Asset Control System for IT Service Provider

by

Mr. Pholakit Triratchatapong

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
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Project Title	Asset Control System for IT Service Provider
Name	Mr. Pholakit Triratchatapong
Project Advisor	Dr. Boonyarit Pokrud
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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.

Approval Committee:

(Dr. Boonyarit Pokrud)
Advisor

(Prof.Dr. Srisakdi Charmonman)
Chairman

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

(Asst.Prof.Dr. Vichit Avatchanakorn)
Member

(Assoc.Prof. Somchai Thayarnyong)
MUA Representative

July 21, 2002

ABSTRACT

Electronic Data Systems Company (EDS) is an information technology outsourcing services company from Texas, United States located in Bangkok, Thailand. It initiates a plan to improve the existing Asset Control System operation to be fully automated and well integrated. Asset Control tasks include monitoring, tracking, updating, maintaining stock and preparing accurate information for budgeting and reporting. All of the assets could be assigned, requested or ordered from users. Information on project schedule and procurement plan, actual work progress is also required. In the existing system data are mostly stored on paper and some are kept in Microsoft Excel files stored in the workstation. These information resources, to a certain extent, need to be stored in a database to reduce redundancy and for efficient and easy access. In the existing stand alone computer environment, information is scattered in several computer units with different data definitions and making it difficult to integrate when needed. Database management system will be used to keep the information in common standard so that these files can be shared among several users.

This system development project focuses on developing a computerized information system to replace the existing system. The proposed system helps to minimize incorrectness, number of operational staff, time delay and human errors. The system development costs will be recovered by the cost saving and cost avoidance benefits after implementation. The benefits also include the improved service level.

ACKNOWLEDGEMENTS

This project could not be completed without contributions from several people. The writer would like to acknowledge their efforts and thank them for their contributions.

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I. INTRODUCTION

1.1 Background of the Project

Nowadays, Computer and Information Systems play an important role for running all kinds of business environments, and part of the business success relies on the efficient use of both of them. Information becomes a valuable asset to the world market and many companies have spent lots of money trying to develop and convert data on hand to be accurate information. However, they are struggling with implementing and maintaining complex technologies, moving from legacy systems to the Web, fragmented infrastructure and lack of skilled staff. Then, outsourcing is an alternative way to ensure competitiveness, cut down costs and solve unskilled problem for the company.

An Information Technology Department is responsible for managing and keeping track of the Information System and Asset Control. This information needs to be shared within the organization for many purposes such as order new equipment, counting software license per seats to be charged to each department, and etc. Then, an asset control system was set up to accomplish this task, but it can only be used for Information Technology department.

Currently, Asset control system provides information for all the asset and computer facilities in which it needed to be requested or assigned to user such as computer desktop, computer notebook, toner, Floppy A, and etc. The system also supplies the information of a requester for a specific item and keeps information of all assigned items including repair item. According to the global policy, the account of the company is designed to use for outsourcing service to do part of the business operation, especially in the Information Technology field. The outsourcing team has been studying and

analyzing the system, which discovers a problem in the asset inventory system. The problem of the asset control system is that data are not centralized and incorrect information is used among related departments. The system makes use of the information which results from the interface between the Procurement, Information Technology, Accounting, Users, Asset information and field services which will be kept in paper documents separately.

This way of handling data is not efficient and it is very time consuming to gather the information. The system must be able to handle the information automatically and always be available as well as can be shared among several computers and departments to support business purposes.

This project is developed on Personnel Computer base for the result of fast implementation, low cost, ease of expansion and further requirement modification of the system.

1.2 Objectives of the Project

This project is to set up an efficient asset control system in a distributed client-server environment for EDS Thailand Company. It aims to provide an efficient and reliable system covering the following areas:

(1) Set up a standard format for cost-related data keeping by using a conventional file method,

(2) Reduce errors and discrepancy of the same data handled by several departments,

(3) Reduce cost of system output by eliminating duplicated and unnecessary data,

(4) Speed up process of information accessibility, since shared database allows direct update by the authorized departments, and

(5) Enhance system by allowing multi-point accessibility.

