 2.1 years						

## Payback Analysis

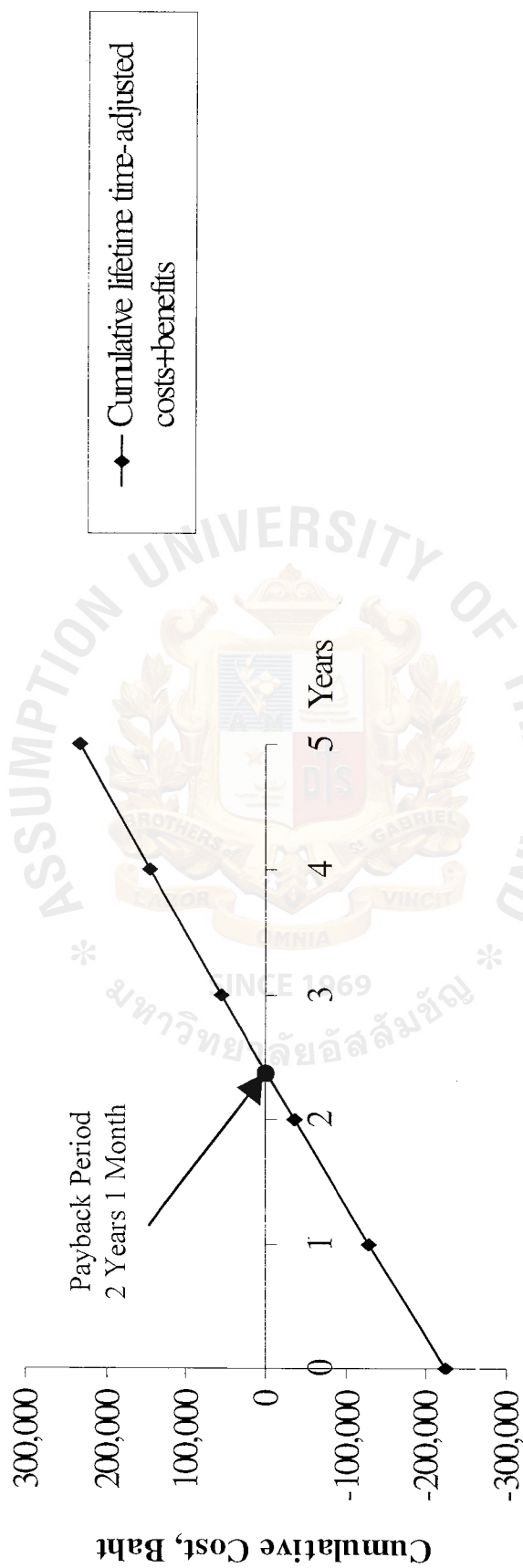


Figure 3.17. Payback Analysis Graph for Candidate Solution 3.

## **IV. PROJECT IMPLEMENTATION**

### **4.1 Overview of Project Implementation**

A smooth transaction from the old system to the new system is performed in system implementation. System Implementation is the construction of the new system and includes all the activities that are related to preparing the system for end users. The following activities are carried out in the typical process of the System Implementation phase.

- (1) Software acquisition, development and installation
- (2) Hardware acquisition and installation
- (3) Personnel training
- (4) Site preparation
- (5) Data preparation
- (6) Testing
- (7) Conversion
- (8) Documentation

Successfully system implementing can ensure that propose system is operational and normal start-up problems are totally completed and solved before it will be replaced in the operation.

#### **Software Acquisition, Development and Installation**

The installation of the software includes installing of Windows 2000 Advanced Server for the server and Windows 2000 Professional for clients, Microsoft SQL Server 2000, Delphi, and the Call Center System on the server. The network system is tested to ensure that the client workstation can access programs and database on the server. Then users and security scheme are created and set up in the system.

## Hardware Acquisition and Installation

The existing system is manually processed therefore new hardware and computers are required. This phase consists of installing hardware components, such as computers, networks, and miscellaneous equipment. After the whole system is set up, Client computers will be connected through the system network, so that communication is enabled to perform via terminal computers.

## Personnel Training

User training can be done prior to or in parallel with both the activities above. The persons who will be associated with or affected by the system, must know in detail as to what their role will be, how they can use the system, and what the system will or will not do. Both systems operators and users need such training.

### (1) System operators

They are the persons who are responsible for keeping the system running as well as providing the necessary supporting services. Their training must ensure that they are able to handle all possible operations. Those persons are such as managers or computer operators. The training is needed for system operators on Windows 2000 Advanced Server, Window 2000 Professional, Microsoft SQL Server 2000, Delphi, and the Call Center System.

### (2) Users

Users are agents who will be using the system in assistance to their work. User training involves equipment usage and practical system operating. The operation of system training emphasizes on the data-handling activities and procedures. This includes adding data or new transaction

editing data formulating enquiries, deleting data, understanding the work flows and producing report in all the modules in the system.

### Site Preparation

Computer site operation comes before the installation of the new system. This phase, site preparation involves with installation of electrical and network equipment. Electrical installation includes the electrical wiring and replacement of outlets if they are not already in place.

### Data Preparation

Since the new system will be computerized, traditional files are needed to prepare for transferring to the system as a database. Clerks as key in operators are required to input those data in the database as well. The conversion of the traditional file to the database needs a careful preparation because data fields in the database need the right input format.

### Testing

Testing is to ensure that all programs are free of errors. There are three steps of the test as follows:

#### (1) Sub testing

This test is performed on individual modules. Whether they are main programs, subroutines, subprograms, blocks or paragraph. There will be a test on every path through the programs. The test cases are developed to result in executing every instruction in the programs or modules.

#### (2) Unit testing

It is the test whereby all the modules that have been coded and stub tested are tested as an integrated unit.

(3) System unit

This test ensures that all isolated integrated units are properly working when replaced in the whole system.

Conversion

For preparing the conversion plan, one strategy, called parallel conversion, is used. It means that both the old and new systems are operated for some period of time. This is done to ensure that all majors' problems in the new system have been solved before the old system is discarded. The final cutoffs may be gradual that the old system is terminated, as portions of the new system deemed adequate. The new system is placed into operation because major errors have been fixed at the beginning.

Documentation

Communication skills are essential to the successful completion of a project. Two forms of communication that are common to systems development projects are documentation and presentations.

(1) Documentation

It is the activity of recording facts and specifications for a system for current and future reference. The installation strategy used in this project is parallel conversion that both the old and the new systems are operated for the beginning period. This ensures that all major problems in the new system have been solved before the old system, which is largely manual is discarded. The final cutoff is abrupt that the old system is terminated and the new system is replaced into the operation because the major errors have been fixed at the beginning.

## (2) Presentation

It is the activity of communicating findings, recommendations and documentation for review by interest users and managers. Presentation may be either written or verbal.

### 4.2 Test Plan

Test plan is very important for the development of the proposed system because it can be used to discover hidden failure, bug, error and any needed requirement that cannot be discovered at the design stage.

The following are required steps for the test plan.

#### (1) Test program logic plan

In this step, the programmer will check all program functions to see any error or bug in any function of the program. The programmer will test the program in three levels.

- (a) Test individuals object in the program to see how well they perform their functions.
- (b) Test each page of program to see whether pages have any error or not and how well each object in program pages works with each other.
- (c) System testing at this level will ensure that our system program is working properly when integrated with hardware and other system software.

#### (2) Test program with sample data and invalid data plan

This step will test the program by input of sample data to see how the program will process them. Programmers and users will look at the output of the program and compare it with the prepared correct results.

This step will test the correctness of data processing in the system.

(a) Test with individual object

This test level will discover how each object in the system process of a sample data is.

(b) Test with individual page

This test level will discover how all objects in each program page processes a sample data and to see a new requirement for the user. System development team can use this requirement in order to improve this program. Also see how each object in each page is linked together in data processing process.

(c) Link testing within a system

This testing is implemented to ensure that each object linking works properly. And see how each individual page in the system is interdependent linked as needed or not. All sample data will input into the system to ensure there is no problem and we also test by entering invalid data to see whether the program can detect it or not.

(3) System testing plan

All users and programmers will test the proposed system by opening full system operation. In full operation, both hardware and software will be tested with a sample of data to see how the proposed system works and to ensure that there is no error or malfunction occurred in the system. Also checking all required output is needed to see correctness and test all mistakes that may occur in the system to see whether the error detection procedure can detect it or not and how the system will detect and correct it.

Testing an operation procedure is required for users in the system to ensure that all users are clear and familiar with the procedure.

(4) Backup and recovery testing plan

This testing is an important testing for the proposed system. Users must test backup procedure for the system to see any difficulty that may occur in the system and to test some errors that can occur during backup process such as power failure, program error and data error.

(5) Concurrent testing plan

Before replacing the existing system with the new proposed system, it is required that both the existing system and the proposed system are run concurrently for one month to see any effects of the proposed system on the Whizz-Bang Book Store and ensure that the proposed system can truly replace the existing system. This testing also can discover more users' needs in a real working environment and if an error occurs, the development team can continue to correct it to ensure smoothness of operation.

#### **4.3 Conversion**

When the system test has been totally completed, the new system is ready to run and be in operation. However, the conversion plan is needed to provide the smooth transition from the old system to the new system.

The steps have to be followed.

- (1) Collect and review the design specification of the new system to identify database installation and needs of user training.
- (2) Build the schedule for database installation.
- (3) Identify a training program and schedule for system users.
- (4) Develop a detailed installation strategy to follow for converting from the existing system to the new system.

The parallel conversion is chosen in this project because it affects the system less. Both the old and the new system are operated together for the beginning period. This is done to ensure that all major problems in new system have been resolved before the old system is discarded. This strategy minimizes the risk of major flows in the new system-causing harm to the Whizz-Bang Book Store.

- (5) To make a final test for new system called “A system acceptance test”. It uses real data over an extended time period. In this project, the beta testing or validation is suitable for this Whizz-Bang Call Center System.

The validation testing is a test that runs the system in a live environment using real data and follows the five steps below.

- (a) System performance

The throughput and response time for processes have to meet a normal processing workload.

- (b) Peak workload processing performance

The new system has to handle the workload. If not, the hardware and software have to be improved to increase efficiency.

