Sales Information System for PP Ontime Company Limited

by

Ms. Pojanee Sujeerapongsin

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

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

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Project Title	Sales Information System for PP Ontime Company Limited
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Academic Year	November 2004

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

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ABSTRACT

This system development project presents the analysis and design of Sales Information Systems for PP Ontime Co., Ltd. It is developed to solve the problems of data redundancy and high operating and maintenance costs. The objectives of this project are to reduce data redundancy, to decrease operating and maintenance costs, as well as to enhance all the work processes.

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, 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 up with the most effective solution. Capital budgeting models such as the payback method, the cost-benefit ration, and the net present value are used to evaluate the proposed system.

It is found out that the new computerized system is implemented using 10Base-T LAN with 1 server, 12 clients, and 2 printers. Software for the proposed system is Windows 2000 Professional, MS Office 2003, and Java2 Standard Edition 1.4.3. 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 about 4 times faster than the existing system. To further improve the proposed system, it is recommended that a web-based solution should be developed and implemented. This will allow users and customers accessing the system more easily and faster.

ACKNOWLEDGEMENTS

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I. INTRODUCTION

1.1 Background of the project

Computer networks become increasingly important for corporations of any sizes nowadays. Even within an organization, exchanges of data from one department to another are required. Data are needed to be shared, so that everyone involved can beneficially use them. Once the organization has grown in size and extended its branches to some other areas, computer networks between those branches have to be established so that work processes can smoothly flow.

PP Ontime Co., Ltd. was established to provide the most suitable network solutions for corporations. It has been operating its business for six years. With increasing number of corporations using its network service, all information of those corporations and their orders have to be handled carefully and professionally.

When orders have been made, salespeople need to inform other departments involved in completing the order. Purchasing department needs be informed about what network equipments to purchase. Engineering department need to know the appointment for the network equipment installation. Accounting department can issue invoices after the installation is completed.

1.2 Objectives of the project

The objectives of this project are to design and develop sales information system for the following purposes:

(1) To assist salespeople and sales manager in handling sales activities.

(2) To facilitate the work flow within the organization.

(3) To increase operating performance of salespeople.

(4) To reduce data redundancy.

(5) To be able to share information.

(6) To be able to manage files properly.

1.3 Scope of the Project

The project scope will be managed in the part of establishing the system for the information management as the following:

(1) Study the background of the company.

(2) Study the current problems and areas of improvement.

(3) Perform requirement analysis and system design for proposed solution.

(4) Determination of candidate solutions.

(5) Costs and benefits analysis.

(6) Perform system implementation.

(7) Produce user manual as a tool in training users how to operate the system.

1.4 Deliverables

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

(1) Data Modeling (ER Diagram)

(2) Process Modeling (Context Diagram, Data Flow Diagram)

(3) System Specification (Hardware and Software Specification)

(4) Cost Benefit Analysis (Payback Period, Net Present Value)

(5) Input Design (Input Screen of Proposed System)

(6) Output Design (Report from Proposed System)

(7) Structured Design (Structured Chart)

(8) Process Specification (Detail of each process of Proposed System)

1.5 Project Plan

This project defines the schedule and plans as shown in Gantt Chart in Figure 1.1

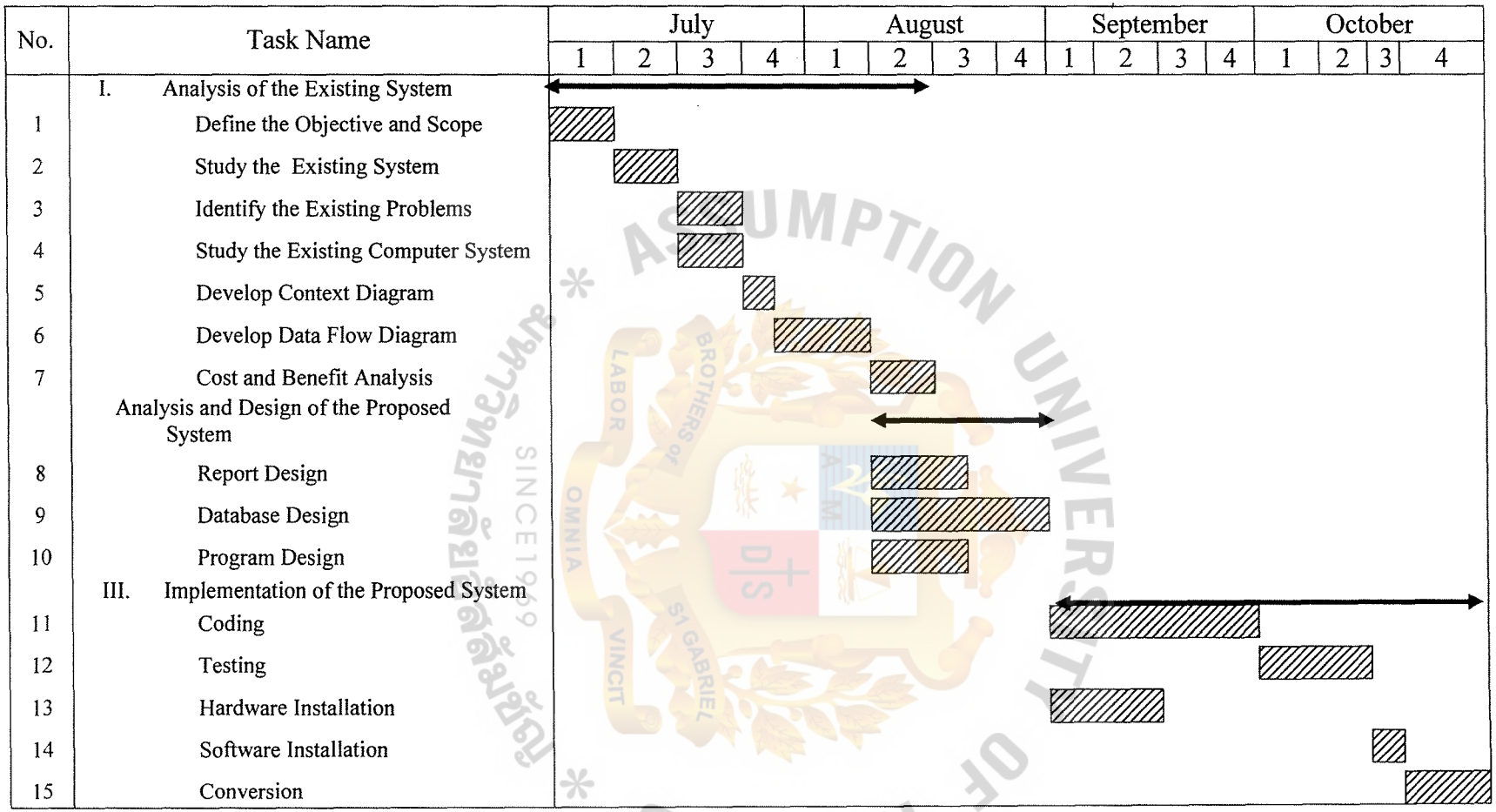

Figure1.1. Project Plan for Sales Information System.

II. THE EXISTING SYSTEM

2.1 Background of the organization

PP Ontime Co., Ltd. has been established for approximately 6 years. It aims to provide network solution to corporations. It acts as a one-stop network service company. The company itself mainly provides network equipments. But, most of the time, customers would like the company to also take care of their leased circuit or frame link they has leased from Communication Authority of Thailand (CAT), United Information Highway (UIH), or some other circuit providers. So, the company coordinates with those circuit providers and acts as the middleman for its customers. The customers can contact only to PP Ontime Co., Ltd. when they have communication problems either caused by the network equipments or the leased circuits.

The responsibilities of PP Ontime Co., Ltd. are as follows,

(1) To acquire customers' requirements for their network.

(2) To design network solutions that are appropriate for the customers and that can work effectively with their current system.

(3) To assign the right equipments to the network design.

(4) To contact circuit providers and arrange for their installation and test.

(5) To install network equipments at customers' offices and/or branches.

(6) To service customers after network installation is completed.

(7) To cooperate with circuit providers if problems occur.

PP Ontime Co., Ltd. comprises of 5 departments, which are as follows,

(1) Sales and Marketing Department

It is responsible for finding new accounts and maintaining the existing ones.

(2) Engineering Department

It is responsible for installing network equipments and servicing after sales whether problems arise or not.

(3) Accounting Department

It is responsible for issuing invoices, collecting service charges, and managing transactions with both customers and suppliers.

(4) Purchasing Department

It is responsible for purchasing products for the company.

(5) Human Resources Department

It is responsible for recruiting new qualified applicants to work for the company.

(6) Customer Relation Management Department

It is responsible for taking care of existing accounts and keeping a good and healthy relationship with them.

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The Organization Chart

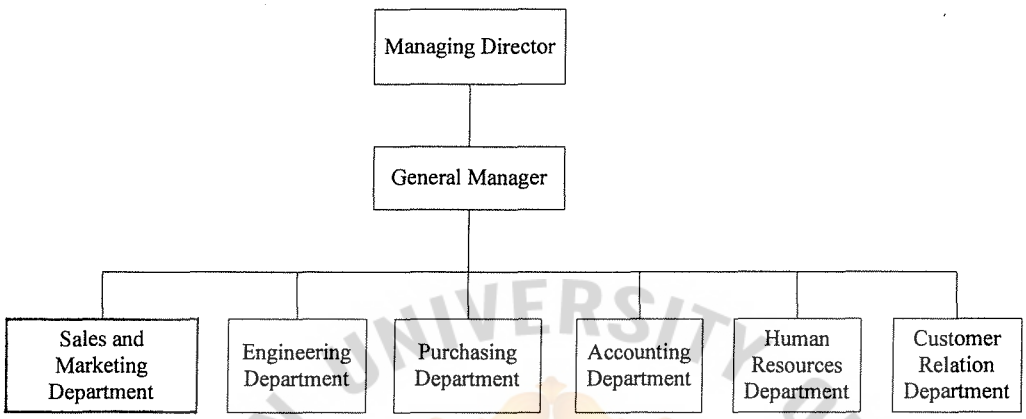

Figure 2.1. The Organization Chart of PP Ontime Co., Ltd.

The Department Chart

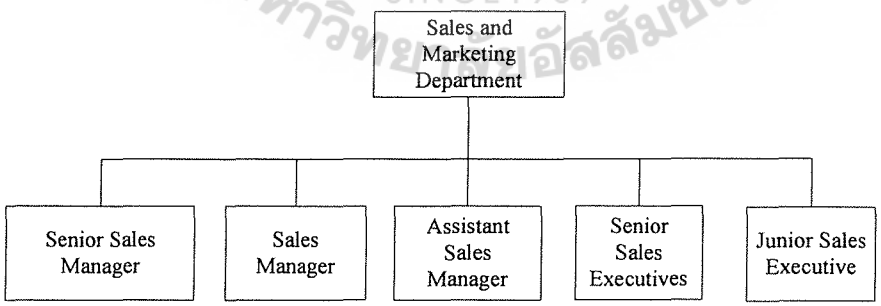

Figure 2.2. The Department Chart of PP Ontime Co., Ltd.

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2.2 Current Problems and Areas for Improvement

At the present time, salespeople keep their customer information in paper form. Information about quotations is kept as spreadsheet files in the file server. When they want to know about each customer, they have to refer both to the paper and database. As the number of customers is increasing, it becomes difficult to keep track of those customers without the system. The present system does not provide sufficient efficiency:

(1) in storing large volume of data

(2) in searching and retrieving data

(3) in updating data

(4) in managing customer accounts

(5) in responding in a timely manner

(6) in reducing human errors

(7) in facilitating sales activities

(8) in reducing work processes

The system should be designed to integrate the information of customers so that searching and/or updating each customer's profile becomes easier and faster. The new system will be implemented to sales and marketing department where other departments can as well have access to it with their authorization level. By implementing the new system, the problems of the current system mentioned above will systematically be improved.

2.3 Existing Computer System

In existing computer system, salespeople calculate and generate quotations in the form of spreadsheet files and store them in the file server. Data stored in the file server mostly are spreadsheet files. Salespeople act as a middleman in the organization. They

have to print out requests such as account request, purchase request, and engineer request and hand them to each department to inform them about the information of each customer needed for each department. There is no application program helps facilitate the sales processes. The process is shown in figure 2.3

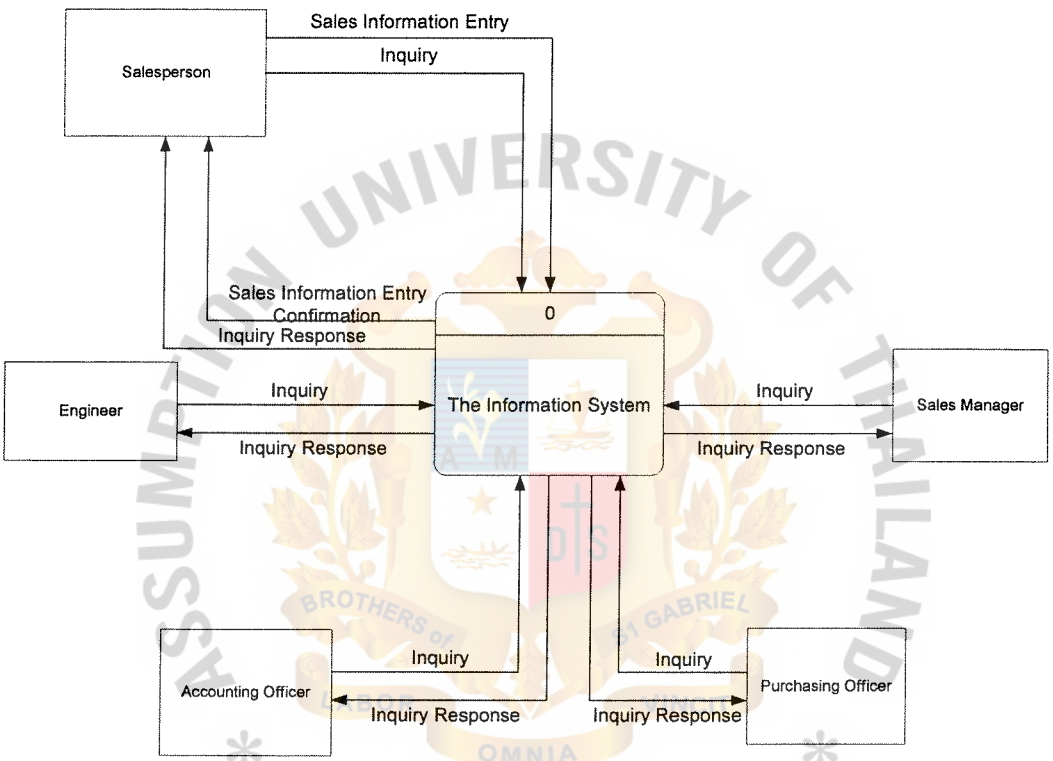

Figure 2.3. The Context Data Flow Diagram of Existing System.

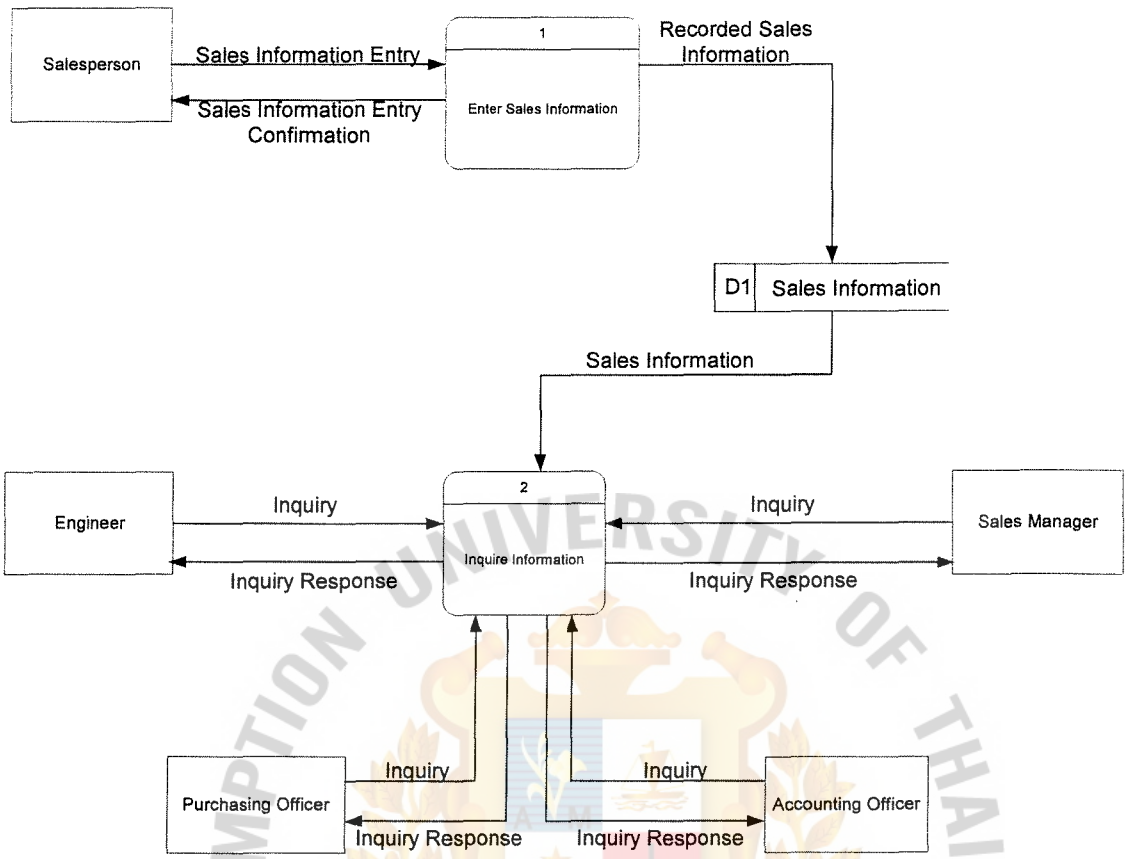

Figure 2.4. The Data Flow Diagram of Existing System.