1.3 Scope of the Project

This Asset Control system deals with the study of existing system. The project analyzes system problems and initiates improvement of the existing system using centralized information system. The scope of this project includes:

(1) Study the workflow and type of usage in the current system,

(2) Reduce errors and discrepancy of the same data kept and handled by several departments,

(3) Develop and improve standard of the information accessibility,

(4) Improve an existing system to use multi tier architecture.

(5) Set up standard working procedures from existing operation and documentation to suit computerized working environment.

(6) Set up a computerized database system by using distributed client-server network. This database system can be shared among several users and departments involved in the asset control information.

(7) Develop input and output screens in the form of graphical user interface to provide friendly environment, and

(8) Develop query function of database management system that can promptly generate accurate information with related fields to meet specific purposes.

1.4 Deliverables

The system will be delivered to the company in the form of Client/Server environment in which all suitable technologies combined to build up an efficient information system. It is expected that the project will be completed in four months. However, some tested data might be randomly selected or be prepared earlier in order to save time. The deliverables for the project on Asset Control System are as follows:

(1) A software package written in Microsoft Visual Basic 6.0 with user manual.

(2) Screen Layout for user interface

(3) Various hard copy layout which contains these information:

- (a) User Request Information
- (b) Software License
- (c) Desktop/Notebook status report
- (d) Number of assign computer
- (e) Computer Inventory
- (f) Stock Inventory
- (g) List of Vendors
- (h) List of Users
- (i) Request for PC Price
- (j) User asset report

1.5 Project Plan

The Asset Control System takes about four months to implement and complete. The project consists of the following phases.

(1) System Analysis Phase - this phase involves collecting, planning of the project, defining the project scope, identifying existing problem, and developing network diagram and dataflow diagrams.

(2) System Design Phase - an alternative system will be evaluated with the design, which includes structure design, database design, and report design to select the most feasible solution.

(3) System Implementation Phase - the Proposed system will be constructed and implemented that includes system testing and training.

The project plan is presented in Figure 1.1.