- (c) Human engineering test

The new system has to be easy to learn for agents.

- (d) Method and procedure test

The methods and procedures have to be modified if they are proved to be inefficient and awkward from the users’ point of view.

- (e) Backup and recovery testing

The loss of data is made to test the recovery in case of disaster.

The time and data is checked to ensure that they work very well.

## **V. CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Conclusions**

The existing Call Center System is studied by analyzing the current problems and user requirements, interviewing agents and supervisors in Operation Department and also reviewing the existing forms and documents. In order to satisfy the user requirements in which fast and accurate processing are emphasized; it is time consuming and is not appropriate to have such a manual system to perform the tasks in the Operation Department. Beside, the studying of the existing system has also defined the weakness and areas for improvement.

The proposed system is designed and implemented to replace the manual operations in the area of the Operation Department. The manual operations involve high cost and yield unsatisfactory productivity and customers. The computerized system is expected to improve the efficiency as well as reducing the operation costs. We can make the conclusion that it is concerned with the development of the system as follows:

#### **(1) Cost-benefit Analysis**

Approximately, it is expected to take about 6 months to get to breakeven point where the costs of existing and proposed system are equal. After that, all benefits gained from the system will totally be the surplus for the Whizz-Bang Company. The lifetime of the system is estimated to be more than 5 years.

#### **(2) Costs reduction**

The computerized system will help reduce workforce required in manual system. Thus, the Whizz-Bang Company will need fewer staffs to perform the computerization. We can expect to a 20% of workforce reduced as well as reduction of other costs in the new system.

(3) Customer satisfaction

Without measuring in terms of money, there is another benefit, which is customer satisfaction. In other words, the customer will be satisfied to all services of the call center so the customers may be back to buy another products again next time. Therefore, the call center will increase sales and productivity.

(4) Better decision making and planning

With the computer system involved, the human errors and mistakes are decreased and other management levels can get the more correct information at the right time for decision making and planning.

In addition, the user requirements are fulfilled by having the computerized database system that keeps customer records, history, information required, customer order and can share information among all the relevant users.

The proposed system is designed to provide suitable solution, respond to the user requirements, and increase more utilization for the system. It helps the agents to increase efficiency in processing time and quality of agents.

Regarding to the table of achievement as shown in Table 5.1 that shows the performance in terms of processing time on some processes of the proposed system in comparison with the existing system. As we can see, the proposed system provides faster response than the existing system.

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

Process	Existing System	Proposed System
1.Customer Information requesting	3-5 minutes	10 seconds
2.History of Customer	15 minutes	30 seconds
3.Product Information	3-5 minutes	15 seconds
4.Issue Invoice	5 minutes	1 minute
5.Generate Report	2-3 days	1 minute

By considering the table of achievement, it shows those relevant processes of the existing system need approximately 72 hours to be done all processes. On the other hand, the proposed system needs only 3 minutes to finish those processes. Consequently, we obviously see that the proposed system can help this workgroup works more efficiently by reducing time and it will increase revenue to the company.

## 5.2 Recommendations

The Call Center System is currently designed and developed for handling current business user requirements in the Operation Department of Whizz-Bang Book Store Company. Presently, even though sufficient functional requirements are embedded into the system, there still could be some other opportunities and directives to further develop and expand the system architecture and configuration.

The multi-tier architecture with web-based application will be a great future option, which can save costs in the long term when number of agent is increasing. Web-based application can support expanding call center in the future where agents can be based on other sites and can access the Call Center System through the Internet.

According to the new system, which is newly designed and developed, Operation Department needs to be familiar with and be able to operate the new system. To prevent any problems from occurring in the new system, the company should train the user to

have some basic knowledge of computer skills and software development along with intensive monitoring at the beginning when the new system is started.

Finally, the company should employ a full-time staffs, who can facilitate and take care of the system, and also have the responsibility of help-desk to solve all problems with the computerized system. Therefore, it can help to save time and cost.





**APPENDIX A**  
**INTERFACE DESIGN**

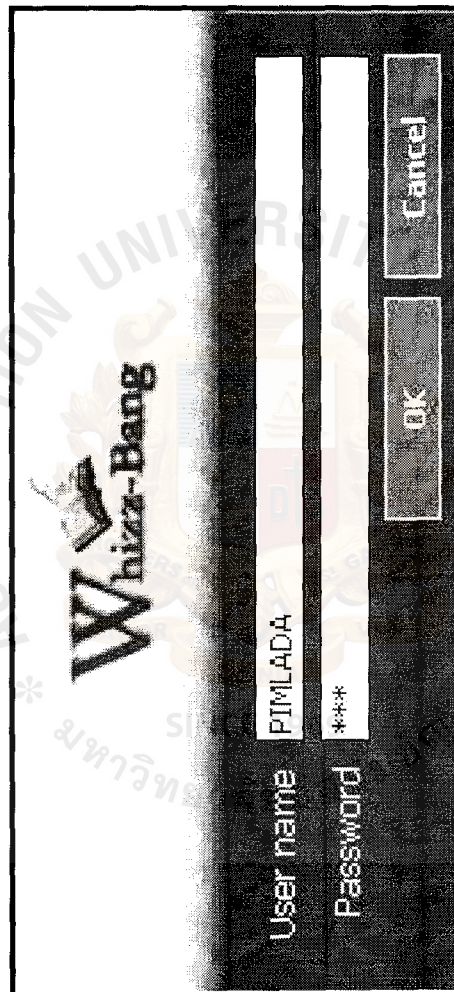


Figure A.1. Access Security Screen.



Figure A.2. Stand by Screen.

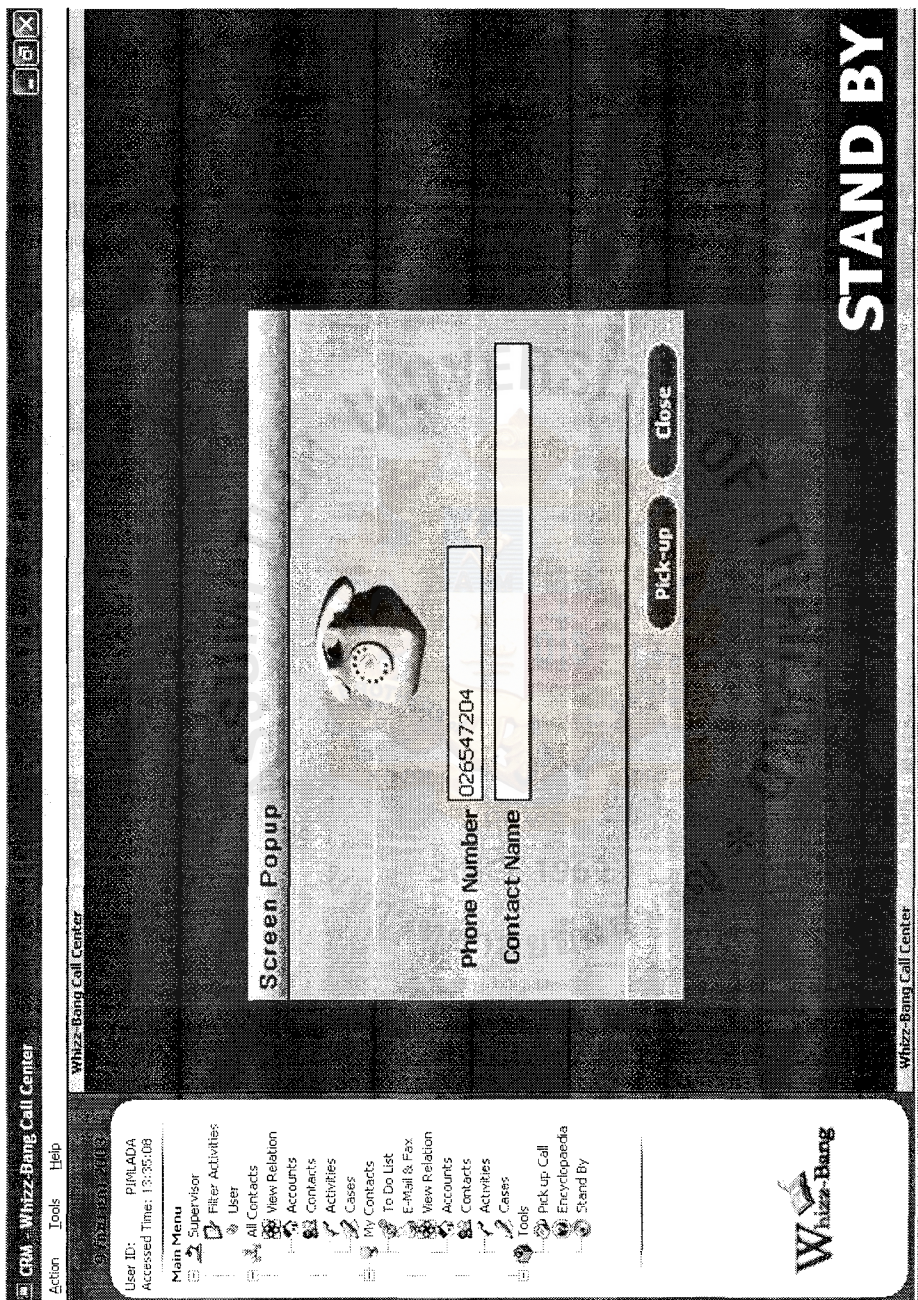


Figure A.3. Calling Pop up Screen.

CRM - Whizz-Bang Call Center

Action

Tools

Help

9:00 AM 2/13

User ID: PIMLADA

Accessed Time: 13:35:08

Supervisor

Filter Activities

User

All Contacts

View Relation

Accounts

Contacts

Activities

Cases

My Contacts

To Do List

E-Mail & Fax

View Relation

Accounts

Contacts

Activities

Cases

Tools

Pick up Call

Encyclopedia

Stand By

Duration Time

00:00:00

Whizz-Bang

Customer Search

Customer Information

History of Customer

History of Order

Search Criteria

Name

Surname

PhoneNo

Total Result

0

Contact ID

Name

Surname

Phone NO

Customer Search

Customer Information

History of Customer

History of Order

Search Criteria

Name

Surname

PhoneNo

Total Result

0

Contact ID

Name

Surname

Phone NO

Inbound

Greeting

"Whizz-Bang Call Center"

I am "Pimlada"

May I help you?