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III. THE PROPOSED SYSTEM

3.1 System Specification

The application developed for the sales department aims at assisting salespeople in managing their activities effectively. It is constructed to replace the current system that depends too much on paper. And it is supposed to help organizing files which makes rapid search and update possible.

In order to solve the problems of current system, the new proposed sales system should be redesigned as follows:

(1) Customer Database needs to be redesigned and converted to high performance database server. It should be available at all time so that salespeople can gain access and manipulate the data in it.

(2) Quotations should be changed from unstructured spreadsheet format to effective database format. And the information concerning certain customers and quotations should be integrated to the same information system.

(3) Account requests, engineer request, and purchase request should be converted from spreadsheet format to effective database format.

(4) Sales reports should be generated and can be viewed by sales manager in specified time period since there are no such sales reports in the current system.

The proposed system is developed to solve the problems of current system which has system specifications as follows:

(1) To facilitate sales activities.

(2) To reduce data redundancy.

(3) To respond in a timely manner.

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(4) To make search and update of data easier and faster.

(5) To be able to generate various reports useful for management level.

(6) To increase efficiency and effectiveness of work processes.

(7) To reduce duplicated work processes.

3.2 System Design

System should be designed to give highest performance to the users. Since many departments are involved in the sales processes, application architecture should well be defined. To implement the information system, processes, interfaces, database, and network design must be specified.

The system design specifications are as follows:

(1) Information Technology Architecture: Two-Tiered Client/Server Computing

Local Area Networks (LANs) are used to connect many clients within the organization to the server. The data and data manipulation are placed on servers and others are placed on clients. This technique generates less network traffic and makes database integrity easier to maintain.

(2) Data Architecture: Relational Database

Relational database management system is applied to facilitate the database server. The company uses this technique because it provides a lot of benefits to the system. Such benefits are:

(a) Data can be shared.

(b) Data entries, updates, and deletions are efficient.

(c) Data retrieval, summarization and reports are efficient.

(d) Transaction support can be provided.

(e) Redundancy can be reduced.

(f) Inconsistency can be avoided.

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(g) Integrity of data can be maintained.

(h) Security can be enforced.

(3) Interface Architecture: Online Processing, Graphic User Interface (GUI)

This technique provides more conversational dialogue between the user and the computer applications. It also provides nearly immediate feedback in response to transactions, problems, and inquiries. Errors are identified and corrected more quickly. By using graphic user interface (GUI), users can easily interact with the application.

(4) Process Architecture: The Software Development Environment

The application is developed using JAVA language. It is one of the very powerful programming languages in developing an application. JAVA is flexible since it is platform independence. Applications can be developed with greater speed.

(5) Database Design

The company needs to make a change from conventional file server to more advanced database because it is more powerful and easier to manage. Data can be shared across systems. Data can be stored in the database in flexible formats. Database provides scalability to the system, which means that the database and the systems that use it can be expanded to meet the changing needs of the organization.

Relational Database System is applied to provide support for the proposed system. The data in relational database is perceived by the user as tables, instead of other data structures. And the operators available to the user are operators that generate new tables from old. Using database technology can greatly reduce data redundancy and increase flexibility

(6) Output Design and Prototyping

The output design for the proposed system can be viewed by the user in two ways: screen output and printed output.

The screen output is useful for internal users. It provides immediate response to the requests. For instance, a purchasing officer would like to check the order check list for certain customers, he can access to the system and make a request, and the output will be shown on the output screen. Should that document print out, he can as well print it as printed output.

The printed output is necessary for printing out quotations and sales reports. But other requests such as account requests, engineer requests, and purchase requests also need the printed version of the output.

(7) Input Design and Prototyping / User Interface Design

Graphic User Interface (GUI) design is applied. It provides more user-friendly interface. It also presents more complex design issues. Users can interact with the system more easily and flexibly

In analyzing the system, candidate system solutions and feasibility need to be identified.

Candidate Systems Matrix is a tool used to document similarities and differences between candidate systems. Many aspects such as benefits, and software and hardware needed, are compared in the matrix. The columns of the matrix represent candidate solutions. The rows of the matrix represent characteristics that differentiate the candidates.

(a) Candidate 1:

The first candidate solution is fully developed in-house. Client/server architecture is used for data processing. It enables a good sharing of data in the system. It is proposed to use basic input devices such as keyboard and mouse; output devices such as 17-inch terminal and a laser printer. The output devices are simply connected to all terminals and server through a local area network (LANs).

MS SQL 2000 Server is used to manage data in the database. MS Windows 2000 server will be installed to the server. And MS Windows 2000 Professional will be installed to the clients.

This candidate solution can fully support user requirements. It provides high performance system.

(b) Candidate 2:

The second candidate is partially developed in-house. Some of its package is purchased. It mainly uses Microsoft products because they are easy to use. It functions with basic input devices such as keyboard and mouse, and output devices such as 17-inch terminals and a laser printer. Microsoft Visual Basic 6.0 is used. It is a very popular development tool. Programmers can use it without any technical assistance. MS Access 2003 is applied to handle all the relevant data in the system. File server architecture is applied to the system. Microsoft 2000 Server and Microsoft Windows 2000 Professional will be installed to the server and clients respectively.

This candidate is easy to implement because most programmers are familiar with Microsoft products. Data can be shared using local area network (LANs).

(c) Candidate 3:

This candidate solution is the Commercial off-the-shelf package software. It will be customized and purchased from outsourcing company. It functions with basic input devices such as keyboard and mouse, and output devices such as 17-inch terminals and a laser printer. Client/server architecture is used for data processing. It enables a good sharing of data in the system. The output devices are simply connected to all terminals and server through a local area network (LANs). Oracle 9i is used to manage data in the system. Microsoft 2000 Server and

Microsoft Windows 2000 Professional will be installed to the server and clients respectively.

Characteristics of each candidate are explored in more details as shown in Table 3.1

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Table 3.1. Candidate System Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized Brief description of that portion of the system that would be computerized in this candidate.	All functions of package will be developed in house	Package programs will be purchased. Some applications will be developed in house.	COTS Package will be purchased and customized to meet business requirements
Benefits Brief description of the business benefits that would be realized for this candidate	This solution can fulfill user requirements. Powerful DBMS and application enable users to perform their tasks more effectively.	This solution can quickly be implemented. The add-on applications can easily be developed.	Since the package used are purchased in a whole package from out-sourcing company. Less time will be spent creating and updating the information.
Servers & Workstation Brief description of the servers and workstation needed to support all these candidates.	CPU : Pentium IV Server : Windows 2000 Server Workstation : Window2000 Professional	Same as Candidate 1	Same as Candidate 1
Software Tools Needed Brief description of software tools needed to design and build all these system. (E.g. database management system, operating systems, modeling tool etc.).	Java Standard Edition 1.4.3 SQL 2000 Server Crystal Report 7	MS Visual Basic 6.0 MS Access 2003 Crystal Report 7	Package Solution
Application Software Brief description of software, which will be purchased, created accessed or same combination of these.	Custom solution	Package solution + Custom solution	COTS Package
Method of Data Processing Generally some combination of online, batch, deferred batch, remote batch and real-time.	Database stores and processes on MS SQL 2000 server and uses client/server architecture and GUI on workstation.	Database stores on server and processes on workstation.	Oracle uses client/server architecture with a powerful database server
Output Devices and Implication Brief description of output devices that would be used, special output requirement (e.g. network, preprinted form, etc.), and output considerations (e.g. timing constraints).	17 inches terminal screen HP Laser printer	Same as Candidate 1	Same as Candidate 1
Input Devices and Implication Brief description of input method to be used , input device(e.g. keyboard, mouse, etc.), special input requirements (e.g. new or revised forms from which data would be input), and input considerations (e.g. timing of actual inputs)	Keyboard Mouse	Same as Candidate 1	Same as Candidate 1
Storage Devices and Implications Brief description of stored data, which storage media would be used stored data, how much storage capacity would be needed, and how data would be organized.	SQL 2000 Server with 100 GB storage capability	File Server with 100 GB storage capability MS Access	Oracle Application Server (Oracle as) with 200 GB storage capability

Feasibility Analysis needs to be conducted in order to measure how beneficial an information system will be to the organization. There are basically four categories in measuring feasibility, which are as follows:

(1) Operational Feasibility

It is a measure of how well a solution will be accepted in an organization. It is also a measure of how people feel about the system. Candidate 1 can fulfill user requirements better than other candidates with powerful functions.

(2) Technical Feasibility

It is a measure of the practicality of a technical solution and the availability of technical resources and expertise. Candidate 1 is easy to implement because current programmers are familiar and experienced with the tools. However, it requires continuous training course for operating and maintaining the system. Candidate 2 can be implemented quite easily, but it requires the program to be frequently upgraded to a newer version so that it can fully be operated. Candidate 3 uses outsourced program, which might not fully support user requirements. It also requires a great deal of expertise.

(3) Economic Feasibility

It is a measure of the cost-effectiveness of a solution. Candidate 1 requires only medium hardware and a system analyst to implement and operated the developed system. It is the most economical as it consumes the smallest amount of investment with the shortest payback period. Candidate 2 requires higher technical skills in operating application programs. Training course might be needed for the staff. Candidate 3 is the most expensive solution because the whole package needs to be purchased. It also requires powerful hardware and great deal of expertise.

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(4) Schedule Feasibility

It is a measure of how reasonable a project timetable is. Projects are initiated with specific deadlines. It is necessary to determine whether the deadlines are mandatory or desirable. Candidate 1 takes shorter time to develop and implement. While the other two candidates, Candidate 2 and 3, take longer time.

All feasibility criteria are evaluated and the weight of each criterion needs to be identified. The weights attributed to operation, technical, and economical feasibilities are set to be 30%. The other 10% is given to schedule feasibility.

After all criteria of feasibility have been measured, a suitable solution can be obtained. From the ranking of the feasibility matrix, the author considers and decides that Candidate 1 is the most appropriate solution for the proposed system because it takes the least development time and costs with reasonable functionality. The feasibility matrix is illustrated in Table 3.2

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Table 3.2. Feasibility Matrix.

Characteristics	Weight	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility Functionally: A description of to what degree the candidate would benefit the organization and how well the system would work. Political: A description of how well received this solution would be from user management, user, and organization perspective.	35%	Fully supports user required functionality. Many of users and management highly accept this solution. They are convinced that this solution will meet all their requirements by using not too long time of construction. IT can also be expanded easily to support other functions in the future. SCORE : 90	Supports user required functionality only partially Many of users and management accept this solution, as it all supports their requirements. But they are afraid that the system cannot be expanded to support other functions in the future. SCORE : 80	Supports user required functionality only partially Many of users and management accept this solution, as it all supports their requirements. But they afraid that the system cannot be expanded to support other functions in the future. SCORE : 75
Technical Feasibility Technology. An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate. Expertise. An assessment of the technical expertise needed to develop, operate and maintain the candidate system.	25%	Programmer is familiar with Microsoft and Java products therefore this reduces development process. Microsoft 2000 Server for server. This solution is using MS SQL 2000 Server for its DBMS, which has been understood by current programmer so it decreases software and training cost. SCORE : 90	Programmer is familiar with Microsoft products, therefore it reduces development process. Current application programs have to frequently be upgraded to a newer version. MS Access does not fully support and manage the operational information. SCORE : 80	Most of the application development is outsourced. The problem with this approach is that expensive consultants must be hired to put the system into operation and for periodic checks. Also personnel have to be well trained SCORE : 70
Economic Feasibility Cost to develop: Payback periods (discounted) Net present value Detailed Calculations :	30%	Approximately: 1,470,000.00 Approximately: 1.7 years Approximately: 219,317.54 See Appendix D SCORE : 95	Approximately: 1,600,000.00 Approximately: 1.9 years Approximately: 20,948.90 See Appendix D SCORE : 85	Approximately: 1,840,000.00 Approximately: 2 years Approximately: (1,533,004.05) See Appendix D SCORE : 75
Schedule Feasibility An assessment of how long the solution will take to design and implement	10%	Approximately 5-6 months SCORE : 95	Approximately 4-5 months SCORE : 85	Approximately 1-2 Months SCORE : 75
Ranking	**100%**	**92**	**82**	**73.75**

3.3 Hardware and Software Requirements

The sales system for PP Ontime Co., Ltd. is developed based on Windows Operating Systems. SQL Server is used to manage the database of the system.

The hardware and software specifications for the proposed sales system are shown in Table 3.1 and 3.2 respectively.

Table 3.3. The Hardware Specification for the Server.

Hardware	Specification
CPU	Intel Pentium IV Processor 2.8 GHz.
Memory	256MB DDR RAM
Cache	512KB or higher
Hard Disk	120 GB 7200 rpm
CD-ROM Drive	52x CD-ROM Drive
Floppy Drive	1.44 MB diskette drive
Network Adapter	Integrated 10/100 Base-T Network
Display Screen	17" LCD
Display Adapter	SVGA Card
Keyboard	PS II or USB Internet Keyboard
Mouse	Internet Scroll Mouse
UPS	UPS 1000 VA

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Table 3.4. The Software Specification for the Server.

Software	Specification
Operating System	Microsoft Windows 2000 Server
Database Software	Microsoft SQL 2000 Server Enterprise Edition
Application Software	Microsoft Office 2003 Professional Edition
Runtime	Java 2 Runtime Environment Standard Edition 1.4.3

The client machines are supposed to have enough performance to work along with the whole system. The application developed is run through web browser. So web browser such as Internet Explorer, Netscape Navigator, or etc. need be installed. The hardware and software specifications for each client machine are shown in Table 3.3 and 3.4 respectively.

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Table 3.5. Hardware Specification for Client Machine.

Hardware	Specification
CPU	Intel Celeron 2.53GHz
Memory	128 MB DDR RAM
Cache	256 KB or Higher
Hard Disk	40 GB
CD-ROM Drive	52x CD-ROM Drive
Floppy Drive	1.44 MB diskette drive
Network Adapter	Integrated 10/100 Base-T Network
Display Screen	17" LCD with integrated speakers
Display Adapter	SVGA Card
Keyboard	PS II or USB Internet Keyboard
Mouse	Internet Scroll Mouse

Table 3.6. Software Specification for Client Machine.

Software	Specification
Operating System	Microsoft Windows 2000 Professional
Application Software	Microsoft Office 2003 Professional Edition
Web Browser	Internet Explorer 6.0 or higher

In a distributed system, client computers are connected over a relatively short distance to one or more servers by using local area network (LAN). Then the company

needs to use some other equipment to complete the system. Other hardware requirements are shown in Table 3.5.

Table 3.7. Other Hardware Requirements.

Hardware	Specification
Switching Hub	24 ports
Cable	LAN Cable UTP
Printer	Laser Printer

The network configuration of sales information system is shown in figure 3.1.