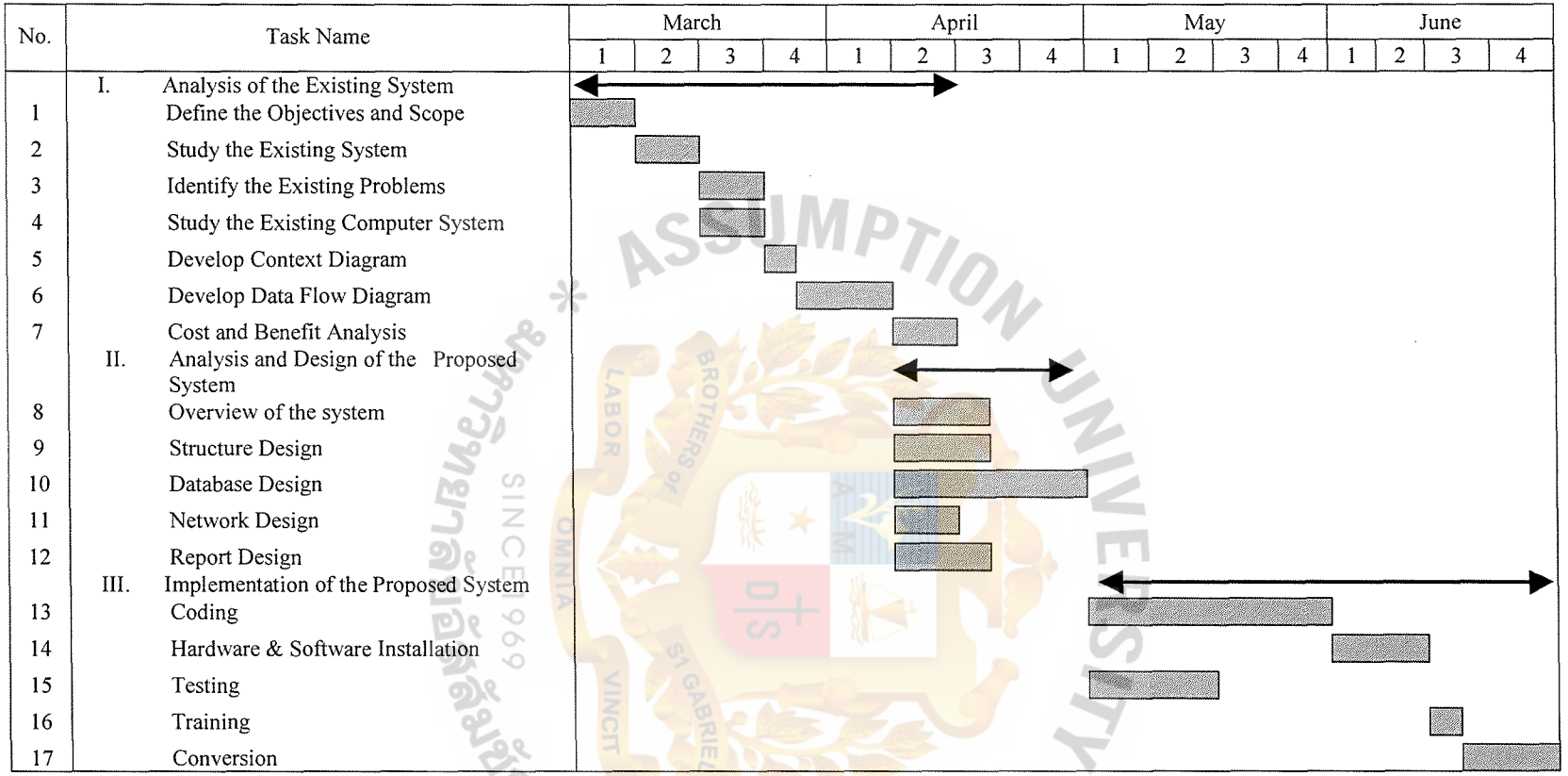

Figure 1.1. Project Plan for Asset Control System.

II. THE EXISTING SYSTEM

2.1 Background of the Organization

Electronic Data System Company (EDS) was founded in 1962 and located in Texas, United States. It was started with an intention to provide a service for fixing computer and perform service of computation data to customer in a professional way. Initially, all computer tasks were processed by using idle time of computers from the other company. Therefore, EDS did not necessary pay large amounts of money for investment on equipment to do the jobs, that made the company save a lot of money. As time goes by, the company has had a rapid and successful growth since Information Technology has become a major part for running business. As a consequence, the company started to expand their business line and entered into the global market. Thailand was one of the countries that were listed in the global account contract, which the company needed to deliver services to clients. Therefore, EDS Thailand Company was established in 1996 in order to deliver professional services to clients as part of the global account contract.

At present EDS Thailand provides information technology outsourcing services, which can be categorized into four business lines: Management Consulting, Electronic Solution, Business Process Management and Information Solution in order to help clients solving complex business issues and achieve results by using technology. The important part of them, which is the Information System, is emphasized in this project since it includes network infrastructure, Internet operation, Information application management, and field services. These capabilities help clients align information technology (IT) and operations with business strategy while ensuring predictable performance and costs. As a result, the companies could gain competitive advantages

over other competitors in the market since they do not have to be concerned with other issues and just concentrate on their business. The organization is divided into six major sections based on its functions and responsibilities, as shown in Figure 2.1, which are Sales & Marketing, Accounting, Information Technology, Procurement, Human Resource and Legal.