May I have your name, please?

Select a response

Information

Complaint

Order Taking

Others

Finish

Instruction

1. Welcome & Introduce yourself.

2. Search for customer data by using customer information (Name, Surname, Tel.no.)

3. Select a response.

Delete Case

Figure A.4. Main Page Of Pick up Call Screen.

65

CRM - Whizz-Bang Call Center

Action

Tools

Help

9 February 2003

User ID: PIMLADA

Accessed Time: 13:35:03

Supervisor

User

Filter Activities

All Contacts

View Relation

Accounts

Contacts

Activities

Cases

To Do List

E-Mail & Fax

View Relation

Accounts

Contacts

Activities

Cases

Tools

Pick up Call

Encyclopedia

Stand By

Duration Time

00:00:00

Whizz-Bang

Customer Search

Customer Information

History of Customer

History of Order

Search Criteria

Name

Su\*

Surname

PhoneNo

Total Result

7

Contact ID	Name	Surname	Phone NO
7	Suchada		029525566
7	Suchada		016895256
9	Sunanta	Kijana	012566321
6	Sunisa	Srivichien	019963563
5	Suphod		029755119
10	Suvila	Lira	026652332
8	Suvimon		029853500

Inbound

Greeting

"Whizz-Bang Call Center"

I am "Pimlada"

May I help you?

May I have your name, please?

Select a response

Information

Complaint

Order Taking

Others

Finish

Instruction

1. Welcome & Introduce yourself.

2. Search for customer data by using customer information (Name, Surname, Tel.no.)

3. Select a response.

Delete Case

Figure A.5. Customer Search Screen.

CRM - Whizz-Bang Call Center

Action

Tools

Help

User ID: PIMLADA

Accessed Time: 13:35:08

Supervisor

Filter Activities

User

All Contacts

View Relation

Accounts

Contacts

Activities

Cases

My Contacts

To Do List

E-Mail & Fax

View Relation

Accounts

Contacts

Activities

Cases

Tools

Pick up Call

Encyclopaedia

Stand By

Duration Time

00:15:23

Whizz-Bang

Contact Detail

Customer Search

Customer Information

History of Customer

History of Order

Inbound

Incoming Phone No.

Hang up

Unknown Customer Name and Phone

Unknown Customer Name

Name

Suchada

Surname

Phone :

Number

Ext

Type

016895256

029525586

Phone No

Ext

Type

016895256

029525586

Mobile Phone

Ok

Cancel

Inbound

Greeting

"Whizz-Bang Call Center"

I am "Pimlada"

May I help you?

May I have your name, please?

Select a response

Information

Complaint

Order Taking

Others

Finish

Instruction

1. Welcome & introduce yourself.

2. Search for customer data by using customer information (Name, Surname, Tel.no.)

3. Select a response.

Delete Case

Figure A.6. Customer Search Result Screen.





CRM - Whizz-Bang Call Center

Action

Tools

Help

User ID: PJMLADA

Accessed Time: 13:35:08

Supervisor

Filter Activities

User

All Contacts

View Relation

Accounts

Contacts

Activities

Cases

My Contacts

To Do List

E-Mail & Fax

View Relation

Accounts

Contacts

Activities

Cases

Tools

Pick up Call

Encyclopedia

Stand By

Duration Time

00:24:40

Whizz-Bang

Contact Detail

Customer Search

Customer Information

History of Customer

History of Order

Inbound

Unknown Customer Name and Phone

Unknown Customer Name

Name

Suchada

Surname

Phone :

Number

Ext

Type

016895256

029525566

Phone No

Ext

Type

016895256

029525566

Unknown Customer

Ok

Cancel

Inbound

What information do you want, "Suchada" ?

Select a response

Whizz-Bang Book Store

Promotion Magazines

Special Activities

Others

Instruction

1. Ask for specific purpose.

2. Select a response

Hang up

Delete Case

Figure A.9. Information Selection Screen.



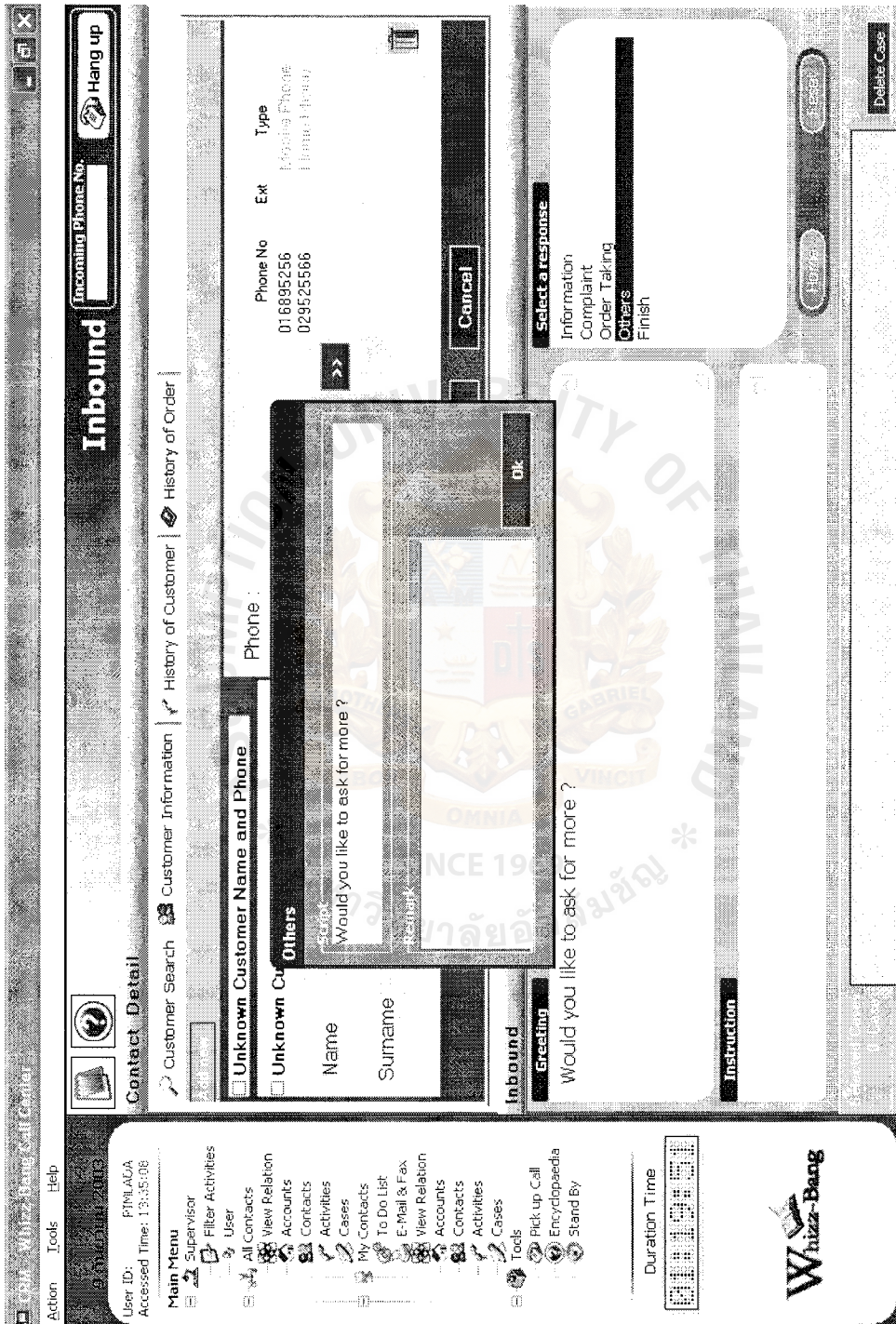


Figure A.11. Other Selection Screen.