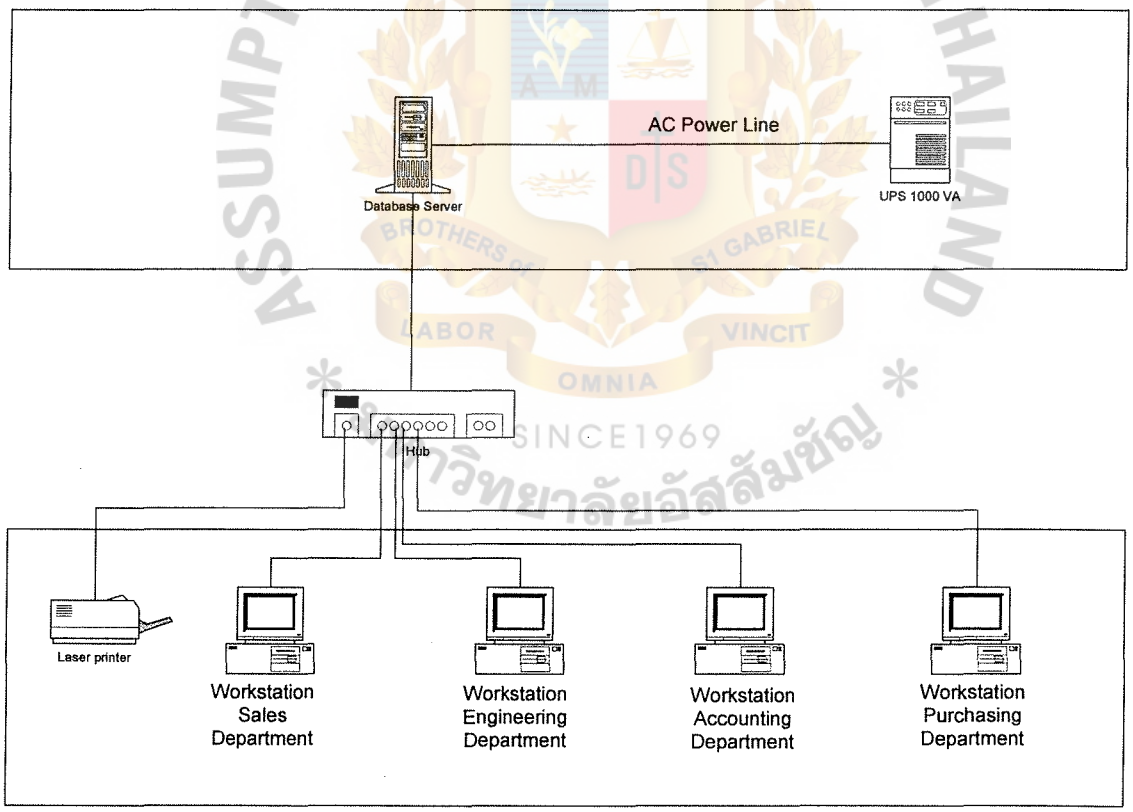

Figure 3.1. The Network Configuration of the Proposed System.

3.4 Security and Controls

Security is very important to the system. Authorization and authentication must be used for granting access to the system. The users using the system must first register and receive their usernames and passwords. The system can then verify and authorize access to them. The system administrator will have to take care of this duty. The proposed system has to provide the following security and controls:

(1) Authentication

Each user needs to have their personal usernames and passwords to gain access to the system. The system administrator will assign the usernames and passwords to the user.

(2) Authorization

Once the users have had their own accounts, they can make a request to enter the system. If the account typing in matches the account stored in the system, access to the system is granted.

(3) Password Encryption

Password is meant to be encrypted so that no one can steal and use it to enter the system as someone else he is not.

(4) Virus Protection

The system needs to be immune to computer viruses. Since many client computers are connected to the server, it is possible for the viruses to spread in the network. Viruses can spread from system to system, clogging computer memory or destroying programs or data. The company should install antivirus software to the system to reduce the chance of infection.

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(5) Protection from Intruders

Sometimes, only authentication might not be enough. The intruders might want to get the information of the company for some business purposes. Firewall may be needed. It can filter what to come in to and out of the system.

(6) Backup and Recovery

Data might be lost from unintentional or intentional deletion or from some other causes such as fire, electrical problems, or telecommunication problems. Back up can help reduce the cost of damage that may occur if that incident really happens.

3.5 Costs and Benefits Analysis

Costs and benefits should be measured so that the company will know that developing new application is worth its money or not. Costs must be estimated before developing the system. Costs can be categorized into two parts:

(1) Costs of Existing System

Costs can be divided into fixed operating cost and variable operating cost. Fixed operating costs occur at regular intervals but at relatively fixed rates. They are not affected by changes in activity within the relevant range during a period. On the other hand, a variable cost is a cost that varies in direct proportion to changes in level of activity. The costs for existing manual system is shown tin table 3.6.

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Table 3.8. Manual System Costs Analysis, Baht.

Cost Items (Baht)	Years				
	1	2	3	4	5
Fixed Cost					
Typewriter	75,000.00	75,000.00	75,000.00	75,000.00	75,000.00
Copy Machine	250,000.00	250,000.00	250,000.00	250,000.00	250,000.00
Hardware Cost	60,000.00	60,000.00	60,000.00	60,000.00	60,000.00
Software Cost	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
Operating Cost	425,000.00	425,000.00	425,000.00	425,000.00	425,000.00
Salary Cost:					
Sales Manager 1 person @ 40,000 per month	40,000.00	40,000.00	40,000.00	42,000.00	42,000.00
Sales person 3 persons @ 20,000 per month	60,000.00	60,000.00	60,000.00	60,000.00	60,000.00
Sales Admin. 2 persons @ 12,000 per month	24,000.00	24,000.00	24,000.00	28,000.00	28,000.00
Accountant 3 persons @ 15,000 per month	45,000.00	45,000.00	45,000.00	51,000.00	51,000.00
Engineer Director 1 person @ 70,000 per month	70,000.00	70,000.00	70,000.00	75,000.00	75,000.00
Engineer 5 persons @ 30,000 per month	150,000.00	150,000.00	150,000.00	165,000.00	165,000.00
Engineer Admin. 2 persons @ 12,000 per month	24,000.00	24,000.00	24,000.00	28,000.00	28,000.00
System Admin. 1 person @ 15,000 per month	15,000.00	15,000.00	15,000.00	17,000.00	17,000.00
Messenger 1 person @ 8,000 per month	8,000.00	8,000.00	8,000.00	8,200.00	8,200.00
Total Monthly Salary	436,000.00	436,000.00	436,000.00	474,200.00	474,200.00
Total Annual Salary Cost	5,232,000.00	5,232,000.00	5,232,000.00	5,690,400.00	5,690,400.00
Office Supplies & Miscellaneous Costs:					
Stationery	30,000.00	35,400.00	41,772.00	49,290.96	58,163.33
Paper	50,000.00	59,000.00	69,620.00	82,151.60	96,938.89
Utility	70,000.00	82,600.00	97,468.00	115,012.24	135,714.44
Miscellaneous	60,000.00	70,800.00	83,544.00	98,581.92	116,326.67
Total Annual Office Supplies & Miscellaneous Cost	210,000.00	247,800.00	292,404.00	345,036.72	407,143.33
Total Operating Cost	5,442,000.00	5,479,800.00	5,524,404.00	6,035,436.72	6,097,543.33
Total Manual System Cost	5,867,000.00	5,904,800.00	5,949,404.00	6,460,436.72	6,522,543.33

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

Year	Total Existing Cost	Accumulated Cost
1	5,867,000.00	5,867,000.00
2	5,904,800.00	11,771,800.00
3	5,949,404.00	17,721,204.00
4	6,460,436.72	24,181,640.72
5	6,522,543.33	30,704,184.05
Total	30,704,184.05	

(2) Costs of Proposed System

Costs of the proposed system are divided into two parts as well, which are fixed costs and variable costs. Fixed costs mainly include new hardware installation, software implementation, and maintenance costs. The costs of operation include office supplies to miscellaneous costs. The costs of proposed system are shown in table 3.8.

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Table 3.10. Proposed System Cost Analysis, Baht.

Cost Items (Baht)	Years				
	1	2	3	4	5
Development Cost:					
Hardware Cost:					
Computer Server Cost 1 unit @ 80,000	16,000.00	16,000.00	16,000.00	16,000.00	16,000.00
Workstation Cost 12 units @ 45,000	108,000.00	108,000.00	108,000.00	108,000.00	108,000.00
Printer 1 unit @ 30,000	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00
UPS 1000 VA 1 unit @ 30,000	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00
Total Hardware Cost	136,000.00	136,000.00	136,000.00	136,000.00	136,000.00
Software Cost:					
Computer Server Cost	200,000.00				
Workstation Cost	300,000.00				
Network Cost	200,000.00				
Total Software Cost	700,000.00				
Implementation Cost:					
Advanced Training Cost	30,000.00				
Basic Training Cost	20,000.00				
Set Up Cost	20,000.00				
Total Implementation Cost	70,000.00				
Office Equipment Cost:					
Calculator	20,000.00				
Total Office Equipment Cost	20,000.00				
Total Development Cost	926,000.00	136,000.00	136,000.00	136,000.00	136,000.00
Operation Cost:					
People-Ware Cost:					
Sales Manager 1 person @ 40,000 per month	40,000.00	40,000.00	40,000.00	42,000.00	42,000.00
Sales person 3 persons @ 20,000 per month	60,000.00	60,000.00	60,000.00	60,000.00	60,000.00
Sales Admin. 2 persons @ 12,000 per month	24,000.00	24,000.00	24,000.00	28,000.00	28,000.00
Accountant 3 persons @ 15,000 per month	45,000.00	45,000.00	45,000.00	51,000.00	51,000.00
Engineer Director 1 person @ 70,000 per month	70,000.00	70,000.00	70,000.00	75,000.00	75,000.00
Engineer 5 persons @ 30,000 per month	150,000.00	150,000.00	150,000.00	165,000.00	165,000.00
Engineer Admin. 2 persons @ 12,000 per month	24,000.00	24,000.00	24,000.00	28,000.00	28,000.00
System Admin. 1 person @ 15,000 per month	15,000.00	15,000.00	15,000.00	17,000.00	17,000.00
Messenger 1 person @ 8,000 per month	8,000.00	8,000.00	8,000.00	8,200.00	8,200.00
Total Monthly Salary	436,000.00	436,000.00	436,000.00	474,200.00	474,200.00
Total Annual Salary Cost	5,232,000.00	5,232,000.00	5,232,000.00	5,690,400.00	5,690,400.00
Office Supplies & Miscellaneous Costs:					
Stationery	30,000.00	29,100.00	28,227.00	27,380.19	26,558.78
Paper	50,000.00	48,500.00	47,045.00	45,633.65	44,264.64
Utility	70,000.00	67,900.00	65,863.00	63,887.11	61,970.50
Miscellaneous	60,000.00	58,200.00	56,454.00	54,760.38	53,117.57
Total Annual Office Supplies & Miscellaneous Cost	210,000.00	203,700.00	197,589.00	191,661.33	185,911.49
Maintenance Cost:					
Maintenance Cost	30,000.00	30,000.00	40,000.00	30,000.00	20,000.00
Total Maintenance Cost	30,000.00	30,000.00	40,000.00	30,000.00	20,000.00
Total Operating Cost	5,472,000.00	5,465,700.00	5,469,589.00	5,912,061.33	5,896,311.49
Total Proposed System Cost	6,398,000.00	5,601,700.00	5,605,589.00	6,048,061.33	6,032,311.49

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Table 3.11. Five Years Accumulated Proposed System Cost, Baht.

Year	Total Computerized Cost	Accumulated Cost
1	6,398,000.00	6,398,000.00
2	5,601,700.00	11,999,700.00
3	5,605,589.00	17,605,289.00
4	6,048,061.33	23,653,350.33
5	6,032,311.49	29,685,661.82
Total	29,685,661.82	

(3) Cost Comparison

Cost Comparisons between accumulated manual system and accumulated proposed system.

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

Year	Accumulated Existing Cost	Accumulated Computerized Cost
1	5,867,000.00	6,398,000.00
2	11,771,800.00	11,999,700.00
3	17,721,204.00	17,605,289.00
4	24,181,640.72	23,653,350.33
5	30,704,184.05	29,685,661.82

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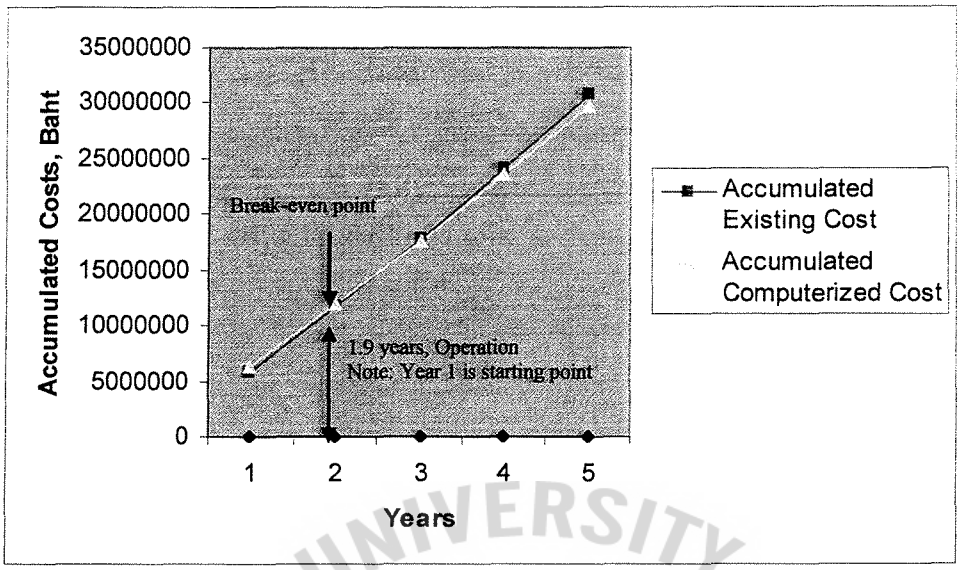

Figure 3.2. Break – Even Point Analysis.

(4) Payback Period Analysis

The company must conduct payback analysis so that it knows whether the investment will pay for itself. Payback analysis determines how much time will lapse before accrued benefits overtake accrued and continuing costs.

Payback period is the length of time required to recover the cost of a project development. It is usually measured by the years. Payback Period can be also used for alternative project investment comparison. In the theory, project with shorter payback period are less risky. In general, payback period of three years or less is preferred. With a shorter payback period, there is a little chance to encounter the effect of the changes in markets conditions, interest rate, and economic situation.

This discount rate is required to calculate discount value of all costs and benefits after the third year to the present value at the present year. If the

payback period is performed without time adjusting the costs and benefits (time value of money), non-time-adjusted paybacks tend to over-optimistic and misleading.

(5) Net Present Value

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

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

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

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IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

When project has already been analyzed, designed and developed, the new system will now be ready for implementation. Users play a role at this point. They have a chance to really test the new system. They can now evaluate the new system whether it meets the desired goals and objectives. If it does not, correction can be made in time. The typical processes of the system implementation are:

(1) Software acquisition and installation

(2) Hardware acquisition and installation

(3) Personnel training

(4) Area preparation

(5) Testing

(6) Conversion

(7) Documentation

The current system and the new system should be simultaneously run until the new system has been proven its accuracy and reliability. Personnel training are required at the state. They need to be informed about the new system and how to use it correctly.

4.2 Hardware and Software Installations

In order to implement the new system, the company needs to install hardware that is specified in the design process. Server and workstations should be ready. Then network connection needs to be performed. Every workstation and the server must be connected via local area network (LAN). After that software is installed to both server and client sides. The new system needs to have Java Virtual Machine installed in it so

that the application can be run. SQL Server 2000 needs to also be installed to manage the database server.

4.3 Test Plan

Testing the application allows developer for correction if errors really occur. The new system needs to be tested to ensure its accuracy and reliability. The new system needs to not interrupt the existing system.

4.4 Conversion

Manual system has been used by employees for a long time. They will need time to make themselves familiar with the new computerized system. The old and new systems should be simultaneously run. Gradually changing the work environment would be better than discarding the old system at once. Running parallel conversion can reduce the risk of rejection by the users. And it is good for the developers to be able to observe and compare the systems closely. The old system will be run for a specified time period before it will be replaced by the new one.

4.5 Training

Personnel are to be informed and trained about the new system. If training has not been performed, confusion may arise. The users have to understand the system as a whole. They have to know how to access to the system, how the system is useful for their work process, and how to use the system wisely and correctly. They will also be informed about how to handle basic problems that might occur as well as how to help maintain the system. The training sessions will vary according to user's group.

4.6 Documentation

Documentation of the new system needs to be prepared in order to be a guideline for the users. It will be helpful for users who are new to the system. They can refer to

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the guideline individually. The guideline will specify how to access the system, what the interface looks like, and how they can use the system correctly and effectively.

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V. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The information system of PP Ontime Co., Ltd. has not yet been systematic.

However, since the business environments have been changed, the company needs to adapt itself to survive the business. The manual system is no longer up to date. If the company does not change, it will be more difficult to win the competition.

The new system has been developed to help the company reach that goal. In the old days, salespeople had to do all the activities, for instance, register new customer, prepare quotations and requests and send all those documents to the departments involved. The new system will benefit especially to sales department. It will help facilitate all sales activities as well as manage customer accounts effectively. It helps reduce workforce which leads to lower operating costs for the company. It gives rapid responses. And the whole company will definitely benefit from implementing the new system.