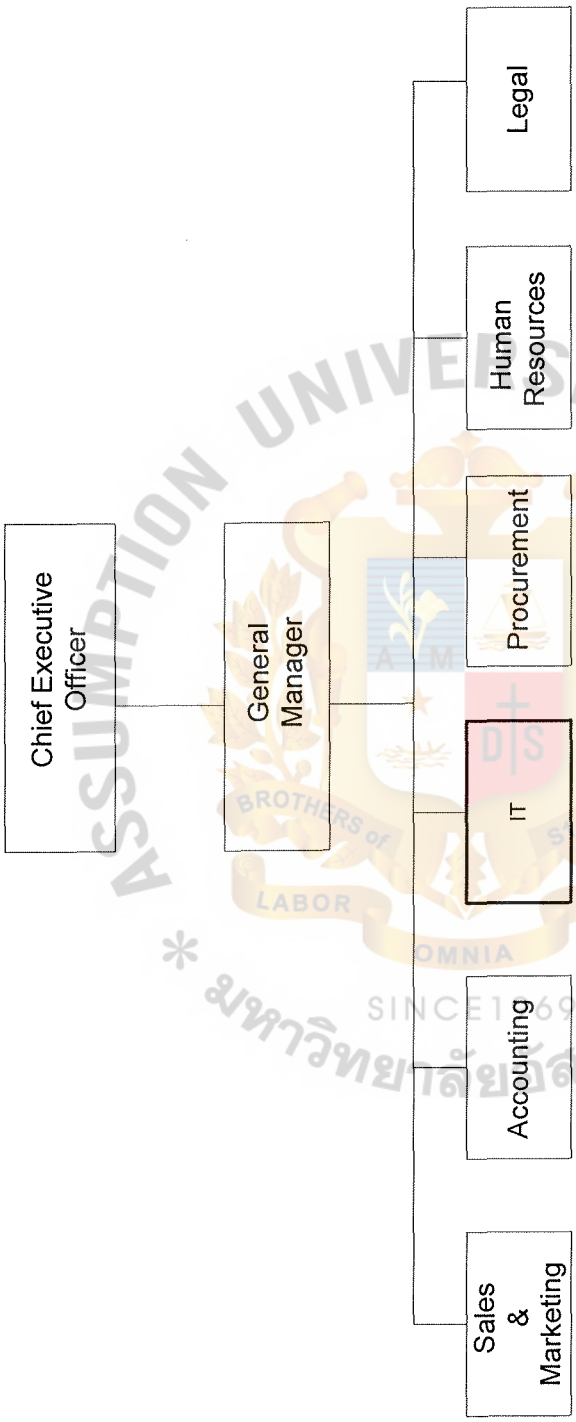

Figure 2.1. Organization Chart of Electronic Data System.

2.2 Current Problems and Areas for Improvement

Currently, there are problems in the operation of the existing asset control system for tracking computers assigned to users together with software licenses. Also, the existing system is incapable of tracing the computers and software licenses lent to users. Another problem is loss of information about the computer office supplies based on the user request. This project emphasizes an asset control system covering personal computer software, hardware and related items such as toner, floppy disk. This is due to the system's limitation to access the information and its incapability to process information accurately and efficiently as we all know that each department would have their own information and processes.

Moreover, the database of the existing system is not connected centrally and it requires many departments to access the information for multi purposes such as schedule of pooled laptop, on hand stock of toner, and etc. Reengineering process should be carried out within the organization. This means the problem that the client company is facing is the data not synchronized between different departments such as IT, Procurement and Accounting, which is a big problem and has to be solved as soon as possible in a short period. It means that the information is out of date, unreliable and incorrect. Also, the local area network within the client company is slow due to bottlenecks occurring internally in the networking system. Therefore, the EDS Thailand would like to set up a new Management Information System to connect and share the information with all the departments with a reliable speed of accessibility to the client system in order to solve those mentioned problems and increase value added in terms of excellent services which is the motto of the company.

The problems could be categorized and falls into the following topics:

(1) Information accuracy

The high workload can cause mistakes in the Information Technology department which often leads to inaccurate information throughout the company. In manual system, data is normally kept in paper so it can cause many troubles concerning data inaccuracy. In addition, data in paper form can sometimes be damaged in any situation; for instance, it can be torn, burnt, stolen and etc. Therefore, there is a great risk of losing crucial data. This can cause errors in decision-making and incorrect output as well.

(2) Document Redundancy

The company will have a lot of document files in each department and it would waste money on space and paper for the redundant documents. The information will be very hard to update and retrieve.

(3) Inventory control

Since the information is inaccurate, it will be very hard to track down the actual number of inventory.

(4) Data not centralized

The data is not reliable and it will be very hard to update, as a result the information become wasted.

(5) Reports for supporting decision-making cannot be provided by the manual system; that is to say, information base is not sufficient for manager to plan, forecast order, and determine the market price. Furthermore, data redundancy is a serious problem that does not support decision-making process such as inability to estimate the stock demand. Also, there is not up-to-date and data incorrectness that can cause items to be out of stock.

(6) Lack of security in manual system, unauthorized persons can occasionally find out the essential or secret information and make changes, which causes damaging effect to the company.