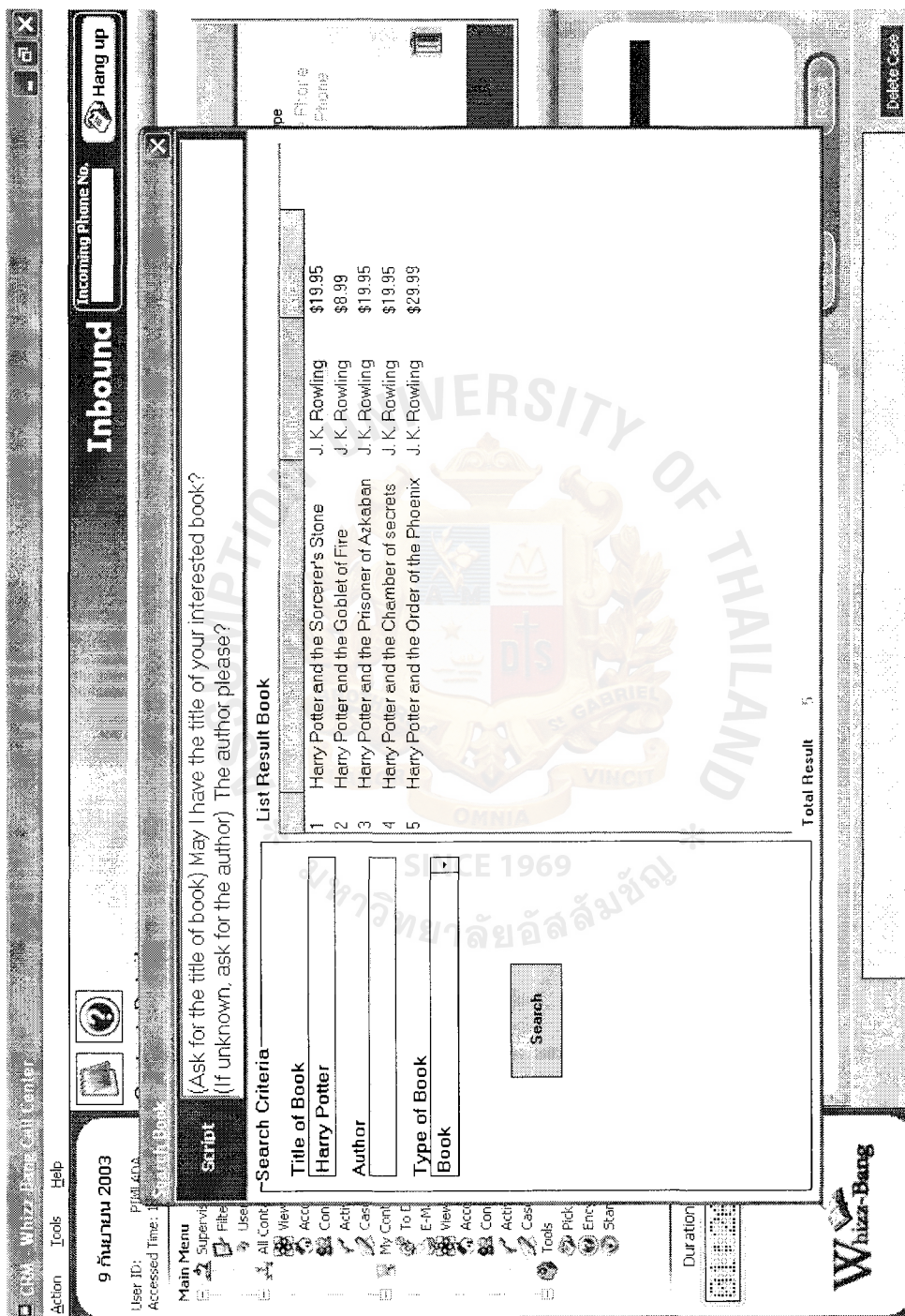


Figure A.12. (Order Taking) Search Product Screen.

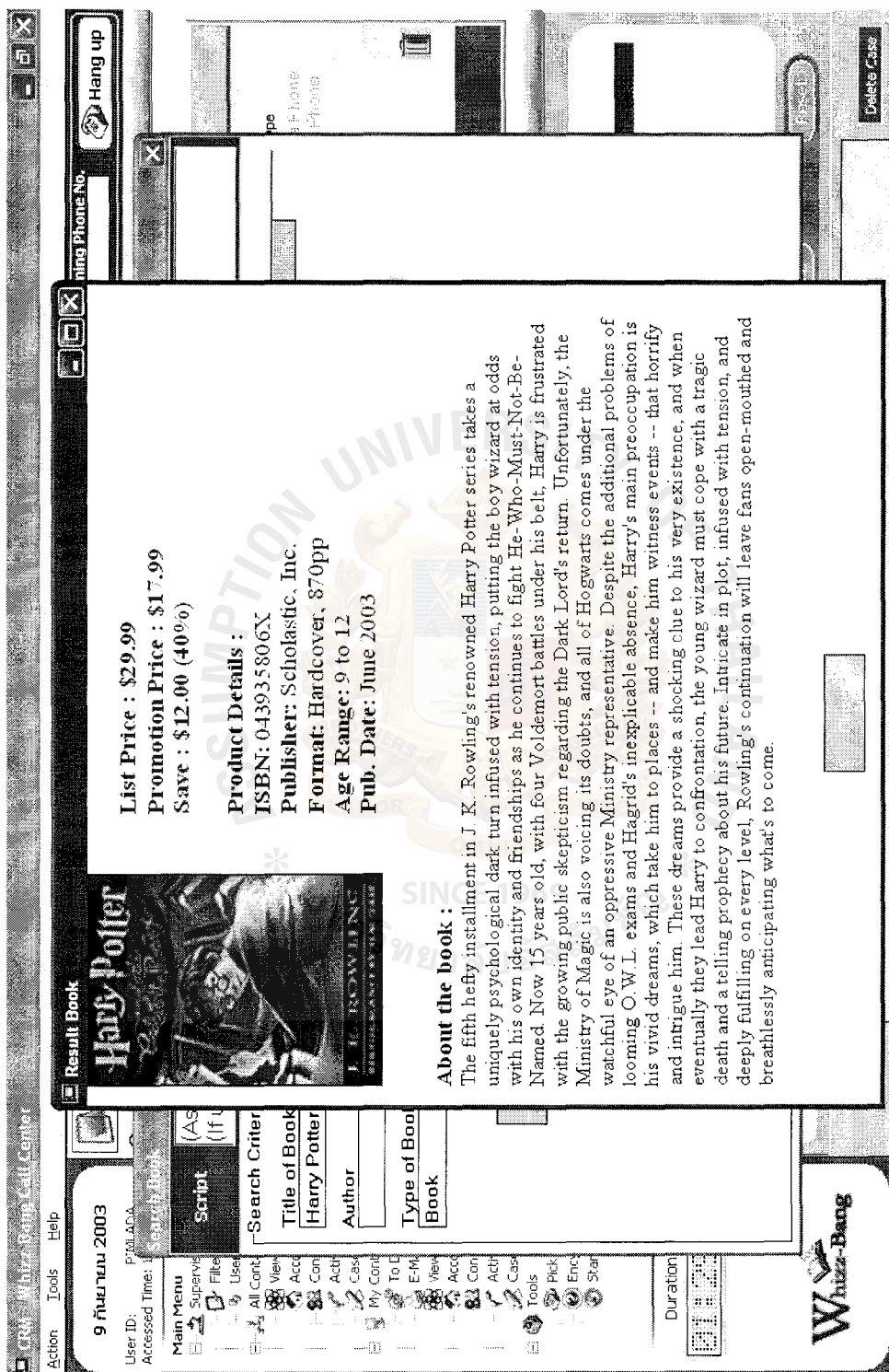


Figure A.13. (Order Taking) Search Product Result Screen.

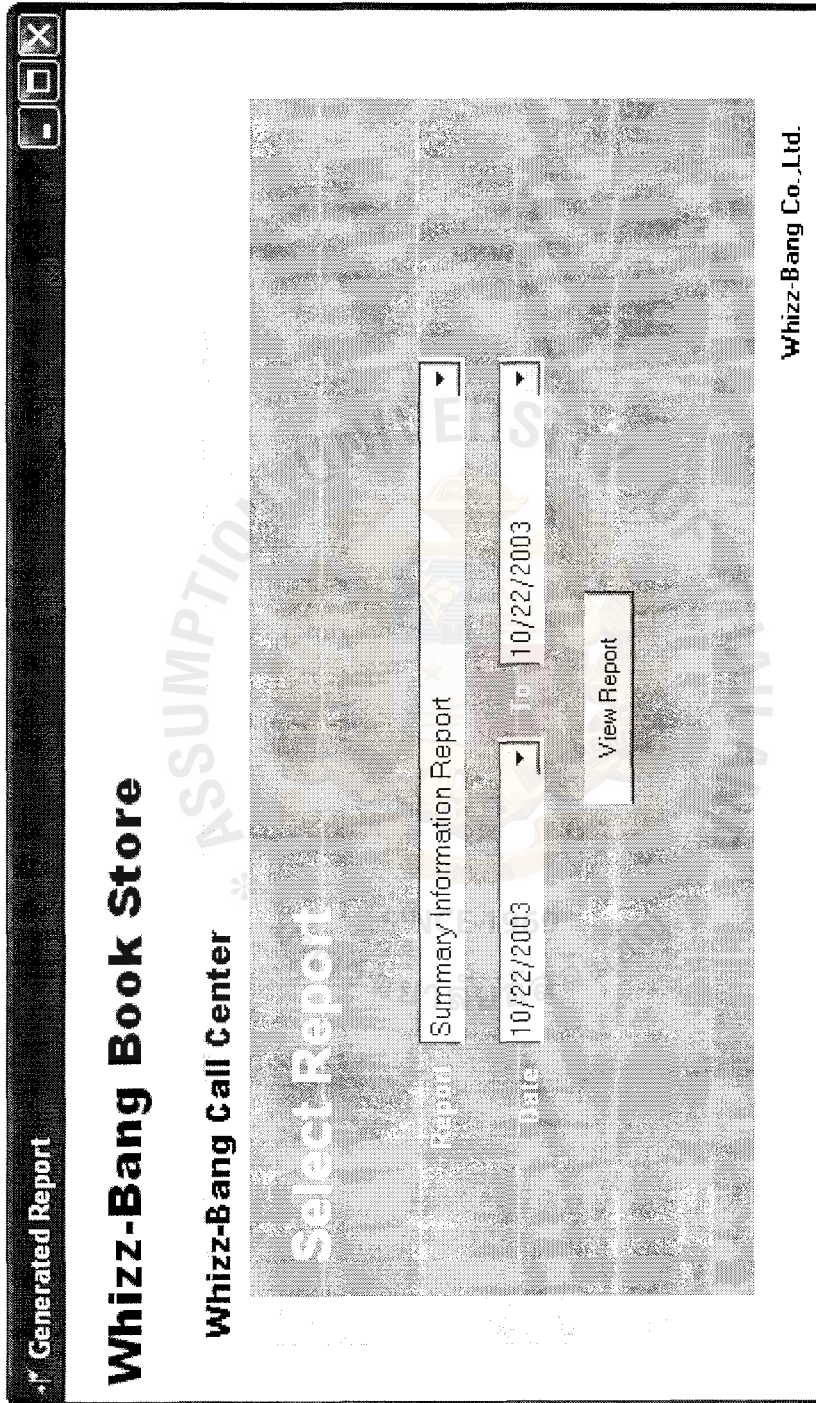


Figure A.14. Generated Report Screen.



**APPENDIX B**  
**REPORT DESIGN**

# Whizz-Bang Call Center

## Call Report

Date : 22 October 2003  
 Prepare By : Operation Department

Call Report			
Total Incoming Call	348	Call	
Maximum Talk Time	15.26	Min	
Minimum Talk Time	0.29	Min	
Average Talk Time	5.36	Min	

Figure B.1. Call Report.

# *Whizz-Bang Call Center* Call Traffic Report

Date : 22 October 2003  
Prepare By : Operation Department

Time Period	Total Call In	% Call In
08:00 - 09:00	24	6%
09:00 - 10:00	48	13%
10:00 - 11:00	40	11%
11:00 - 12:00	35	9%
12:00 - 13:00	30	8%
13:00 - 14:00	50	13%
14:00 - 15:00	35	9%
15:00 - 16:00	37	10%
16:00 - 17:00	29	8%
17:00 - 18:00	23	6%
18:00 - 19:00	12	3%
19:00 - 20:00	10	3%
Total	378	100%

Figure B.2. Call Traffic Report.