Comparison between the proposed computerized systems to the existing systems is shown in Table 5.1. It compares some processes that can be done faster by using computers. Response time has dramatically been reduced by implementing the new system. Benefits generated by the new system are as follows:

(1) Document loss might no longer be the case because data are safely stored in the database.

(2) Response time in searching, updating, and retrieving data has been increased.

(3) Some workforce can be replaced by the computerized system, which leads to lower cost in hiring employees.

(4) Performance of overall company has been enhanced

(5) Sales reports can be generated at a specified time period automatically.

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

Processes	Existing Systems	Proposed Systems
Customer Search	30 minutes	< 1 minute
Quotation Search	20 minutes	< 1 minute
Record Process	20 minutes	10 minutes
Report Generation	45 minutes – 1 day	15 minutes

5.2 Recommendation

The proposed system has been developed for the first time. It can further be developed to enhance its functions according to user's requirements. This system is not limited to sales department only. It can expand in some ways as follows:

(1) Integrate every department to the same information system. This introduces the enterprise application integration (EAI) concept.

(2) Expand to facilitate engineering activities, purchasing activities, or accounting activities.

Since the technological world changes every day, revision of the system may be needed to meet user's requirements in the future. Ongoing development should be done in case of change in management policies, procedures, and controls. Nowadays, Internet plays a very important role in every part of life. Web-based application development should well be considered.

APPENDIX A

ENTITY RELATIONSHIP DIAGRAM

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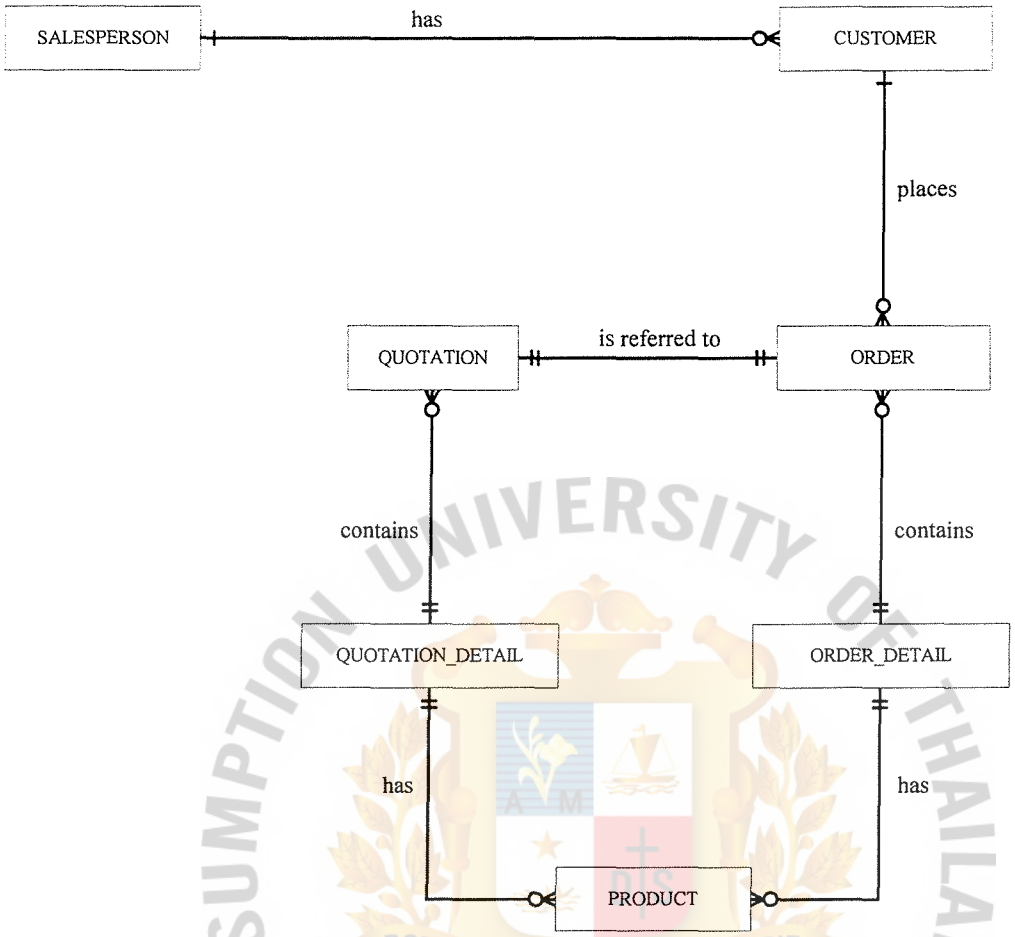

Figure A.1. Context Entity Relationship Diagram of the Proposed System.

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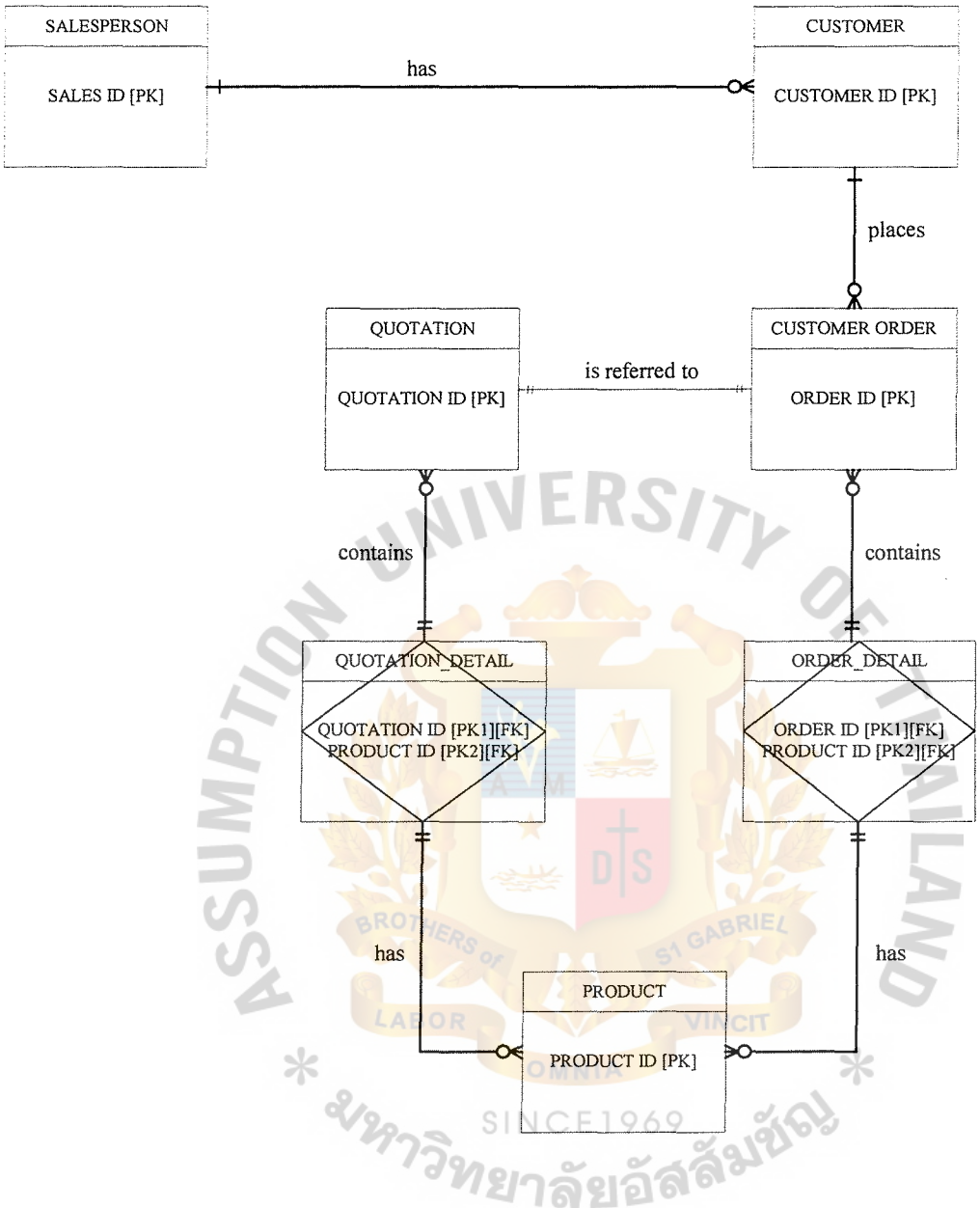

Figure A.2. Key-Based Entity Relationship Diagram.

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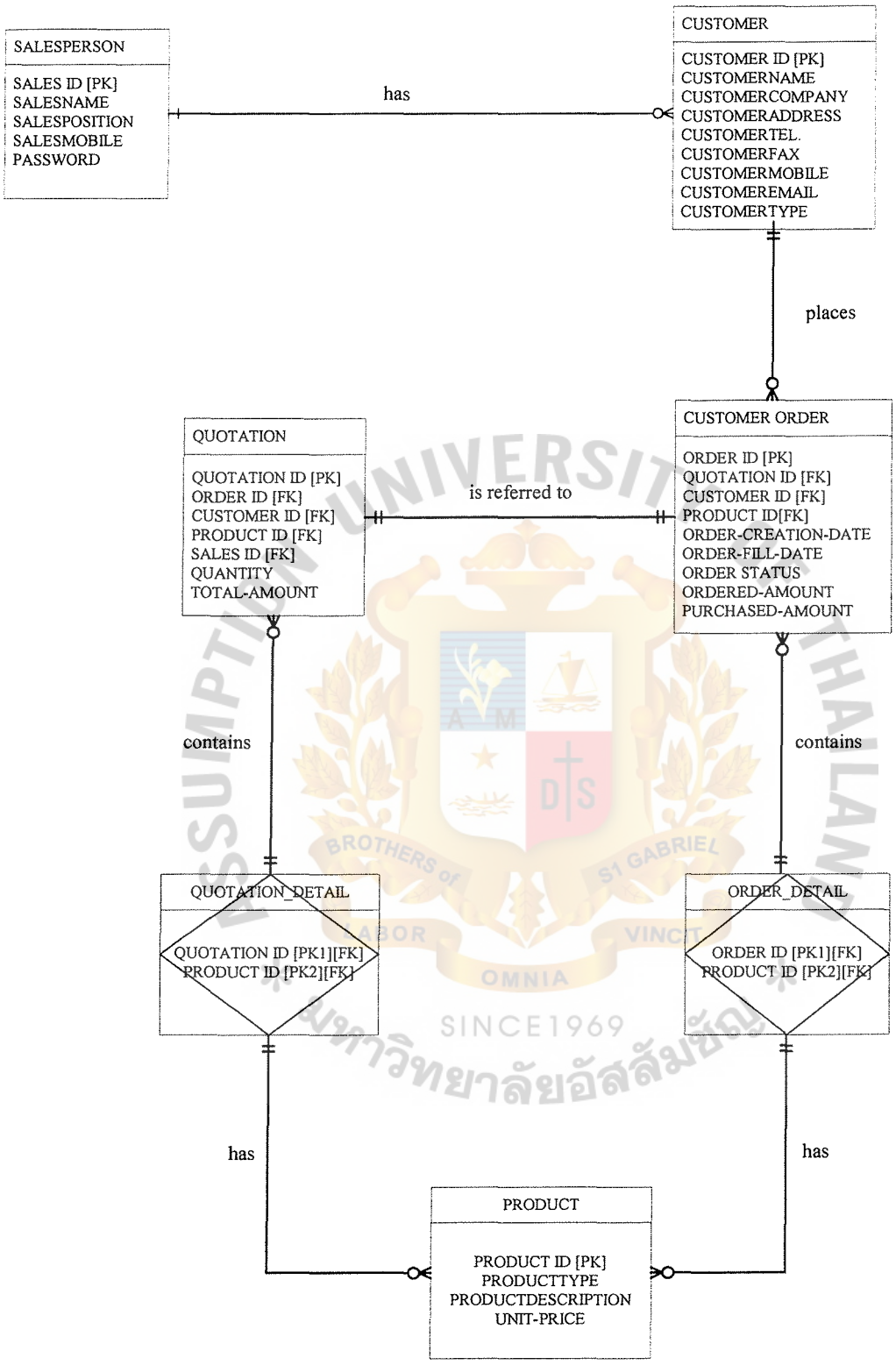

Figure A.3 Fully Entity Relationship Diagram.

APPENDIX B

DATA FLOW DIAGRAM

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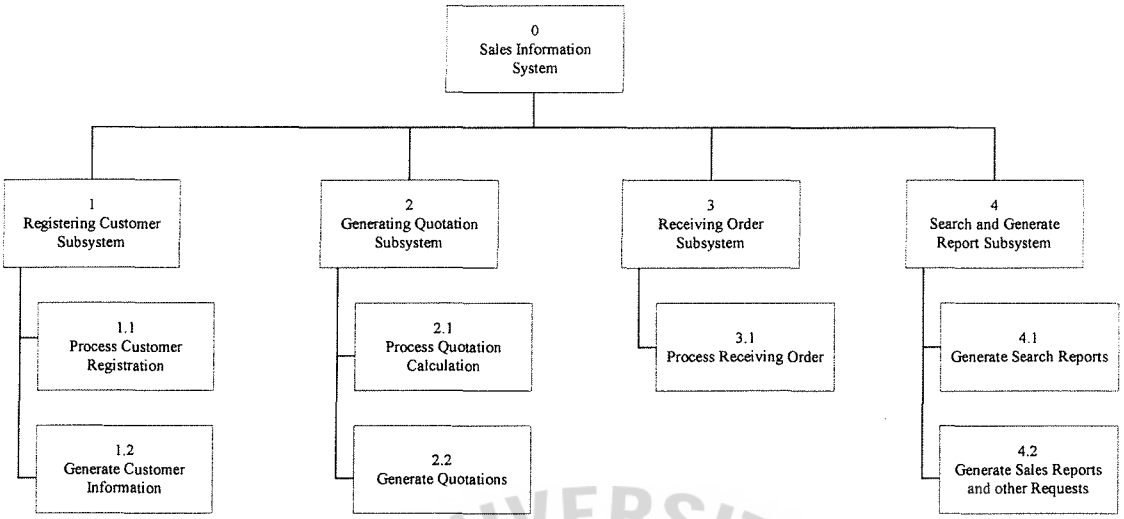

Figure B.1. Functional Decomposition Diagram.

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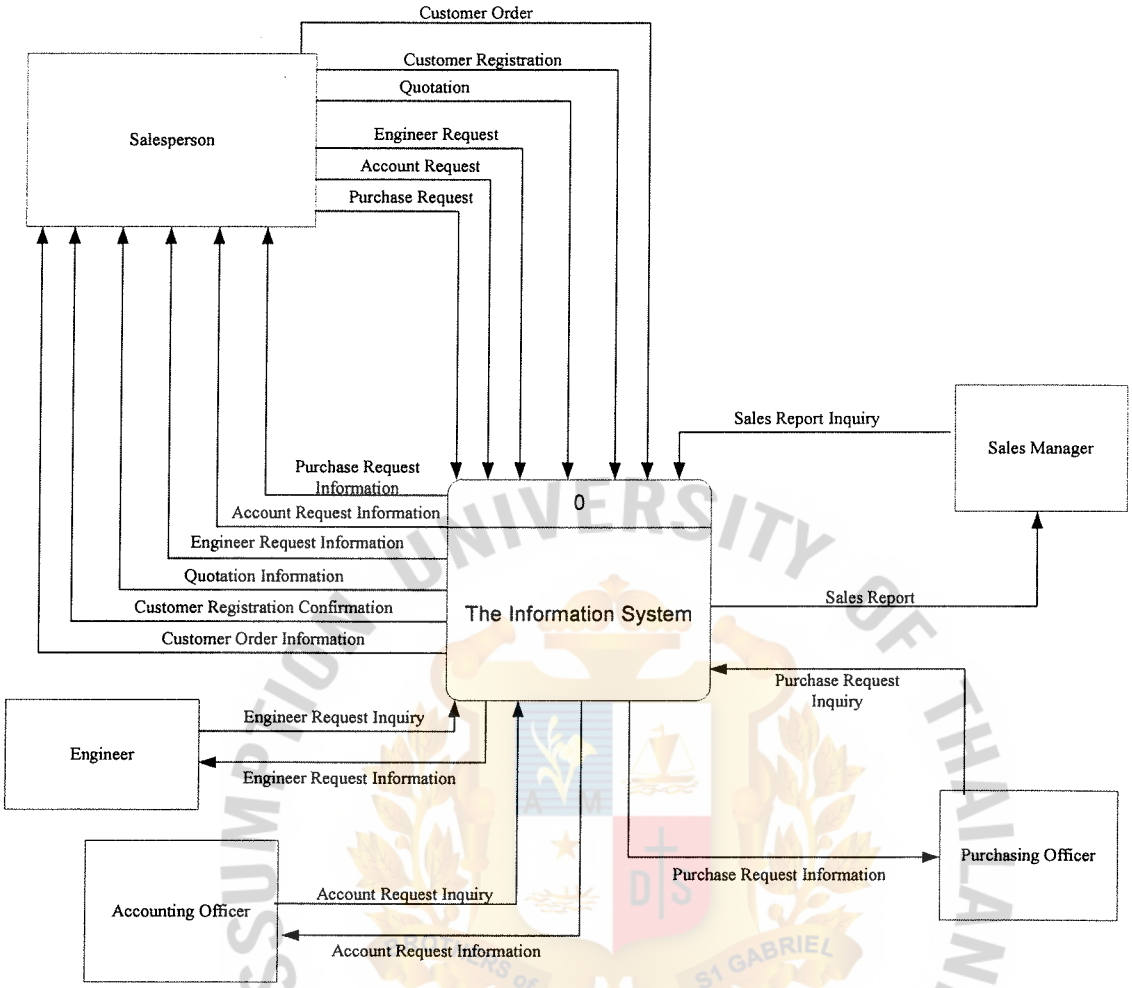

Figure B.2. Context Diagram of Proposed System.