2.3 Existing Computer System

Information Technology Department is responsible for analyzing, monitoring and finding a new solution to make the Networking and Application System perform business operation task functionally. It employs about twenty-five employees to operate tasks for business partners. The department consists of System Administrator, Network Administrator, Helpdesk, Desk site and Stock room. The Information Technology department needs to be responsible for assigning and tracking all computer asset uses in the company. The system must provide details of all information about the computer assets and related equipments such as code, serial number, owner name, assign date, and etc.

Normally, an user that wishes to request for a new computer, or request for computer facilities such as toner, and etc. will be required to pass request form with an approval from their business unit manager. Then, each of the requests will be proceeded by checking stock on hand for the computer facilities case. If there is any item left it will be passed through the requester. This information will be kept manually on paper work for each of the request. On the other hand, user request will be used first come first serve order as criteria to process the request. All related information such as the serial number, name of user and business unit will be recorded and let the requester sign the paper for acknowledgement. There is only one place to keep track of all the information about the asset and there is no way to track the historical data if this paper is lost. A request for a new computer IT staff will firstly check against inventory on hand to clarify about data in stock and if there are any requested item in stock it will be

given to the requester, with an approval from business unit manager, but it will usually need to order a new one for a new user. After the inventory checking process is completed the information will be sent to procurement department for getting quotation and make order of the item from the vendor.

Following are the job description of members of the Information Technology Department.

System Administrator is responsible for monitor and maintains operating system and software application and solved problem that relate to each other to make it run smoothly. This group will support server diagnostic as well. The other duty of the system administrator is to design the new environment or find solution to improve the existing system.

Network Administrator task is mainly monitoring and troubleshooting the networking problem. The network administrator will look at network utilization and try to make a real time quality of service for the bandwidth usage of the networking. Also, a duty to prevent all kinds of intruders and tracing back any attempt from outside, that try to get into the Local Area Network.

Helpdesk is the one who is responsible for hardware and software installation, maintenance, and preventive maintenance. The helpdesk handles all kinds of problems related to computer issue, and escalate task to desk site support if necessary. Moreover, the helpdesk required coordinating with vendor for checking necessary information about related products, which needs to be fixed or upgraded. Any user can request new software and install it through the Helpdesk.

Desk site responsibility is to pay a visit on user site whenever helpdesk assigned task. It requires judgment from the helpdesk to see whether the problem needs to be solved at user site instead of doing remotely. There are some tasks that might need to

escalate or consult with system administrator or network administrator in order to overcome the problem, and once it is completed, then the desk site needs to inform status back to the helpdesk for closing each job.

Stock room is where spare part and computer facilities are being kept. The spare part ordering and controlling will be under the Information Technology Department decision. Source of spare part comes from the ordering point in Singapore or from local sources. The spare part disbursement will be done here and distributed throughout Bangkok and other provinces through motorcycles, vans, mails, and airfreight.

When the user call/visit for the computer problem, Helpdesk will record the incident and assign the call to related Desk site or System Administrator to handle the job. In case some problems require to be supported by user site such as link of router down, mainframe down or server problem, then the desk site or the system administrator assigned by Helpdesk will be responsible. In normal cases the Personal Computer will be fixed by our support team but if it involves hardware change then the PC that has the maintenance agreement and not expired with the third party will send desk site to visit customer site for diagnose and repair immediately on that site. However, any PC that does not have the maintenance agreement and requires getting repair parts, then the manager of PC owner needs to grant an authorization prior starting repairing process. Moreover, in the case of received or exchange PC or computer device, a new machine will be replaced at the Information Technology Department because the user might require to transfer data to the new machine which this task could be completed by Helpdesk.