## *Whizz-Bang Call Center* Summary Report

Date : 22 October 2003  
Prepare By : Operation Department

Case	No. Of Case	%
Information	145	55%
Complaint	38	14%
Order Taking	78	29%
Other	4	2%
Total	265	100%

Figure B.3. Summary Report.

# *Whizz-Bang Call Center*

## Summary Report by Gender

Date : 22 October 2003  
 Prepare By : Operation Department

Case/Gender	Male		Female	
	No. Of Case	%	No. Of Case	%
Information	56	70%	72	64%
Complaint	12	15%	3	3%
Order Taking	10	13%	36	32%
Other	2	3%	1	1%
Total	80	100%	112	100%

Figure B.4. Summary Report by Gender.

## *Whizz-Bang Call Center*

### Inbound Report by Call

Date : 22 October 2003  
 Prepare By : Operation Department

No.	Rec Date / Time	Customer Name	Phone No.	Address	Duration(Min)
1	22/08/2003 8:54:53	Prontip	(PH) 026136737	3/74 Cheang-Wattana Laksi Bangkok	10.15
2	22/10/2002 9:42:15	Nittaya	(MP) 066266596	2 Moo4 LadPao Chakuiak Bangkok	7.43
3	22/10/2002 10:11:24	Supaporn	(PH) 022853519	3/55 Prachavach HadYai SongKha	7.12
4	22/10/2002 10:14:23	Suchada	(MP) 068182141		2.35
5	22/10/2002 11:29:12	Suranan Vichai	(MP) 013123476	1/89 Chiang-Mai University Chiang-Mai	4.12
6	22/10/2002 11:43:59	Tipsuda Nipanan	(PH) 043441200	7/11 Ramkumhang Rd, Bangkok	6.36
7	22/10/2002 12:07:50	N/A N/A	(PH) 025943146		9.11
8	22/10/2002 13:41:56	Chatupon	(PH) 026908920	115 Moo6 Ramkumhang Rd, Bangkok	5.56
9	22/10/2002 13:53:30	Nuttavit	(MP) 019412908 (PH) 032211451		1.05
10	22/10/2002 14:09:21	Jinda Panya	(PH) 029738064	1 Moo6 Cheang-Wattana Laksi Bangkok	10.15
11	22/10/2002 14:41:43	Somchai Karnkai	(PH) 075218154	Trang	2.33
Total Call : 11					

Phone No. --> MP = Mobile Phone, PH = Phone (Home), PO = Phone (Office), FO = FAX

Figure B.5. Inbound Report by Call.

# *Whizz-Bang Call Center*

## Summary Information Report

Date : 22 October 2003  
 Prepare By : Operation Department

Information Case	No. Of Case	%
Whizz-Bang Book Store	52	40%
Promotion	68	53%
Special Activity	9	7%
Other	0	0%
Total	129	100%

Figure B.6. Summary Information Report.

## *Whizz-Bang Call Center*

### Summary Complaint Report

Date : 22 October 2003  
 Prepare By : Operation Department

Complaint Case	No. Of Case	%
Unavailable Books	9	39%
Low Member Privilege	2	9%
Impolite Staffs	5	22%
Insufficient Shop	7	30%
Other	0	0%
Total	23	100%

Figure B.7. Summary Complaint Report.

## *Whizz-Bang Call Center*

### Information Detail Report

Date : 22 October 2003  
 Prepare By : Operation Department

No.	Rec Date / Time	Customer Name	Phone No.	Description
1	22/08/2003 8:54:53	Prontip	(PH) 026136737	Information (Promotion)
2	22/10/2002 9:42:15	Nittaya	(MP) 066266596	Information (Whizz-Bang Book Store)
3	22/10/2002 10:11:24	Supaporn	(PH) 022853519	Information (Special Activity)
4	22/10/2002 10:14:23	Suchada	(MP) 068182141	Information (Promotion)
5	22/10/2002 11:29:12	Suranan Vichai	(MP) 013123476	Information (Whizz-Bang Book Store)
6	22/10/2002 14:09:21	Jinda Panya	(PH) 029738064	Information (Whizz-Bang Book Store)
7	22/10/2002 14:31:13	Ldanan	(MP) 095052446	Information (Whizz-Bang Book Store)
8	22/10/2002 14:41:43	Somchai Kamkai	(PH) 025218154	Information (Special Activity)
				Total Case : 8

Phone No. --> MP = Mobile Phone, PH = Phone (Home), PO = Phone (Office), FO = FAX

Figure B.8. Information Detail Report.

## *Whizz-Bang Call Center*

### Complaint Detail Report

Date : 22 October 2003  
 Prepare By : Operation Department

No.	Rec Date / Time	Customer Name	Phone No.	Description
1	22/08/2003 8:54:53	Prontip	(PH) 026136737	Complaint (Impolite Staffs)
2	22/10/2002 10:11:24	Supaporn	(PH) 022853519	Complaint (Insufficient Shop)
3	22/10/2002 12:07:50	N/A N/A	(PH) 025943146	Complaint (Unavailable Books)
4	22/10/2002 13:41:56	Chatupon	(PH) 026908920	Complaint (Low Member Privilege)
5	22/10/2002 14:09:21	Jinda Panya	(PH) 029738064	Complaint (Other) Calling Call Center is too difficult.
6	22/10/2002 14:31:13	Ldanan	(MP) 095052446	Complaint (Insufficient Shop)

Total Case : 6

Phone No. --> MP = Mobile Phone, PH = Phone (Home), PO = Phone (Office), FO = FAX

Figure B.9. Complaint Detail Report.

## *Whizz-Bang Call Center*

### Other Detail Report

Date : 22 October 2003  
 Prepare By : Operation Department

No.	Rec Date / Time	Customer Name	Phone No.	Description
1	22/10/2002 12:07:50	N/A N/A	(PH) 025943146	Other (Call the wrong number)
2	22/10/2002 14:31:13	Ldanan	(MP) 095052446	Other (Call hang up during talking)

Total Case : 2

Phone No. --> MP = Mobile Phone, PH = Phone (Home), PO = Phone (Office), FO = FAX

Figure B.10. Other Detail Report.

# Whizz-Bang Call Center

## Order Detail Report

Date : 22 October 2003  
 Prepare By : Operation Department

No.	Rec Date / Time	Customer Name	Phone No.	Description
1	22/08/2003 8:54:53	Prontip	(PH) 026136737	Order Taking ( Learn English Easy Vol1 1 Unit )
2	22/10/2002 10:11:24	Supaporn	(PH) 022853519	Order Taking ( Harry Potter and the Order of the Phoenix 1Unit )
3	22/10/2002 13:53:30	Nuttavit	(MP) 019412908 (PH) 032211451	Order Taking ( Travel Thailand 2 Units )
4	22/10/2002 14:31:13	Ldanan	(MP) 095052446	Order Taking ( English-Thai Dictionary 1 Unit )

Total Case : 4

Phone No. --> MP = Mobile Phone, PH = Phone (Home), PO = Phone (Office), FO = FAX

Figure B.11. Order Detail Report.

Date	: 15/08/2003
Invoice ID	: 103403

**Whizz-Bang Company**  
**101 BBC Building Floor 9 Sukumvit Rd Wattana Bangkok 10110**

### Invoice

Customer Name	: Suchada Vichavanit
Address	: 1/31 Cheang Wattana Rd, Laksi , Bangkok 10210
Phone No.	: 0-1994-0982

No	Decription	Quantity	UnitPrice	Discount	Amount
1	Harry Pott and the Order of the Phoenix	1	\$29.99	\$12.00	\$17.99
Sub Total					\$17.99
Vat					0.00
Total					\$17.99

Figure B.12. Invoice.

## *Whizz-Bang Call Center*

### Monthly Best Sellers Report

Month : September 2003  
 Prepare By : Operation Department

No.	Title of Book	Unit	%
1	Harry Potter and the Order of Phoenix	236	40%
2	Learn English Easy	124	21%
3	Good Word Good Feeling	98	17%
4	Rich Kid Smart Kid	74	13%
5	Body Fit	52	9%
Total		584	100%

Figure B.13. Monthly Best Sellers Report.



**APPENDIX C**  
**PROCESS SPECIFICATION**

## PROCESS SPECIFICATION

Table C.1. Process Specification of Process 1.1.

Items	Descriptions
Process Name:	Process New Customer
Data In:	New Customer Information
Data Out:	Insert New Record
Process:	(1) Get customer data, customer name, address, mobile phone, home phone, fax, etc. (2) Add new call data, time of call, duration of call, etc.
Attachment:	(1) Customer (2) Data Store D1 : Call (3) Data Store D2 : Customer

Table C.2. Process Specification of Process 1.2.

Items	Descriptions
Process Name:	Process Update Customer
Data In:	Update Customer Information
Data Out:	Update Customer Information
Process:	(1) Update customer data (2) Add new call data, time of call, duration of call, etc.
Attachment:	(1) Customer (2) Data Store D1 : Call (3) Data Store D2 : Customer

Table C.3. Process Specification of Process 1.3.

Items	Descriptions
Process Name:	Process History Customer
Data In:	Customer Information
Data Out:	History Calls History Cases
Process:	(1) Receive customer Information (2) Check history calls of customer (3) Check history cases of customer
Attachment:	(1) Data Store D1 : Call (2) Data Store D2 : Customer (3) Data Store D3 : Case

Table C.4. Process Specification of Process 2.1.

Items	Descriptions
Process Name:	Process Customer Order
Data In:	Order Information
Data Out:	Confirm Order Request
Process:	(1) Receive order from customer (2) Add new case of order (3) Check for products and availability (4) Assign order date according to system date (5) Insert new order record to data store D4 and D5 (6) Send packing order to warehouse
Attachment:	(1) Customer (2) Data Store D2 : Customer (3) Data Store D3 : Case (4) Data Store D4 : Order (5) Data Store D5 : Order_Product (6) Data Store D6 : Product (7) Warehouse

Table C.5. Process Specification of Process 2.2.