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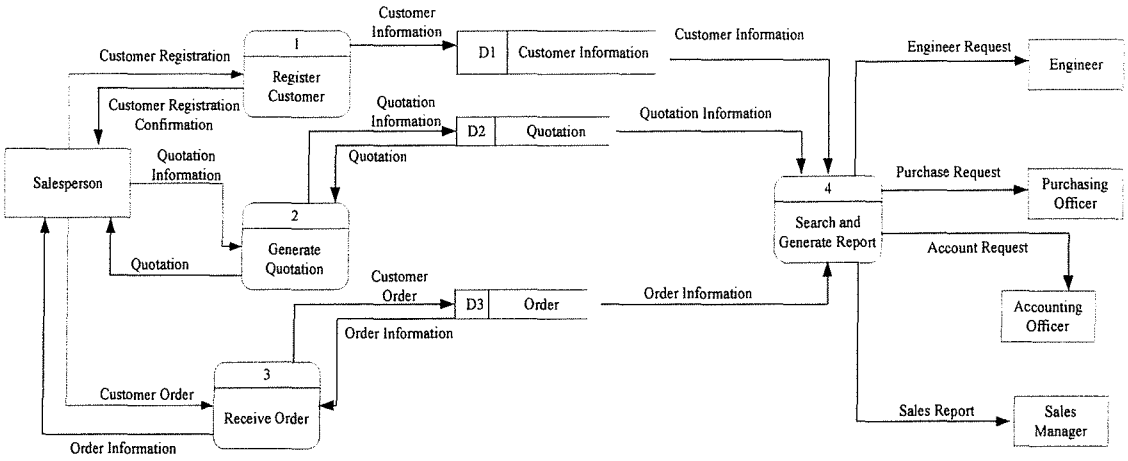

Figure B.3. Data Flow Diagram of the Proposed System.

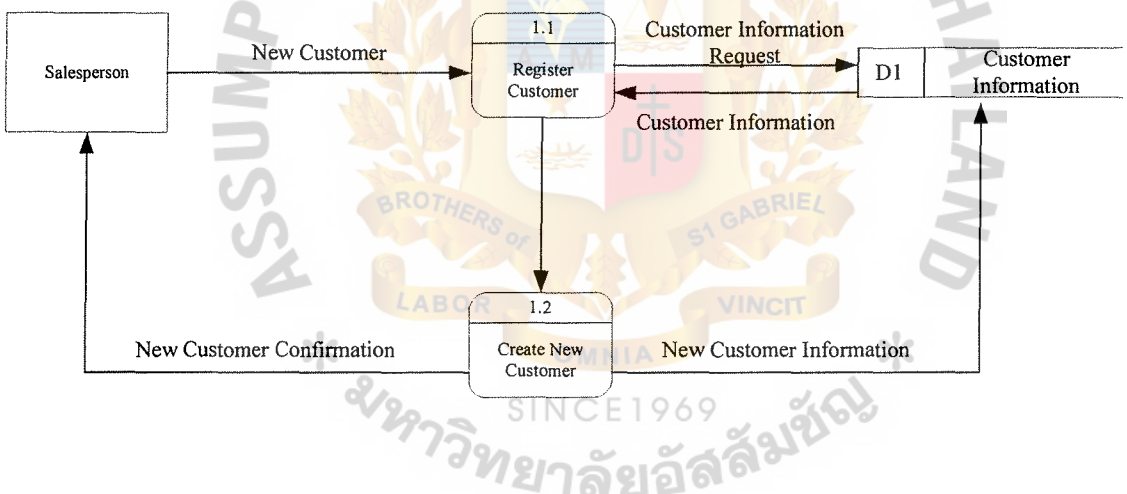

Figure B.4. Data Flow Diagram – Registering Customer.

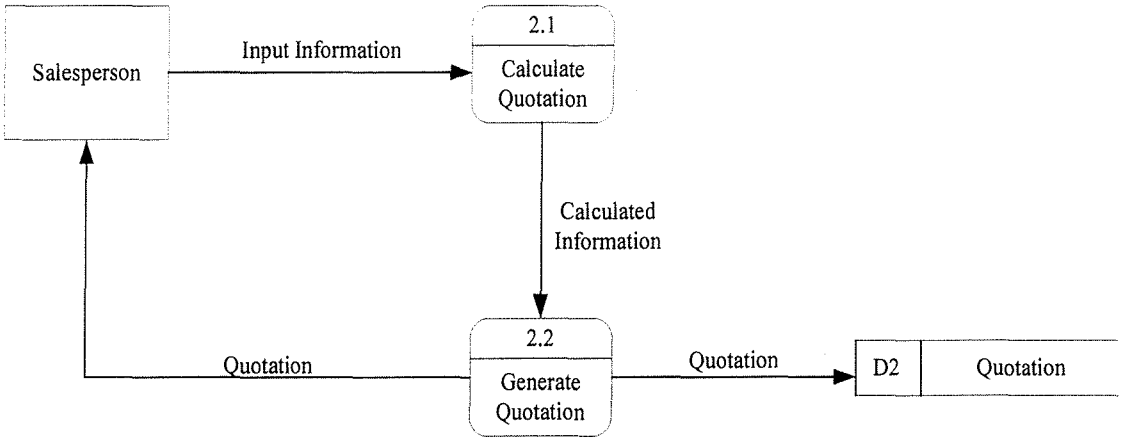

Figure B.5. Data Flow Diagram – Generating Quotation.

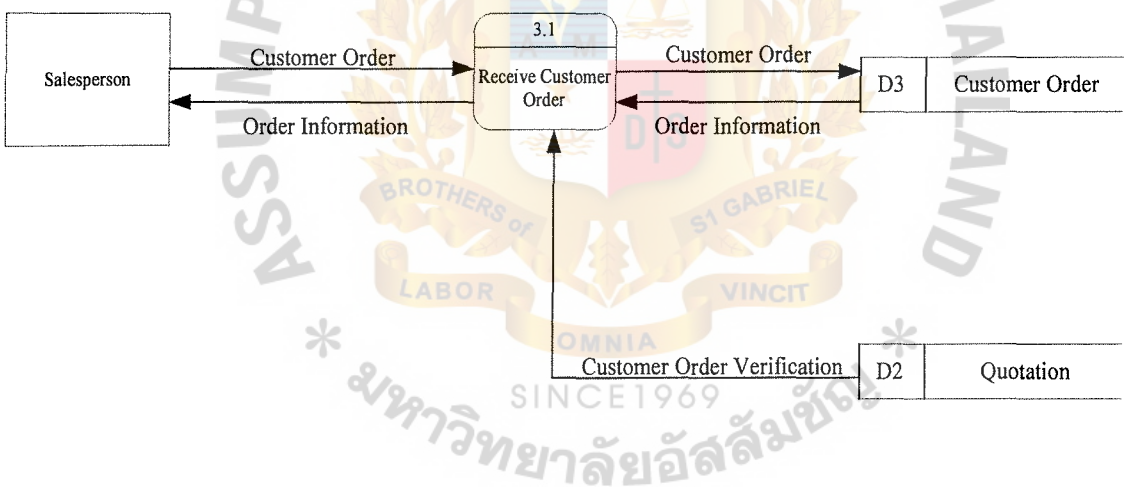

Figure B.6. Data Flow Diagram – Customer Order.

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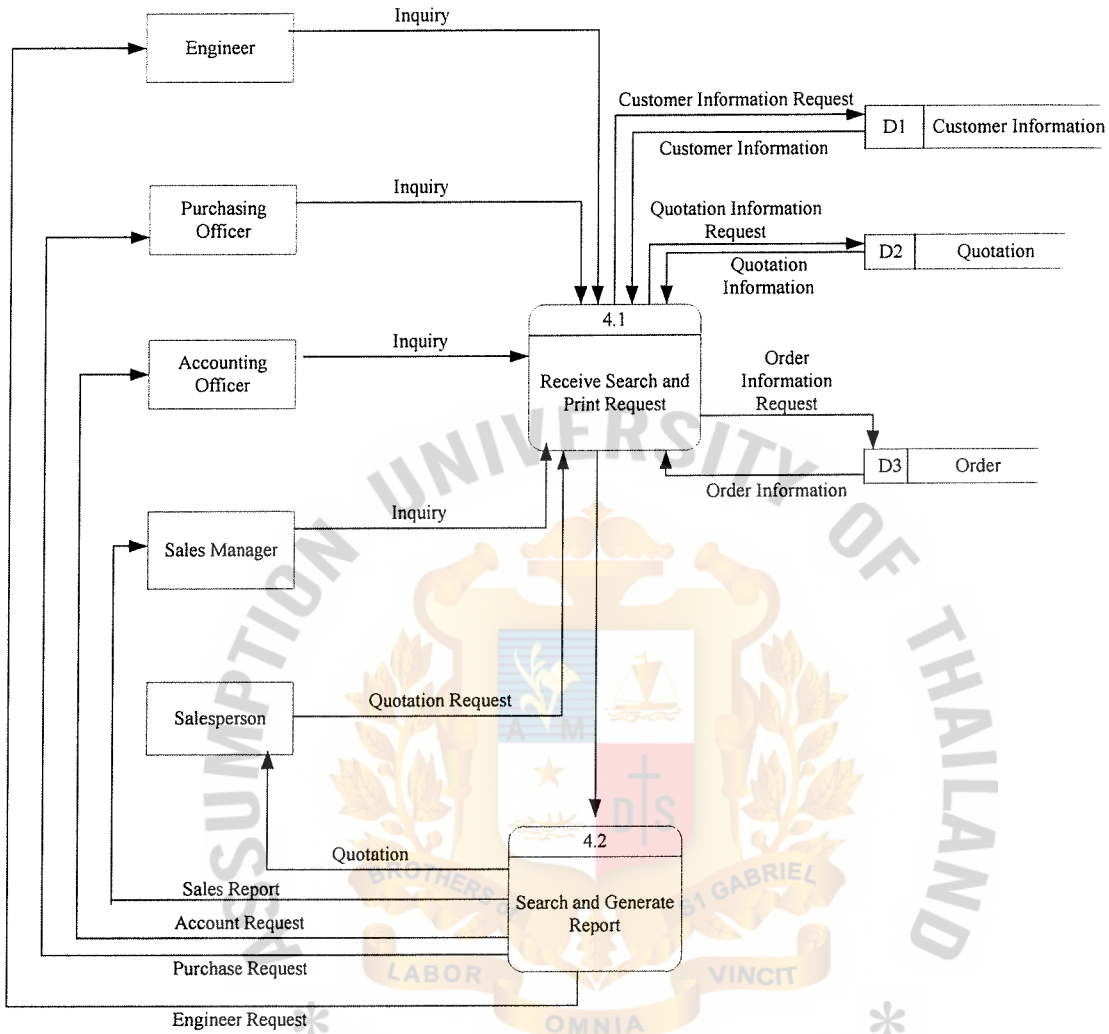

Figure B.7. Data Flow Diagram – Searching Generating Report.

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APPENDIX C

STRUCTURE DIAGRAM

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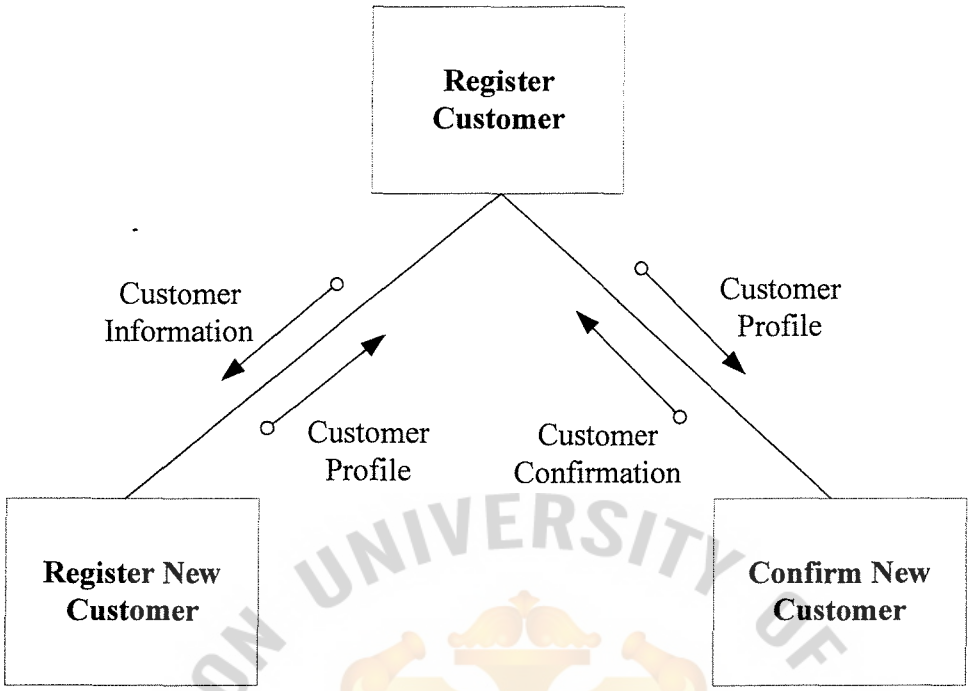

Figure C.1. Structure Chart – Registering Customer.

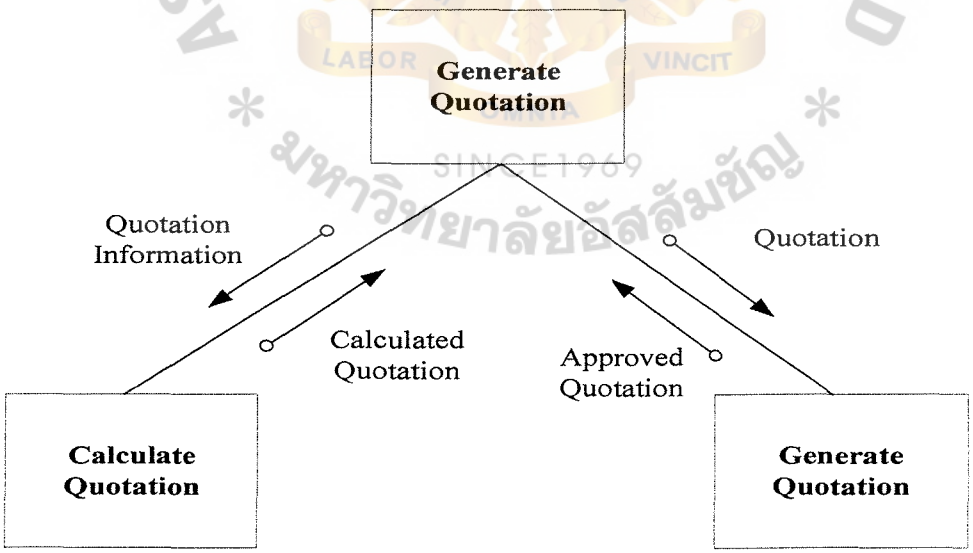

Figure C.2. Structure Chart – Generating Quotation.