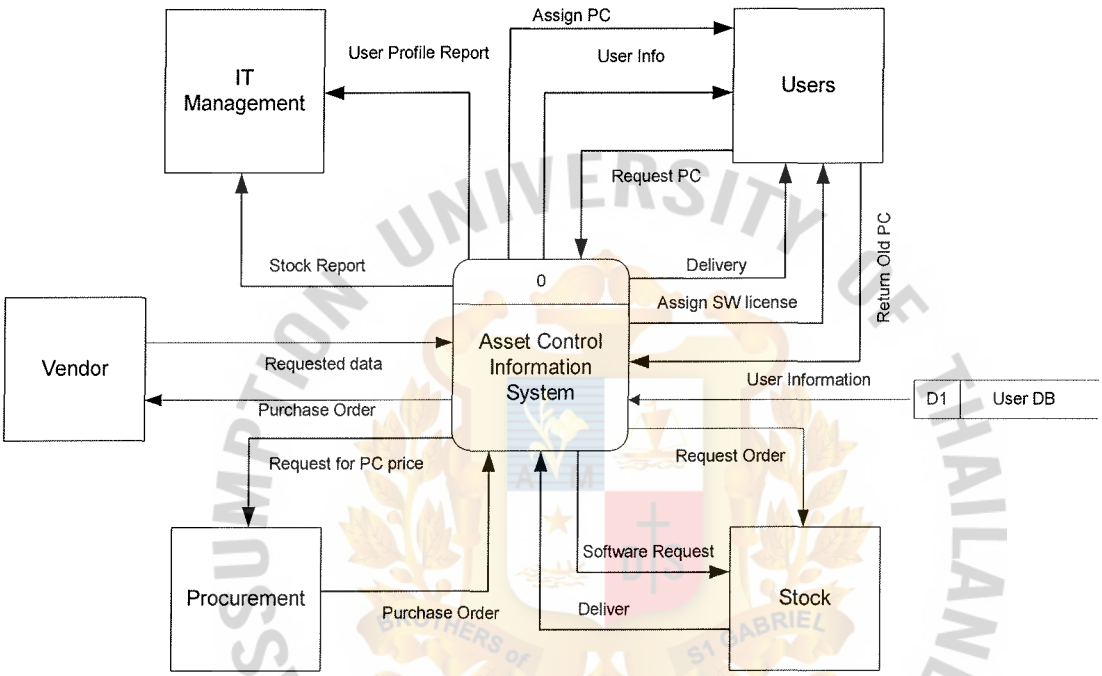

Figure 2.2. Context Data Flow Diagram of the Existing System.