Items	Descriptions
Process Name:	Process Customer Order Revision
Data In:	Order Information Revision
Data Out:	Confirm Request
Process:	(1) Receive order revision from customer (2) Add new case of order (3) Check for products and availability (4) Update order record to data store D4 and D5 (5) Send revision of packing order to warehouse
Attachment:	(1) Customer (2) Data Store D2 : Customer (3) Data Store D3 : Case (4) Data Store D4 : Order (5) Data Store D5 : Order_Product (6) Data Store D6 : Product (7) Warehouse

Table C.6. Process Specification of Process 2.3.

Items	Descriptions
Process Name:	Process Customer Order Cancellation
Data In:	Order Information Cancellation
Data Out:	Confirm Request
Process:	(1) Receive order cancellation from customer (2) Add new case of order (3) Check for products and availability (4) Delete order record to data store D4 and D5 (5) Send cancellation of packing order to warehouse
Attachment:	(1) Customer (2) Data Store D2 : Customer (3) Data Store D3 : Case (4) Data Store D4 : Order (5) Data Store D5 : Order_Product (6) Data Store D6 : Product (7) Warehouse

Table C.7. Process Specification of Process 2.4.

Items	Descriptions
Process Name:	Generate Order Report
Data In:	Order Information Order Case Time
Data Out:	Order Case Report Sale Report
Process:	(1) Receive case order from data store D3 (2) Receive product order from data store D5 (3) Select the period of time (4) Send order case report to operation department (5) Send sale report to marketing department
Attachment:	(1) Data Store D3 : Case (2) Data Store D5 : Order_Product (3) Operation Department (4) Marketing Department (5) Time

Table C.8. Process Specification of Process 3.1.

Items	Descriptions
Process Name:	Process Information Service
Data In:	Request Information
Data Out:	Response Information
Process:	(1) Add new information case to data store D3 (2) Get product's information from data store D6
Attachment:	(1) Customer (2) Data Store D3 : Case (3) Data Store D6 : Product

Table C.9. Process Specification of Process 3.2.

Items	Descriptions
Process Name:	Generate Information Report
Data In:	Time Information Cases
Data Out:	Information Report
Process:	(1) Receive information cases from data store D3 (2) Select the period of time (3) Send information report to operation department
Attachment:	(1) Data Store D3 : Case (2) Operation Department (3) Time

Table C.10. Process Specification of Process 4.1.

Items	Descriptions
Process Name:	Process Customer's Complaint
Data In:	Make Complaint
Data Out:	Complaint Cases
Process:	(1) Add new complaint case with detail to data store D3
Attachment:	(1) Customer (2) Data Store D3 : Case

Table C.11. Process Specification of Process 4.2.

Items	Descriptions
Process Name:	Generate Complaint Report
Data In:	Time Complaint Cases
Data Out:	Complaint Report
Process:	(1) Receive complaint cases from data store D3 (2) Select the period of time (3) Send complaint report to operation department
Attachment:	(1) Data Store D3 : Case (2) Operation Department (3) Time

Table C.12. Process Specification of Process 5.1.

Items	Descriptions
Process Name:	Process Of Other cases
Data In:	Make Other Case
Data Out:	Other Cases
Process:	(1) Add new other case with detail to data store D3
Attachment:	(1) Customer (2) Data Store D3 : Case

Table C.13. Process Specification of Process 5.2.

Items	Descriptions
Process Name:	Generate Other Case Report
Data In:	Time Other Cases
Data Out:	Other Case Report
Process:	(1) Receive other cases from data store D3 (2) Select the period of time (3) Send other report to operation department
Attachment:	(1) Data Store D3 : Case (2) Operation Department (3) Time

Table C.14. Process Specification of Process 6.1.

Items	Descriptions
Process Name:	Process Of Integrated Data
Data In:	Customer Information Order Information Order Product List Product Information
Data Out:	Complete Order Data
Process:	(1) Get customer information from data store D2 (2) Get order Information from data store D4 (3) Get order product list from data store D5 (4) Get product information from data store D6 (5) Assign new replication ID or Invoice ID (6) Arrange all data in predetermined format
Attachment:	(1) Data Store D2 : Customer (2) Data Store D4 : Order (3) Data Store D5 : Order_Product (4) Data Store D6 : Product

Table C.15. Process Specification of Process 6.2.

Items *	Descriptions
Process Name:	Process of Recorded Invoice Data
Data In:	Complete Order Data from process 6.1
Data Out:	Invoice Detail
Process:	(1) Get current date from the system and assign as the order date

Table C.16. Process Specification of Process 6.3.

Items	Descriptions
Process Name:	Process of Calculated Amount & Discount
Data In:	Invoice Detail from Process 6.2
Data Out:	Invoice Data
Process:	<ol style="list-style-type: none"> <li>(1) Calculate amount of each order item by multiplying quantity by unit price</li> <li>(2) Calculate subtotal by summing up all amounts of each order item</li> <li>(3) Receive discount rate percentage from promotion, otherwise assign 0 as default value</li> <li>(4) Calculate Discount amount by multiplying discount rate</li> <li>(5) Calculate total amount by minus subtotal with discount amount</li> <li>(6) Record invoice data to data store D7</li> </ol>
Attachment:	(1) Data Store D7 : Invoice

Table C.17. Process Specification of Process 6.4.

Items	Descriptions
Process Name:	Process Of Print Invoice
Data In:	Invoice Detail from process 6.3
Data Out:	Copies of Invoices
Process:	<ol style="list-style-type: none"> <li>(1) Arrange invoice detail in pre-determined format</li> <li>(2) Print copies of invoice</li> </ol>
Attachment:	(1) Finance & Account Department

Table C.18. Process Specification of Process 7.1.

Items	Descriptions
Process Name:	Process Of Create New Promotion
Data In:	New Promotion
Data Out:	Confirm Created Promotion
Process:	(1) Receive promotion from marketing department (2) Insert promotion data to data store D9
Attachment:	(1) Marketing Department (2) Data Store D9 : Promotion

Table C.19. Process Specification of Process 7.2.

Items	Descriptions
Process Name:	Process Of Add Product to Promotion
Data In:	Promotion Detail from process 7.1
Data Out:	Complete Created promotion
Process:	(1) Receive promotion detail from process 7.1 (2) Check for products and availability (3) Insert promotion's product to data store D8
Attachment:	(1) Data Store D6 : Product (2) Data Store D9 : Promotion (3) Data Store D8 : Product Promotion



**APPENDIX D**  
**DATA DICTIONARY**

## DATA DICTIONARY

Table D.1. Data Dictionary of Call Database.

Field Name	Meaning
CallID	The identification number of call
CustomerID	The identification number of customer
CallType	The type of call
Duration	The duration of call
CreateDate	The date of entry creation
Remark	The remark of call

Table D.2. Data Dictionary of Customer Database.

Field Name	Meaning
CustomerID	The identification number of customer
Name	The first name of customer
Surname	The last name of customer
Gender	The gender of customer
Birthdate	The birthday of customer
Age	The age of customer
Position	The position of customer within company
Address	The address of customer
City	The city of customer
PostCode	The post code of customer
Mobile_Phone	The mobile phone number of customer
Home_Phone	The home phone number of customer
Office_Phone	The office phone number of customer
Fax	The fax number of customer
Email	The email address of customer

Table D.3. Data Dictionary of Case Database.

Field Name	Meaning
CaseID	The identification number of case
CallID	The identification number of call
CaseDescID	The identification number of case description
CreateDate	The date of entry creation
Remark	The remark of call

Table D.4. Data Dictionary of Order Database.

Field Name	Meaning
OrderID	The identification number of order
CustomerID	The identification number of customer
CaseID	The identification number of case
OrderDate	The date of order
OrderStatus	The status of order
Remark	The remark of order

Table D.5. Data Dictionary of Order\_Product Database.

Field Name	Meaning
OrderID	The identification number of order
ProductID	The identification number of product
Unit	The unit of product's order
Total	The total of product's order

Table D.6. Data Dictionary of Product Database.

Field Name	Meaning
ProductID	The identification number of product
ProductType	The type of product
ProductName	The name of product
ProductDesc	The description of product
UnitPrice	The unit price of product
FileDesc	The description file of product

Table D.7. Data Dictionary of Invoice Database.

Field Name	Meaning
InvoiceID	The identification number of invoice
OrderID	The identification number of order
InvoiceDate	The date of invoice
InvoiceDiscount	The discount of invoice
InvoiceTotal	The total of invoice

Table D.8. Data Dictionary of Product\_Promotion Database.

Field Name	Meaning
ProductID	The identification number of product
PromotionID	The identification number of promotion
CreateDate	The date of entry creation
Active	Status of promotion

Table D.9. Data Dictionary of Promotion Database.

Field Name	Meaning
PromotionID	The identification number of promotion
PromotionName	The name of promotion
PromotionReleaseDate	The release date of promotion
PromotionStatus	The status of promotion
PromotionType	The type of promotion
CreateDate	The date of entry creation

Table D.10. Data Dictionary of CaseDesc Database.