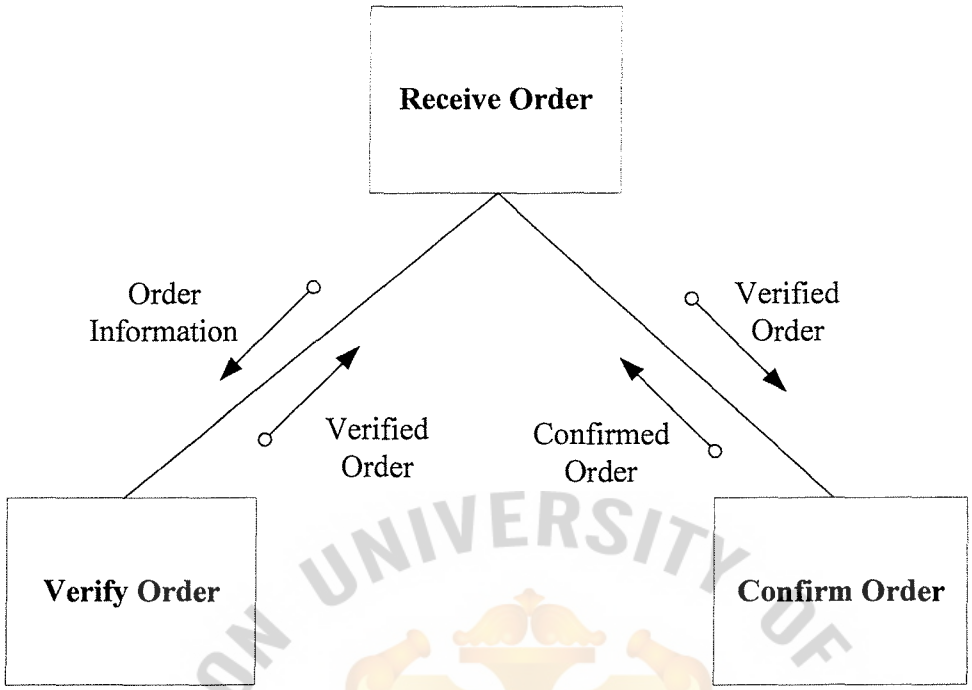

Figure C.3. Structure Chart – Customer Order.

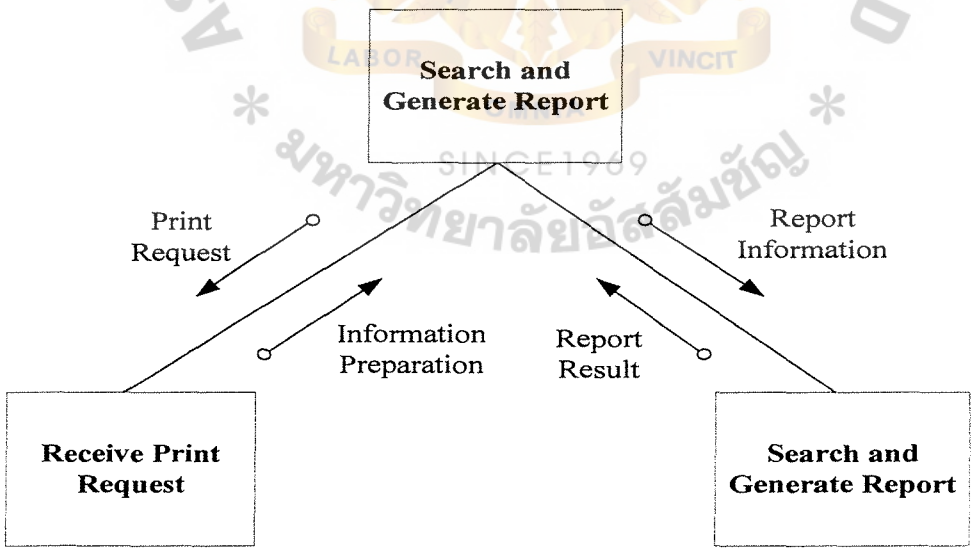

Figure C.4. Structure Chart – Generate Sales Report.

APPENDIX D

FEASIBILITY ANALYSIS

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

Cost Items (Baht)	Years				
	1	2	3	4	5
Development Cost:					
Hardware Cost:					
Computer Server Cost 1 unit @ 80,000	16,000.00	16,000.00	16,000.00	16,000.00	16,000.00
Workstation Cost 12 units @ 45,000	108,000.00	108,000.00	108,000.00	108,000.00	108,000.00
Printer 1 unit @ 30,000	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00
UPS 1000 VA 1 unit @ 30,000	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00
Total Hardware Cost	136,000.00	136,000.00	136,000.00	136,000.00	136,000.00
Software Cost:					
Computer Server Cost	200,000.00				
Workstation Cost	400,000.00				
Network Cost	200,000.00				
Total Software Cost	800,000.00				
Implementation Cost:					
Advanced Training Cost	50,000.00				
Basic Training Cost	20,000.00				
Set Up Cost	30,000.00				
Total Implementation Cost	100,000.00				
Office Equipment Cost:					
Calculator	20,000.00				
Total Office Equipment Cost	20,000.00				
Total Development Cost	1,056,000.00	136,000.00	136,000.00	136,000.00	136,000.00
Operation Cost:					
People-Ware Cost:					
Sales Manager 1 person @ 40,000 per month	40,000.00	40,000.00	40,000.00	42,000.00	42,000.00
Sales person 3 persons @ 20,000 per month	60,000.00	60,000.00	60,000.00	60,000.00	60,000.00
Sales Admin. 2 persons @ 12,000 per month	24,000.00	24,000.00	24,000.00	28,000.00	28,000.00
Accountant 3 persons @ 15,000 per month	45,000.00	45,000.00	45,000.00	51,000.00	51,000.00
Engineer Director 1 person @ 70,000 per month	70,000.00	70,000.00	70,000.00	75,000.00	75,000.00
Engineer 5 persons @ 30,000 per month	150,000.00	150,000.00	150,000.00	165,000.00	165,000.00
Engineer Admin. 2 persons @ 12,000 per month	24,000.00	24,000.00	24,000.00	28,000.00	28,000.00
System Admin. 1 person @ 15,000 per month	15,000.00	15,000.00	15,000.00	17,000.00	17,000.00
Messenger 1 person @ 8,000 per month	8,000.00	8,000.00	8,000.00	8,200.00	8,200.00
Total Monthly Salary	436,000.00	436,000.00	436,000.00	474,200.00	474,200.00
Total Annual Salary Cost	5,232,000.00	5,232,000.00	5,232,000.00	5,690,400.00	5,690,400.00
Office Supplies & Miscellaneous Costs:					
Stationary	30,000.00	29,100.00	28,227.00	27,380.19	26,558.78
Paper	50,000.00	48,500.00	47,045.00	45,633.65	44,264.64
Utility	70,000.00	67,900.00	65,863.00	63,887.11	61,970.50
Miscellaneous	60,000.00	58,200.00	56,454.00	54,760.38	53,117.57
Total Annual Office Supplies & Miscellaneous Cost	210,000.00	203,700.00	197,589.00	191,661.33	185,911.49
Maintenance Cost:					
Maintenance Cost	30,000.00	30,000.00	40,000.00	30,000.00	20,000.00
Total Maintenance Cost	30,000.00	30,000.00	40,000.00	30,000.00	20,000.00
Total Operating Cost	5,472,000.00	5,465,700.00	5,469,589.00	5,912,061.33	5,896,311.49
Total Proposed System Cost	6,528,000.00	5,601,700.00	5,605,589.00	6,048,061.33	6,032,311.49

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

Cost Items (Baht)	Years				
	1	2	3	4	5
Development Cost:					
Hardware Cost:					
Computer Server Cost 1 unit @ 80,000	16,000.00	16,000.00	16,000.00	16,000.00	16,000.00
Workstation Cost 12 units @ 45,000	108,000.00	108,000.00	108,000.00	108,000.00	108,000.00
Printer 1 unit @ 30,000	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00
UPS 1000 VA 1 unit @ 30,000	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00
Total Hardware Cost	136,000.00	136,000.00	136,000.00	136,000.00	136,000.00
Software Cost:					
Computer Server Cost	200,000.00				
Workstation Cost	600,000.00				
Network Cost	200,000.00				
Total Software Cost	1,000,000.00				
Implementation Cost:					
Advanced Training Cost	70,000.00				
Basic Training Cost	30,000.00				
Set Up Cost	40,000.00				
Total Implementation Cost	140,000.00				
Office Equipment Cost:					
Calculator	20,000.00				
Total Office Equipment Cost	20,000.00				
Total Development Cost	1,296,000.00	136,000.00	136,000.00	136,000.00	136,000.00
Operation Cost:					
People-Ware Cost:					
Sales Manager 1 person @ 40,000 per month	40,000.00	40,000.00	40,000.00	42,000.00	42,000.00
Sales person 3 persons @ 20,000 per month	60,000.00	60,000.00	60,000.00	60,000.00	60,000.00
Sales Admin. 2 persons @ 12,000 per month	24,000.00	24,000.00	24,000.00	28,000.00	28,000.00
Accountant 3 persons @ 15,000 per month	45,000.00	45,000.00	45,000.00	51,000.00	51,000.00
Engineer Director 1 person @ 70,000 per month	70,000.00	70,000.00	70,000.00	75,000.00	75,000.00
Engineer 5 persons @ 30,000 per month	150,000.00	150,000.00	150,000.00	165,000.00	165,000.00
Engineer Admin. 2 persons @ 12,000 per month	24,000.00	24,000.00	24,000.00	28,000.00	28,000.00
System Admin. 1 person @ 15,000 per month	15,000.00	15,000.00	15,000.00	17,000.00	17,000.00
Messenger 1 person @ 8,000 per month	8,000.00	8,000.00	8,000.00	8,200.00	8,200.00
Total Monthly Salary	436,000.00	436,000.00	436,000.00	474,200.00	474,200.00
Total Annual Salary Cost	5,232,000.00	5,232,000.00	5,232,000.00	5,690,400.00	5,690,400.00
Office Supplies & Miscellaneous Costs:					
Stationary	30,000.00	29,100.00	28,227.00	27,380.19	26,558.78
Paper	50,000.00	48,500.00	47,045.00	45,633.65	44,264.64
Utility	70,000.00	67,900.00	65,863.00	63,887.11	61,970.50
Miscellaneous	60,000.00	58,200.00	56,454.00	54,760.38	53,117.57
Total Annual Office Supplies & Miscellaneous Cost	210,000.00	203,700.00	197,589.00	191,661.33	185,911.49
Maintenance Cost:					
Maintenance Cost	30,000.00	30,000.00	40,000.00	30,000.00	20,000.00
Total Maintenance Cost	30,000.00	30,000.00	40,000.00	30,000.00	20,000.00
Total Operating Cost	5,472,000.00	5,465,700.00	5,469,589.00	5,912,061.33	5,896,311.49
Total Proposed System Cost	6,768,000.00	5,601,700.00	5,605,589.00	6,048,061.33	6,032,311.49

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Table D.3. The Benefits of the Proposed System, Baht.

Benefit Item	Price
1 Personnel Reduction	
Support Services Officer (24,000 per month)	288,000
2 Office Supplier & Miscellaneous cost reduction	
Stationary (20,000 annual)	20,000
Paper (30,000 annual)	30,000
Utility (25,000 annual)	25,000
Miscellaneous (40,000 annual)	40,000
Total Office Supplier & Miscellaneous	125,000
3 Elimination of the possible long run cost	
Support Services Officer (15,000 per month)	180,000
Total Benefit	593,000

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Table D.4. The Payback Period for the Candidate 1, Baht.

Cash Flow Description (Baht)	Years					
	0	1	2	3	4	5
Development Cost:	(1,470,000.00)					
Operation & Maintenance Cost:		(300,000.00)	(291,000.00)	(282,270.00)	(273,801.90)	(265,587.84)
Discount Factor for 12%	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost (adjusted to present value):	(1,470,000.00)	(267,900.00)	(231,927.00)	(200,976.24)	(174,138.01)	(150,588.31)
Cumulative time-adjusted cost over lifetime:	(1,470,000.00)	(1,737,900.00)	(1,969,827.00)	(2,170,803.24)	(2,344,941.25)	(2,495,529.56)
Benefits derived from operation of new system:	0.00	689,000.00	723,450.00	759,622.50	797,603.63	837,483.81
Discount factors for 12%:	1.00	0.893	0.797	0.712	0.636	0.567
Time - adjusted benefits(current of present value):	0.00	615,277.00	576,589.65	540,851.22	507,275.91	474,853.32
Cumulative time- adjusted benefits over lifetime:	0.00	615,277.00	1,191,866.65	1,732,717.87	2,239,993.78	2,714,847.09
	0	1	2	3	4	5
Cumulative time- adjusted costs + benefits :	(1,470,000.00)	(854,723.00)	337,143.65	2,069,861.52	4,309,855.30	7,024,702.39

Table D.5. The Payback Period for the Candidate 2, Baht.

Cash Flow Description (Baht)	Years					
	0	1	2	3	4	5
Development Cost:	(1,600,000.00)					
Operation & Maintenance Cost:		(320,000.00)	(310,400.00)	(301,088.00)	(292,055.36)	(283,293.70)
Discount Factor for 12%	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost (adjusted to present value):	(1,600,000.00)	(285,760.00)	(247,388.80)	(214,374.66)	(185,747.21)	(160,627.53)
Cumulative time-adjusted cost over lifetime:	(1,600,000.00)	(1,885,760.00)	(2,133,148.80)	(2,347,523.46)	(2,533,270.66)	(2,693,898.19)
Benefits derived from operation of new system:	0.00	689,000.00	723,450.00	759,622.50	797,603.63	837,483.81
Discount factors for 12%:	1.00	0.893	0.797	0.712	0.636	0.567
Time - adjusted benefits(current of present value):	0.00	615,277.00	576,589.65	540,851.22	507,275.91	474,853.32
Cumulative time- adjusted benefits over lifetime:	0.00	615,277.00	1,191,866.65	1,732,717.87	2,239,993.78	2,714,847.09
	0	1	2	3	4	5
Cumulative time- adjusted costs + benefits :	(1,600,000.00)	(984,723.00)	207,143.65	1,939,861.52	4,179,855.30	6,894,702.39

Table D.6. The Payback Period for the Candidate 3, Baht.

Cash Flow Description (Baht)	Years					
	0	1	2	3	4	5
Development Cost:	(1,840,000.00)					
Operation & Maintenance Cost:		(369,000.00)	(357,930.00)	(347,192.10)	(336,776.34)	(326,673.05)
Discount Factor for 12%	1.00	0.893	4.000	0.712	0.636	0.567
Time-adjusted Cost (adjusted to present value):	(1,840,000.00)	(329,517.00)	(1,431,720.00)	(247,200.78)	(214,189.75)	(185,223.62)
Cumulative time-adjusted cost over lifetime:	(1,840,000.00)	(2,169,517.00)	(3,601,237.00)	(3,848,437.78)	(4,062,627.53)	(4,247,851.14)
Benefits derived from operation of new system:	0.00	689,000.00	723,450.00	759,622.50	797,603.63	837,483.81
Discount factors for 12%:	1.00	0.893	0.797	0.712	0.636	0.567
Time - adjusted benefits(current of present value):	0.00	615,277.00	576,589.65	540,851.22	507,275.91	474,853.32
Cumulative time- adjusted benefits over lifetime:	0.00	615,277.00	1,191,866.65	1,732,717.87	2,239,993.78	2,714,847.09
	0	1	2	3	4	5
Cumulative time- adjusted costs + benefits :	(1,840,000.00)	(1,224,723.00)	(32,856.35)	1,699,861.52	3,939,855.30	6,654,702.39

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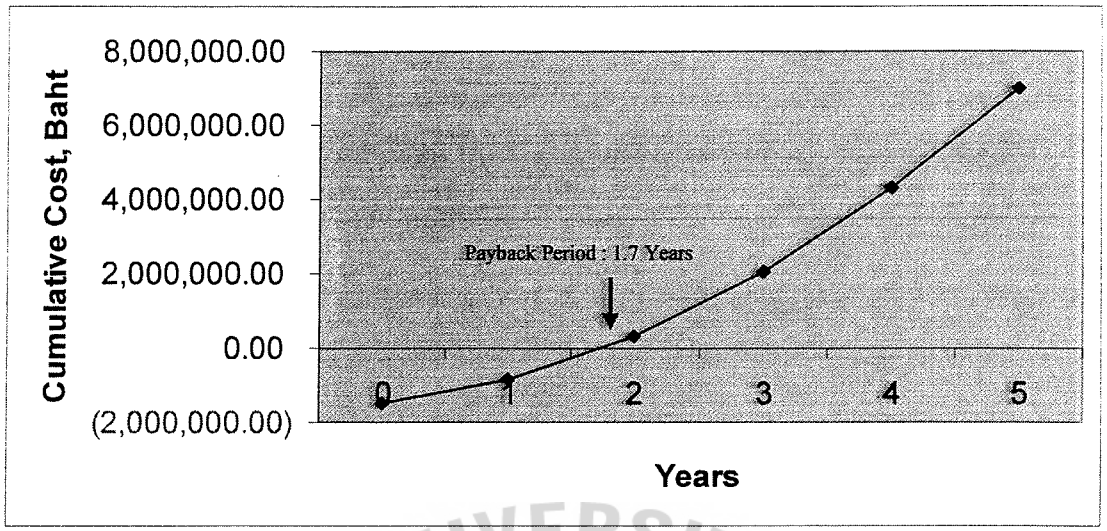

Figure D.1. Payback Period for Candidate 1.