Field Name	Meaning
CaseDescID	The identification number of case description
CaseDesc	The description of case



**APPENDIX E**  
**DATABASE DESIGN**

Database D1

Table E.1. Call Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	CallID	int	Y	Y				Primary Key
2	CustomerID	Int	Y	Y		Customer		Foreign Key
3	CallType	varchar (20)						Attribute
4	Duration	varchar (10)						Attribute
5	CreateDate	datetime						Attribute
6	Remark	varchar (255)			Y			Attribute

Database D2

Table E.2. Customer Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	CustomerID	int	Y	Y				Primary Key
2	Name	varchar (20)						Attribute
3	Surname	varchar (30)			Y			Attribute
4	Gender	varchar (10)			Y			Attribute
5	Birthdate	datetime			Y			Attribute
6	Age	int			Y			Attribute
7	Position	varchar (20)			Y			Attribute
8	Address	varchar (255)			Y			Attribute
9	City	varchar (20)			Y			Attribute
10	PostCode	varchar (5)			Y			Attribute
11	Mobile Phone	varchar (20)			Y			Attribute
12	Home Phone	varchar (20)			Y			Attribute
13	Office Phone	varchar (20)			Y			Attribute
14	Fax	varchar (20)			Y			Attribute
15	Email	varchar (20)			Y			Attribute

Database D3

Table E.3. Case Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	CaseID	int	Y	Y				Primary Key
2	CallID	Int	Y	Y		Call		Foreign Key
3	CasedescID	Int	Y	Y		Casedesc		Foreign Key
4	CreateDate	datetime						Attribute
5	Remark	varchar (255)			Y			Attribute

Database D4

Table E.4. Order Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	OrderID	int	Y	Y				Primary Key
2	CustomerID	Int	Y	Y		Customer		Foreign Key
3	CaseID	Int	Y	Y		Case		Foreign Key
4	OrderDate	datetime						Attribute
5	OrderStatus	varchar (10)						Attribute
6	Remark	varchar (255)						Attribute

Database D5

Table E.5. Order\_Product Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	OrderID	int	Y	Y		Order		Foreign Key
2	ProductID	Int	Y	Y		Product		Foreign Key
3	Unit	Int						Attribute
4	Total	Float						Attribute

Database D6

Table E.6. Product Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	ProductID	int	Y	Y				Primary Key
2	ProductType	varchar (10)						Attribute
3	ProductName	varchar (20)						Attribute
4	ProductDesc	varchar (255)						Attribute
5	UnitPrice	float						Attribute
6	FileDesc	varchar (30)			Y			Attribute

Database D7

Table E.7. Invoice Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	InvoiceID	int	Y	Y				Primary Key
2	OrderID	Int	Y	Y		Order		Foreign Key
3	InvoiceDate	datetime						Attribute
4	InvoiceDiscount	float						Attribute
5	InvoiceTotal	float						Attribute

Database D8

Table E.8. Product\_Promotion Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	ProductID	int	Y	Y		Product		Foreign Key
2	PromotionID	Int	Y	Y		Promotion		Foreign Key
3	CreateDate	datetime						Attribute
4	Active	char(1)						Attribute

Database D9

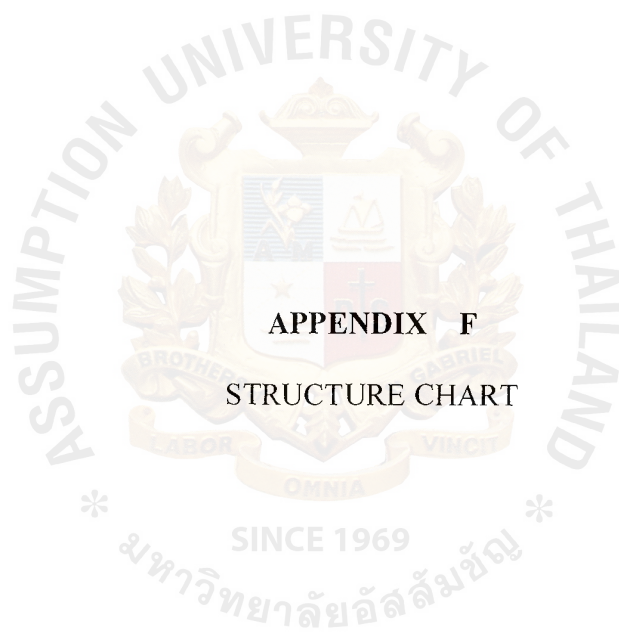
Table E.9. Promotion Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	PromotionID	int	Y	Y				Primary Key
2	PromotionName	varchar (20)						Attribute
3	PromotionRealseDate	datetime						Attribute
4	PromotionStatus	varchar (1)						Attribute
5	PromotionType	varchar (1)						Attribute
6	CreateDate	datetime						Attribute

Database D10

Table E.10. Casedesc Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	CasedescID	int	Y	Y				Primary Key
2	CaseDesc	varchar (30)						Attribute



**APPENDIX F**  
**STRUCTURE CHART**

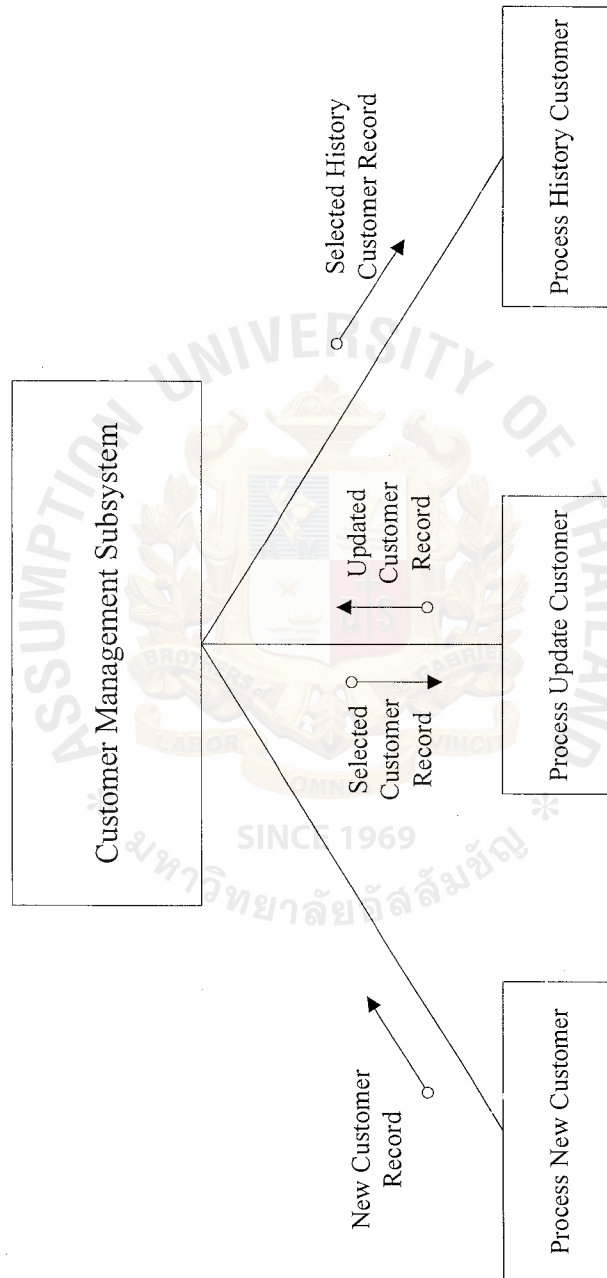


Figure F.1. Structure Chart for Customer Management Subsystem.

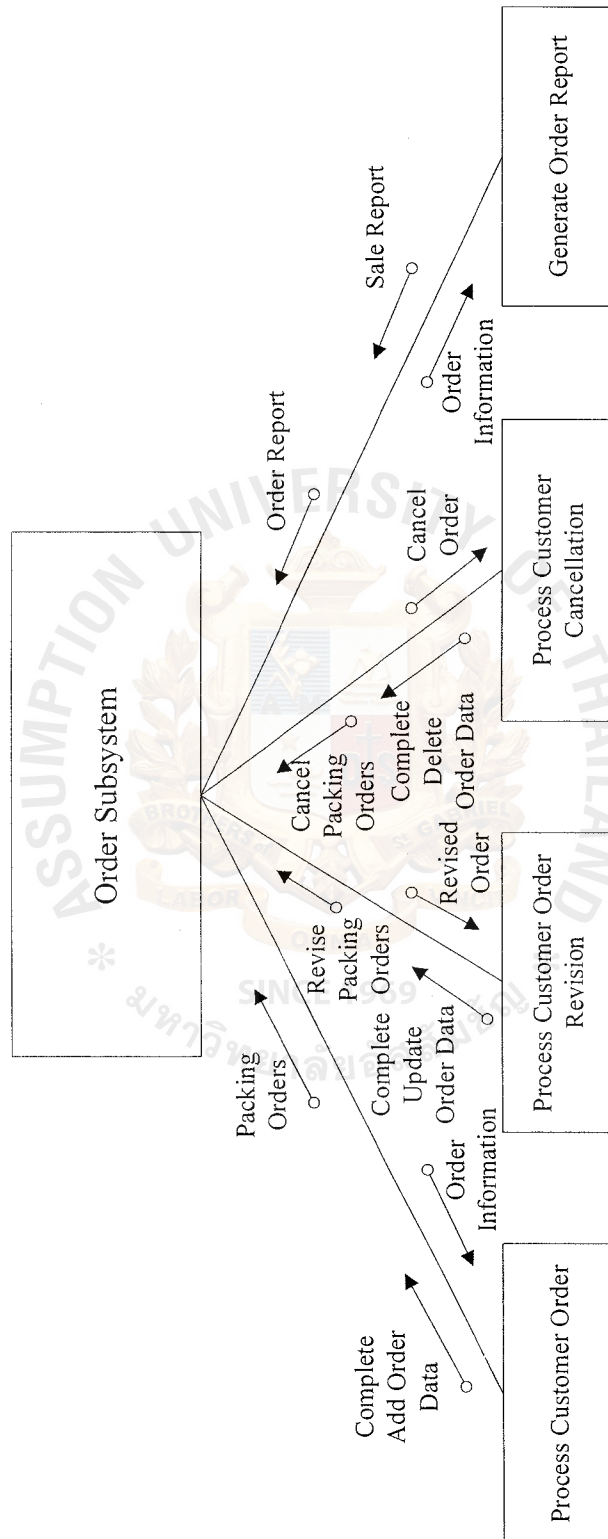


Figure F.2. Structure Chart for Order Subsystem.

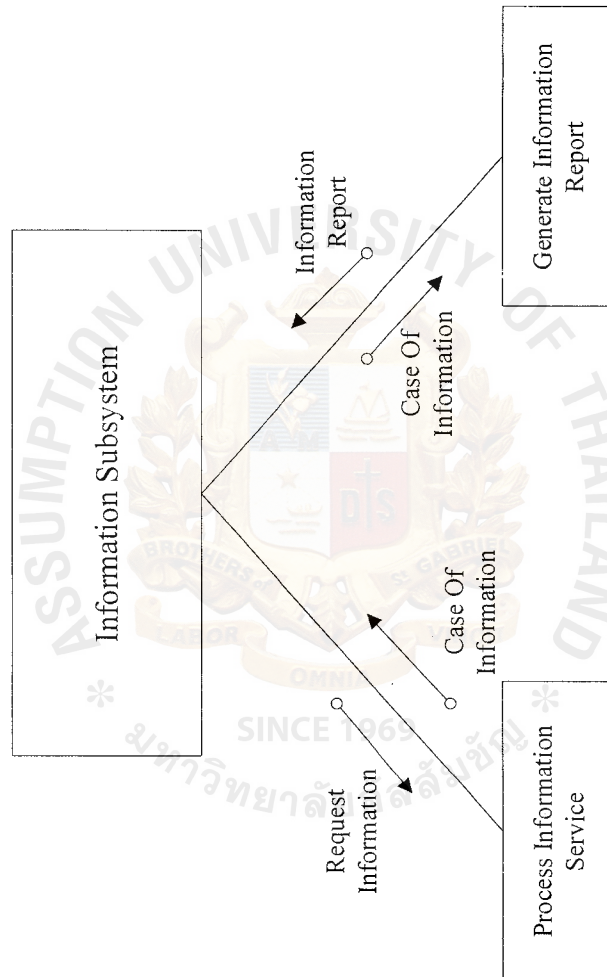


Figure F.3. Structure Chart for Information Subsystem.

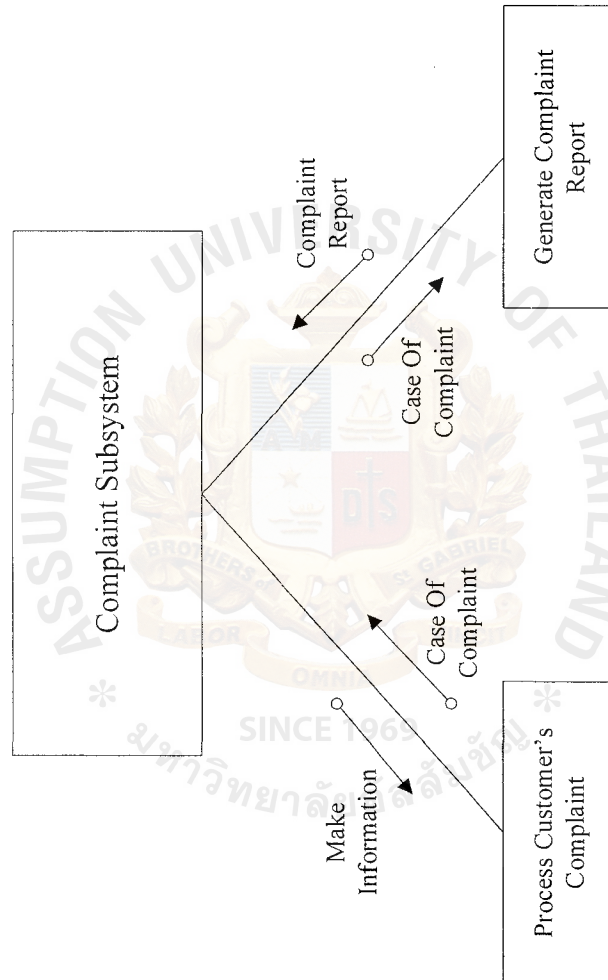


Figure F.4. Structure Chart for Complaint Subsystem.

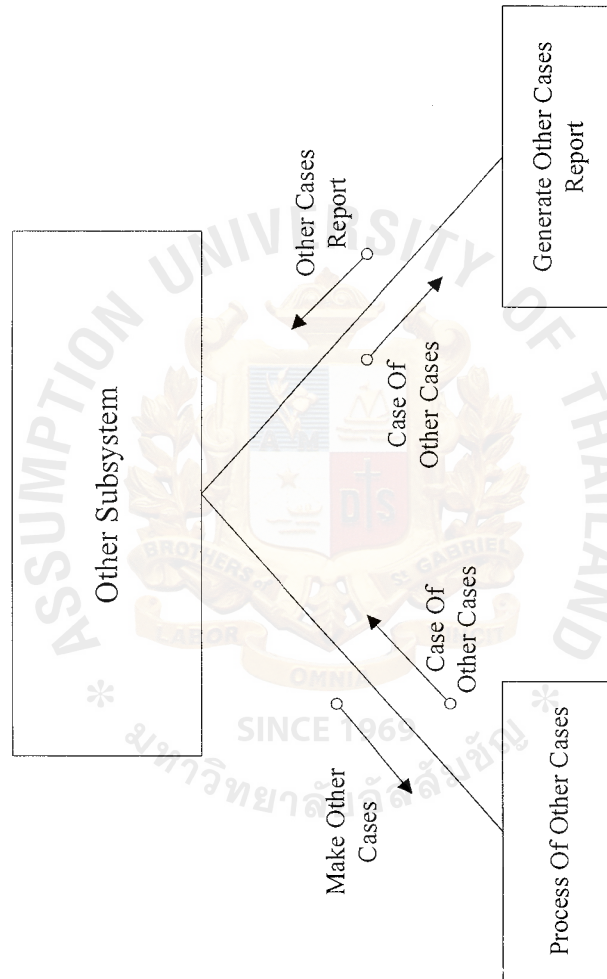


Figure F.5. Structure Chart for Other Subsystem.

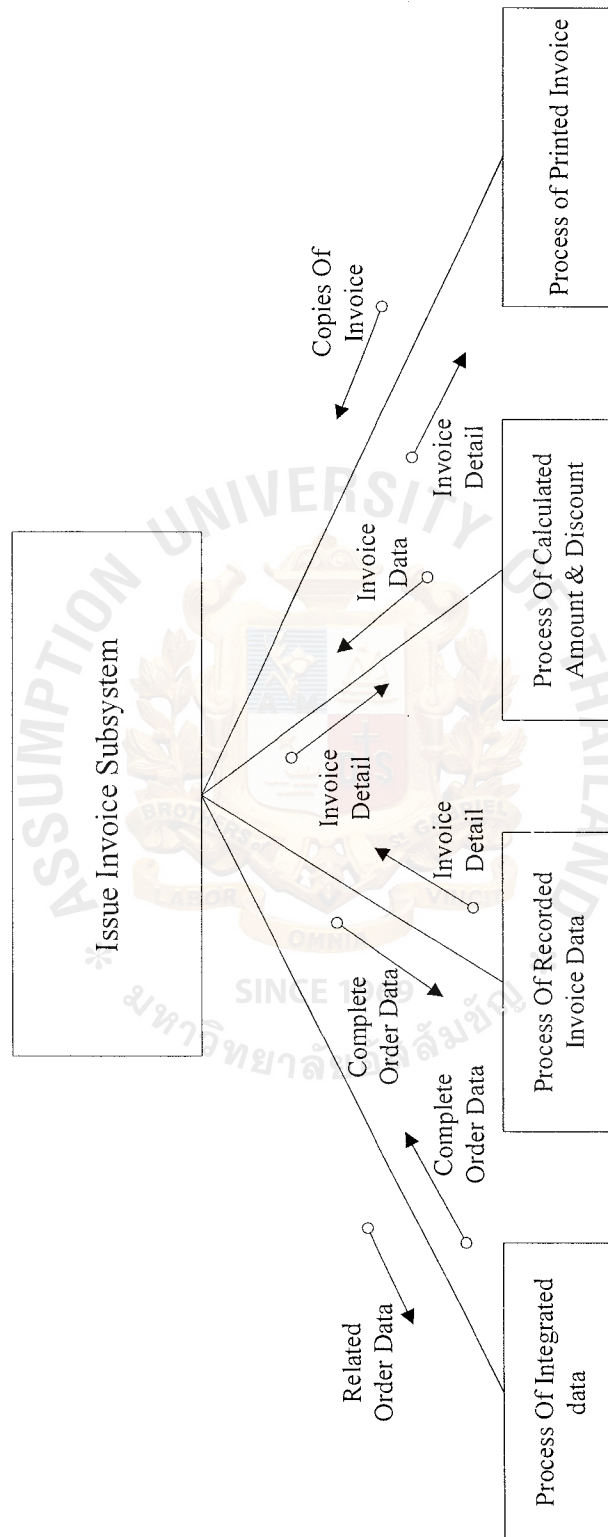


Figure F.6. Structure Chart for Issue Invoice Subsystem.

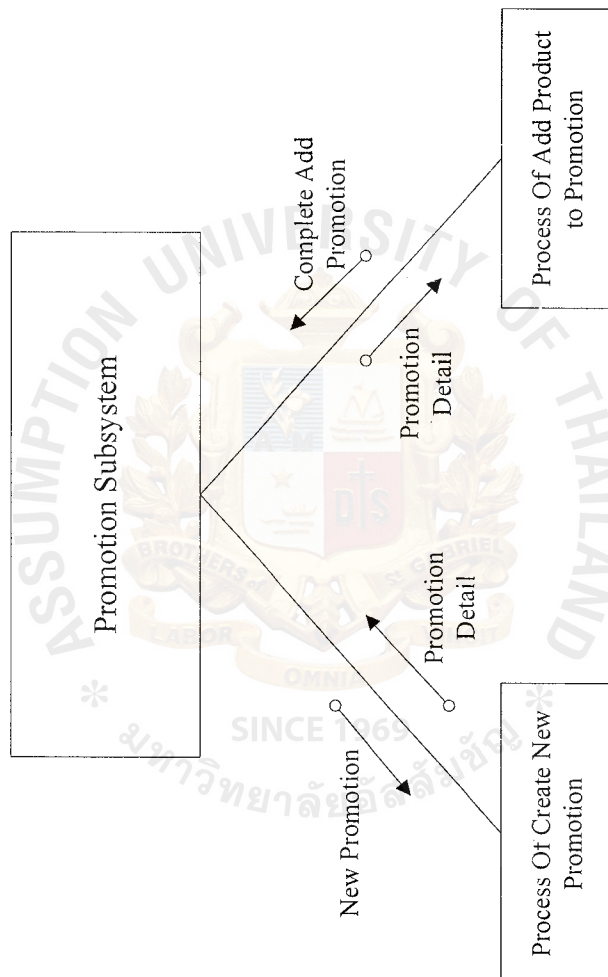


Figure F.7. Structure Chart for Promotion Subsystem.

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