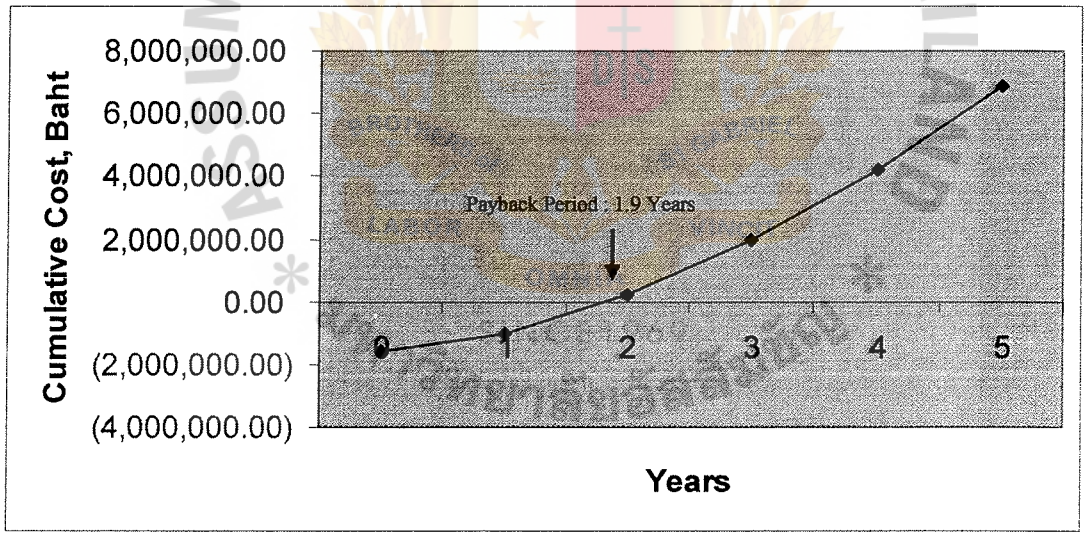

Figure D.2. Payback Period for Candidate 2.

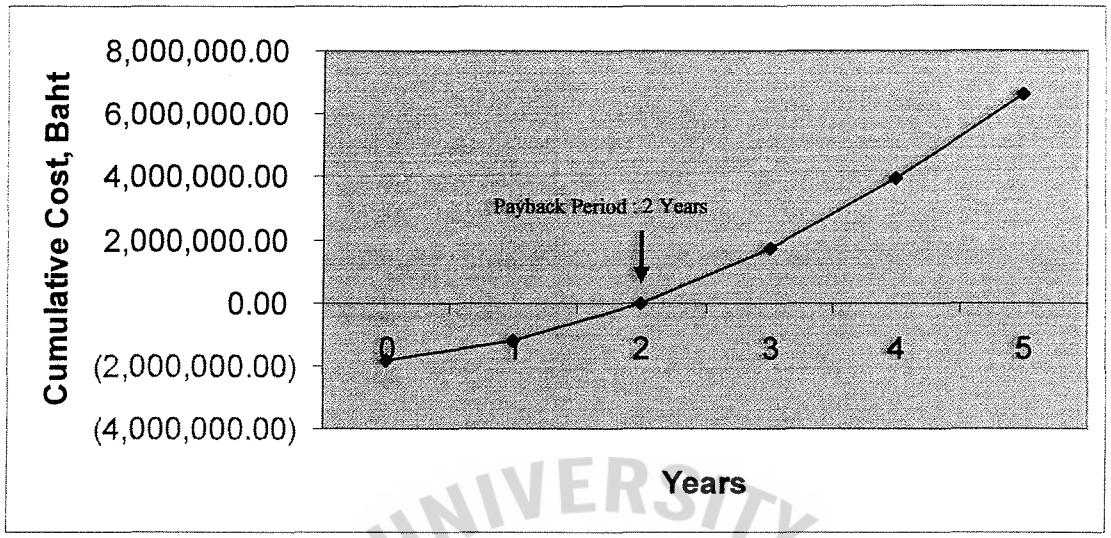

Figure D.3. Payback Period for Candidate 3.

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Table D.7. Net Present Value for the Candidate 1, Baht.

Cash Flow Description (Baht)	Years						Total
	0	1	2	3	4	5	
Development Cost:	(1,470,000.00)						
Operation & Maintenance Cost:		(300,000.00)	(291,000.00)	(282,270.00)	(273,801.90)	(265,587.84)	
Discount Factor for 12%	1.00	0.893	0.797	0.712	0.636	0.567	
Present Value of Annual Cost:	(1,470,000.00)	(267,900.00)	(231,927.00)	(200,976.24)	(174,138.01)	(150,588.31)	
Total Present Value of Lifetime Cost:							(2,495,529.56)
Benefits derived from operation of new system:	0.00	689,000.00	723,450.00	759,622.50	797,603.63	837,483.81	
Discount factors for 12%:	1.00	0.893	0.797	0.712	0.636	0.567	
Present Value of Annual Benefits:	0.00	615,277.00	576,589.65	540,851.22	507,275.91	474,853.32	
Total Present Value of Lifetime Benefit							2,714,847.09
Net Present Value of this Alternative:							219,317.54

Table D.8. Net Present Value for the Candidate 2, Baht.

Cash Flow Description (Baht)	Years						Total
	0	1	2	3	4	5	
Development Cost:	(1,600,000.00)						
Operation & Maintenance Cost:		(320,000.00)	(310,400.00)	(301,088.00)	(292,055.36)	(283,293.70)	
Discount Factor for 12%	1.00	0.893	0.797	0.712	0.636	0.567	
Present Value of Annual Cost:	(1,600,000.00)	(285,760.00)	(247,388.80)	(214,374.66)	(185,747.21)	(160,627.53)	
Total Present Value of Lifetime Cost:							(2,693,898.19)
Benefits derived from operation of new system:	0.00	689,000.00	723,450.00	759,622.50	797,603.63	837,483.81	
Discount factors for 12%:	1.00	0.893	0.797	0.712	0.636	0.567	
Present Value of Annual Benefits:	0.00	615,277.00	576,589.65	540,851.22	507,275.91	474,853.32	
Total Present Value of Lifetime Benefit							2,714,847.09
Net Present Value of this Alternative:							20,948.90

Table D.9. Net Present Value for the Candidate 3, Baht.

Cash Flow Description (Baht)	Years						Total
	0	1	2	3	4	5	
Development Cost:	(1,840,000.00)						
Operation & Maintenance Cost:		(369,000.00)	(357,930.00)	(347,192.10)	(336,776.34)	(326,673.05)	
Discount Factor for 12%	1.00	0.893	4.000	0.712	0.636	0.567	
Present Value of Annual Cost:	(1,840,000.00)	(329,517.00)	(1,431,720.00)	(247,200.78)	(214,189.75)	(185,223.62)	
Total Present Value of Lifetime Cost:							(4,247,851.14)
Benefits derived from operation of new system:	0.00	689,000.00	723,450.00	759,622.50	797,603.63	837,483.81	
Discount factors for 12%:	1.00	0.893	0.797	0.712	0.636	0.567	
Present Value of Annual Benefits:	0.00	615,277.00	576,589.65	540,851.22	507,275.91	474,853.32	
Total Present Value of Lifetime Benefit							2,714,847.09
Net Present Value of this Alternative:							(1,533,004.05)

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APPENDIX E

USER INTERFACE DESIGN

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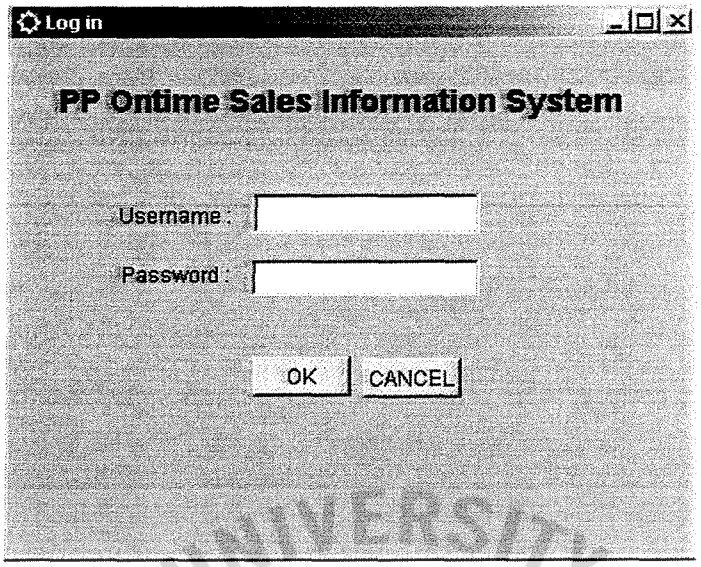

Figure E.1. Interface Design for System Login.

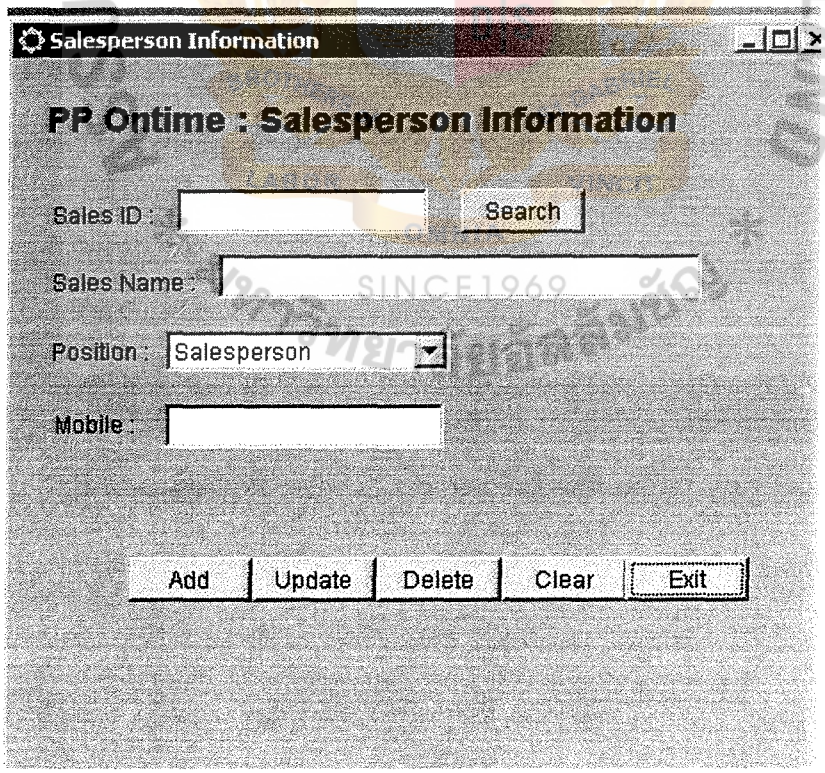

Figure E.2. Interface Design for Sales Information.

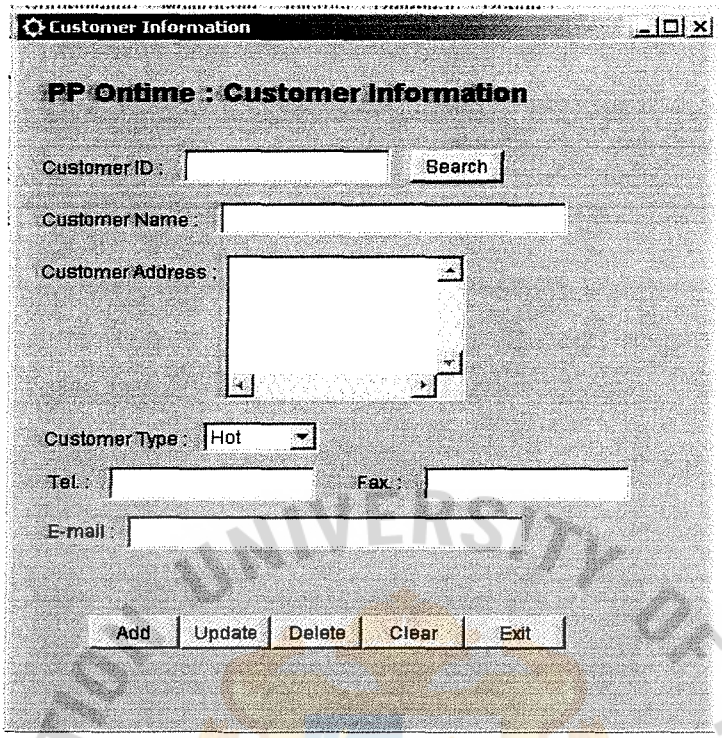

Figure E.3. Interface Design for Customer Information.

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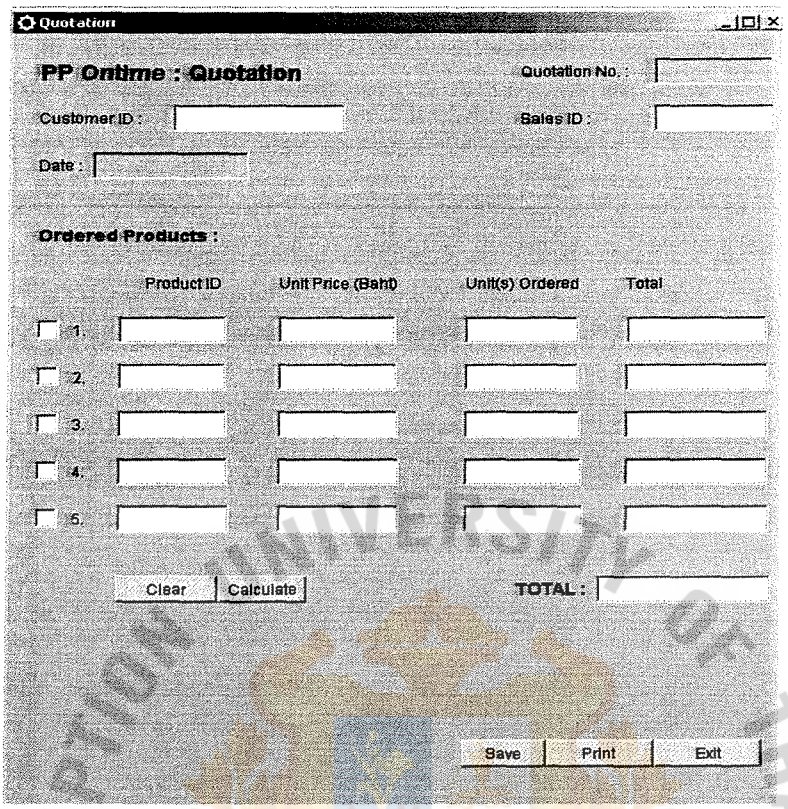

Figure E.4 Interface Design for Generating Quotation.

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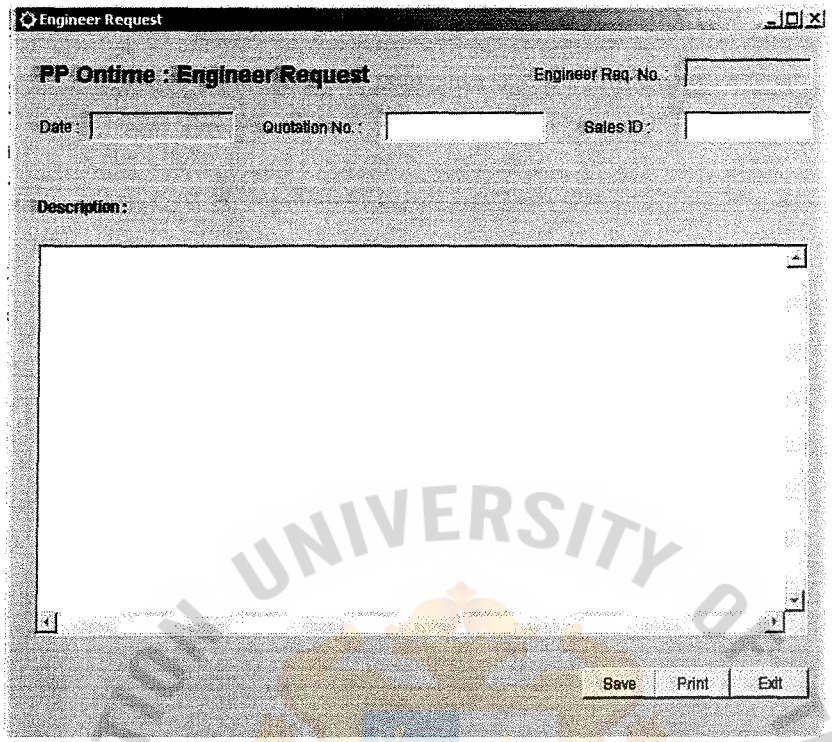

Figure E.5. Interface Design for Generating Engineer Request.

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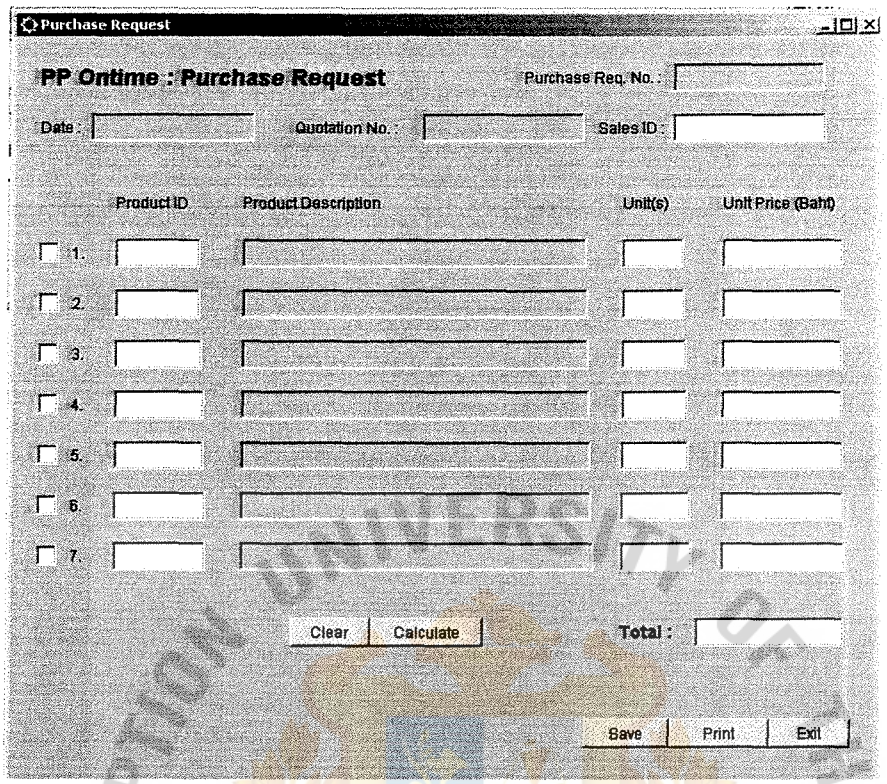

Figure E.6. Interface Design for Generating Purchase Request.

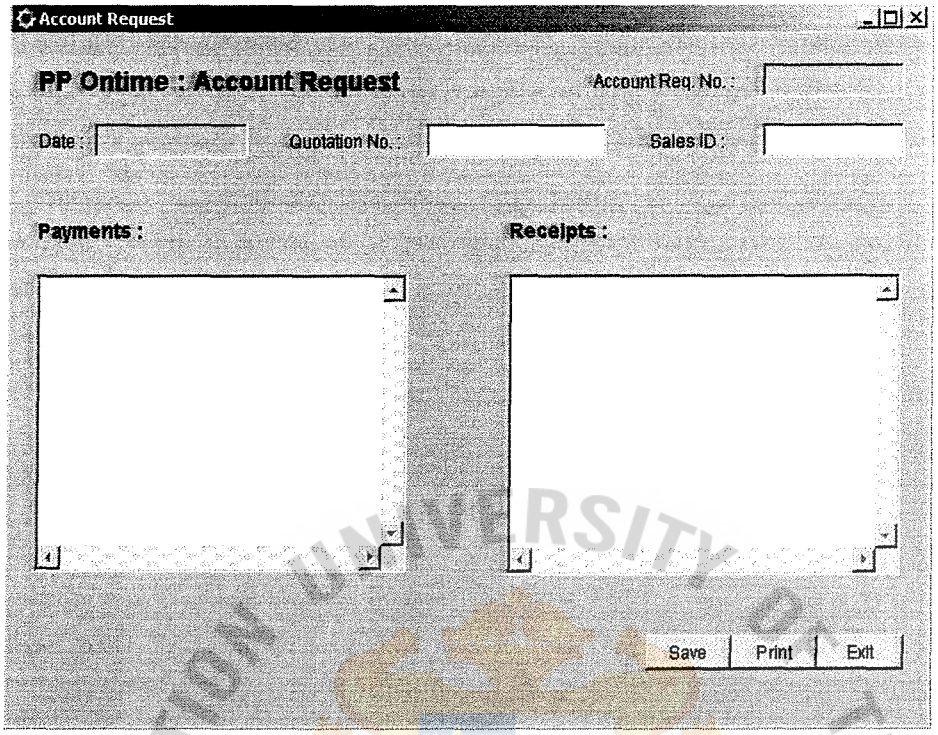

Figure E.7. Interface Design for Generating Account Request.

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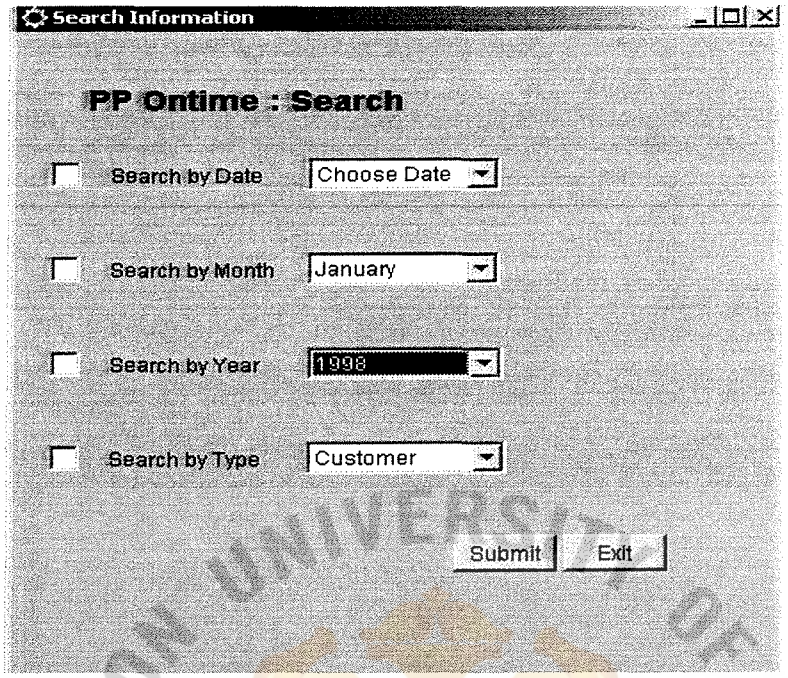

Figure E.8. Interface Design for Searching Information.

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APPENDIX F

REPORT DESIGN

PP Ontime

PP ONTIME CO., LTD.
2532 Rama 3 Tower, Rama 3 Road,
Bangkolam, Bangkok 10120
Tel. (662) 683-9155 Fax. (662) 683-9150

Quotation

ATTN : K. Sommart Juthichariyawat
COMPANY : Yamatake (Thailand) Co., Ltd.
ADDRESS : Bangna Tower C. 12th Floor, 40/14 Moo 12, Bangna-Trad Rd., K.M. 6.5, Bangkaew, Bangplee, Samutprakarn 10540
E-MAIL :
PHONE : 0-2751-9427-33
FAX : 0-2751-9434

QUOTATION NO. : PS/R0127-V01
DATE : 26 November 2004
SALESPERSON : Pojanee Sujeerapongsin
MOBILE : 0-9449-4643

Item	Description	Unit Price (Baht)	QTY	Amount (Baht)
1 1.1	**Installation Charge** : Equipment Installation	20,000.00	1	20,000.00
2 2.1	**Equipment** Cisco 1760-V : 10/100 Modular Router : 1-Port Serial WAN Interface Card : 2-Port Voice Interface Card : V.35 Cable, DTE, Male, 10 Feet	7,800.00	2	15,600.00
	TOTAL			**35,600.00**

Approved by

(Orratai Harnjeerapunya)
Sales Manager

Sincerely Yours,

(Pojanee Sujeerapongsin)
Sales Executive

Figure F.1. Quotation .

ENGINEER REQUEST

CUSTOMER :	K. Sommart Juthichariyawat	ENGINEER REQUEST NO. :	ER-0001/04
COMPANY :	Yamatake (Thailand) Co., Ltd.	DATE :	26 November 2004
ADDRESS :	Bangna Tower C. 12th Floor, 40/14 Moo 12, Bangna-Trad Rd., K.M. 6.5, Bangkaew, Bangplee, Samutprakarn 10540	SALESPERSON :	Pojanee Sujeerapongsin
E-MAIL :		MOBILE :	0-9449-4643
PHONE :	0-2751-9427-33		
FAX :	0-2751-9434		

Description :

Approved by

(Weerasak Mongkolpetch)
Engineering Manager

Figure F.2. Engineer Request.

PURCHASE REQUEST

CUSTOMER : K. Sommart Juthichariyawat
COMPANY : Yamatake (Thailand) Co., Ltd.
ADDRESS : Bangna Tower C. 12th Floor, 40/14 Moo 12, Bangna-Trad Rd., K.M. 6.5, Bangkaew, Bangplee, Samutprakarn 10540
E-MAIL :
PHONE : 0-2751-9427-33
FAX : 0-2751-9434

PURCHASE REQUEST NO. : PR-0001/04
DATE : 26 November 2004
SALESPERSON : Pojanee Sujeerapongsin
MOBILE : 0-9449-4643

Description	Unit Price	QTY	Amount
TOTAL			

Approved by

(Daranan Pattaramool)
Purchasing Officer

Figure F.3. Purchase Request.

ACCOUNT REQUEST

CUSTOMER : K. Sommart Juthichariyawat
COMPANY : Yamatake (Thailand) Co., Ltd.
ADDRESS : Bangna Tower C. 12th Floor, 40/14 Moo 12, Bangna-Trad Rd., K.M. 6.5, Bangkaew, Bangplee, Samutprakarn 10540
E-MAIL :
PHONE : 0-2751-9427-33
FAX : 0-2751-9434

ACCOUNT REQUEST NO. : AR-0001/04
DATE : 26 November 2004
SALESPERSON : Pojanee Sujeerapongsin
MOBILE : 0-9449-4643

Payments :

TOTAL :

Receipts :

TOTAL :

Approved by

(Supattra Punyakong)
Accounting Officer

Figure F.4. Account Request.

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SALES REPORT

Date : 26/11/04

Customer ID	Customer Name	Order Date	Quotation ID	Order ID	Amount (Baht)	Sales Name
xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx
xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx
xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx
xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx
xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx
xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx
xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx
xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx
xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx
xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx

Figure F.5. Sales Report.

APPENDIX G

DATABASE DESIGN

Table G.1. Structure of Customer Table.

Filed Name	Type	Length	Key Type	Foreign Key To	Index	Unique	Nullable
CustomerID	Character	10	Primary Key	Quotation Order	Y	Y	
CustomerType	Character	10	Attribute				
CompanyName	Character	50	Attribute				
CustomerAddress	Character	100	Attribute				
CustomerTel	Character	20	Attribute				
CustomerFax	Character	20	Attribute				Y
CustomerMobile	Character	20	Attribute				Y
CustomerEmail	Character	30	Attribute				Y

Table G.2. Structure of Salesperson Table.

Filed Name	Type	Length	Key Type	Foreign Key To	Index	Unique	Nullable
SalesID	Character	10	Primary Key	Quotation	Y	Y	
SalesName	Character	50	Attribute				
SalesMobile	Character	20	Attribute				
SalesPosition	Character	50	Attribute				
Password	Character	10	Attribute				

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Table G.3. Structure of Customer Order Table.

Filed Name	Type	Length	Key Type	Foreign Key To	Index	Unique	Null able
OrderID	Character	10	Primary Key	Quotation	Y	Y	
OrderCreationDate	Date	-	Attribute				
OrderFillDate	Date	-	Attribute				
OrderedAmount	Integer	-	Attribute				
OrderStatus	Integer	-	Attribute				
CustomerID	Character	10	Foreign Key				
QuotationID	Character	10	Foreign Key				
ProductID	Character	10	Foreign Key				

Table G.4. Structure of Product Table.

Filed Name	Type	Length	Key Type	Foreign Key To	Index	Unique	Null able
ProductID	Character	10	Primary Key		Y	Y	
ProductType	Character	100	Attribute				
ProductDescription	Character	500	Attribute				

Table G.5 Structure of Quotation Table.

Filed Name	Type	Length	Key Type	Foreign Key To	Index	Unique	Null able
QuotationID	Character	10	Primary Key		Y	Y	
Quantity	Integer	-	Attribute				
UnitPrice	Integer	-	Attribute				
TotalAmount	Integer	-	Attribute				
CustomerID	Character	10	Foreign Key				
SalesID	Character	10	Foreign Key				
OrderID	Character	10	Foreign Key				
ProductID	Character	10	Foreign Key				

Table H.1. Process Specification of Creating New Customer.

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APPENDIX H

PROCESS SPECIFICATION

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Table H.1. Process Specification of Creating New Customer.

Items	Description
Process Name :	Create the new customer
Data In :	Customer information
Data Out :	Record the customer information
Process :	(1) Receive new customer information (2) Create new customer information
Attachment :	(1) Customer information database

Table H.2. Process Specification of Generating Quotation.

Items	Description
Process Name :	Generating Quotation
Data In :	Receive relevant information Send the information
Data Out :	Issue quotation
Process :	(1) Return the quotation to salesperson
Attachment :	(1) Quotation information database
	(2) Salespeople

Table H.3. Process Specification of Receiving Order.

Items	Description
Process Name :	Processing Order
Data In :	Customer Order
	Send the information
Data Out :	Issue confirmed order
Process :	(1) Receive the transaction of document
Attachment :	(1) Order information database

Table H.4. Process Specification of Searching and Generating reports.

Items	Description
Process Name :	Search and Generate Report
Data In :	Send the request results
Data Out :	Get the report and results
Process :	(1) Receive the request for search and generate report (2) Send the information from request
Attachment :	(1) Manager (2) Engineer (3) Purchasing Officer (4) Accounting Officer (5) Salesperson

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APPENDIX I

DATA DICTIONARY

Table I.1. Data Dictionary of Data Flow Diagram.

Name	Type	Description
Account Request	Data Flow	To send account request to accounting department
Customer Order	Data Flow	To record customer order
Customer Order Information	Data Flow	To view customer order information
Customer Registration	Data Flow	To register new customer
Customer Registration Confirmation	Data Flow	To confirm new customer registration
Engineer Request	Data Flow	To send engineer request to engineering department
Purchase Request	Data Flow	To send purchase request to purchasing department
Quotation	Data Flow	To send already calculated quotation
Quotation Information	Data Flow	To transfer information needed in generating a quotation
Accounting Officer	External Entity	The officer who is responsible for collecting and paying money
Engineer	External Entity	The officer who handle technical activities
Purchasing Officer	External Entity	The officer who is responsible for purchasing activities
Sales Manager	External Entity	The headmaster of the sales department
Salesperson	Entity	The officer who sells product to and service the customer
Create New Customer	Process	The process of creating new customer account
Generate Quotation	Process	The process of generating quotation
Receive Order	Process	The process of handling orders received from the customers
Register Customer	Process	The process of registering new customers
Search and Generate Report	Process	The process of inquiring information and print out reports
Calculate Quotation	Process	The process of calculating information for quotation

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Table I.2. Data Dictionary of Database.

Field Name	Meaning
SALESID	The identification number of salesperson
SALESNAME	The name of salesperson
SALESPOSITION	The position of sales officer
SALESMOBILE	The mobile phone number of sales officers
SALESPASSWORD	The password for sales officer
CUSTOMERID	The identification number of customer
CUSTOMERNAME	The name of customer
CUSTOMERCOMPANY	The company name of customer
CUSTOMERADDRESS	The address of customer
CUSTOMERTEL	The phone number of customer
CUSTOMERFAX	The fax number of customer
CUSTOMERMOBILE	The mobile phone number of customer
CUSTOMEREMAIL	The e-mail address of customer
CUSTOMERTYPE	The classification of customer such as hot, warm, cold
QUOTATIONID	The identification number of quotation
QUANTITY	The quantity quoted in the quotation
TOTALAMOUNT	The total amount of money quoted in the quotation in baht
ORDERID	The identification number of customer order
ORDER-CREATION-DATE	The creation date of order
ORDER-FILL-DATE	The completion date of filling order
ORDERSTATUS	The status of delivery of the product
ORDERED-AMOUNT	The quantity order
PURCHASED-AMOUNT	The amount of money customers have ordered
PRODUCTID	The identification number of product
PRODUCTTYPE	The classification of products
PRODUCTDESCRIPTION	The detail about each product
UNIT-PRICE	The unit price of the product

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