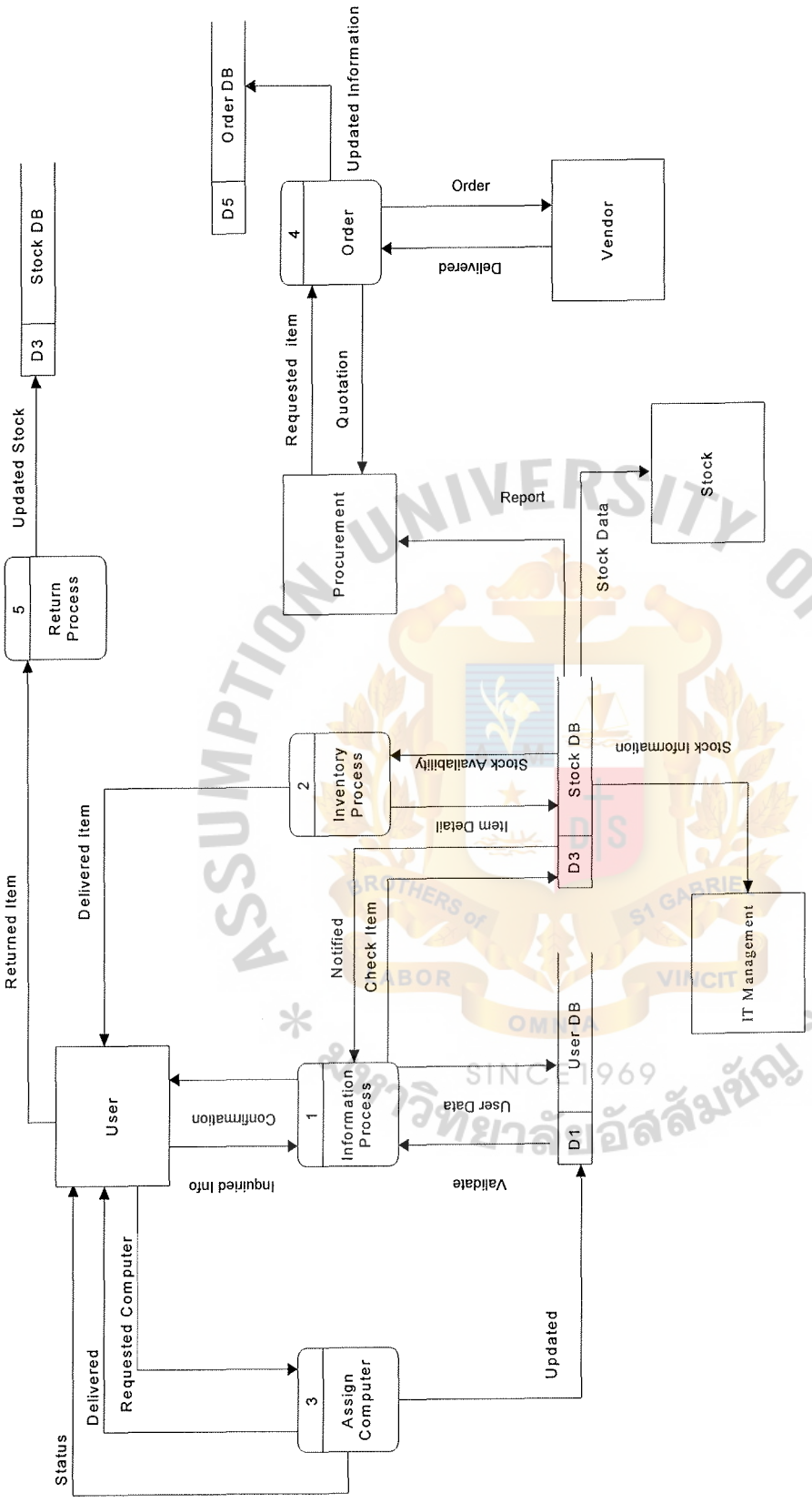

Figure 2.3. Data Flow diagram of the Existing System.

III. THE PROPOSED SYSTEM

The proposed system has the major concern about the users by way of interviewing the users, who are in the field of Helpdesk in order to explain the process and their needs to make Asset Control System reliable, reduce the work process, and be highly efficient.

3.1 User Requirements

The current Asset Control System deals with a number of computer related data, as dynamic information should be promptly retrieved at any time required. Analysis has been conducted to figure out how to store, process and retrieve data in practical way. Data flow from one department to another efficiently. Database design is required to handle the large quantity of frequently changed computer related data of the asset control system. The application should assist in preparing full details of specific items or personnel at lower levels and develop fully consistent summary information to be distributed up to the management level. When developing computer related data report, the required information can be promptly retrieved and regeneration of the report can be easily furnished. Control of data access and updated should be added to provide adequate security and consistency of information.

After the survey, the requirements of relevant users can be summarized as follows:

(1) Staff Requirements:

(a) The application should assist in determining details of requested item and be able to do major group of related part.

(b) The system should support the concurrent update and share the information among other departments for a specific group of information.

(c) To be able to detect errors occurred during operation of program.

(d) To provide the security and operation control.

(e) The application should be able to generate the form of spreadsheet or table to be used promptly in newly identified equipment item.

(f) To be reliable and consistent procedure to eliminate error.

(g) To generate customized reports and preferred by each department.

(h) To improve the speed of retrieving the data and information.

(i) To share the information over all departments.

(j) The system should support the possible addition and deletion of computer items from conceptual planning stage through actual construction and up until the completion of project.

(2) Technician Requirements:

(a) The technician requirement for the input screen that is easy to key in all related information i.e. Computer Serial Number, CPU, User name, LAN ID, and etc.

(b) There should be control system for data input to verify key-entered data. For example, if character is found in number fields, error condition should be reported, or the number keyed to process falls below or above predefined range, warning message should be reported.

(c) There should be password in accessing information in Master files to prevent unauthorized users.

(3) Finance and Accounting Department

(a) The system can generate reports of each user, computer office supplies and Software license to summarize the total number of request being used.

(b) The system can keep the reports, which can be retrieved later.

(4) Management

(a) The management requires the new system to generate the reports to support decision making on order new PC, printer and etc as follows:

(1) The report shows user with the categories of item.

(2) The report is for tracking all of the request status. The report must show the requester name, item quantity and the total amount of stock.

3.2 System Analysis

During the system selection, the system analyst identifies candidate system solutions and analyzes those solutions for feasibility. The feasibility analysis uses the Candidate System Matrix and Feasibility Analysis Matrix for presenting candidates and recommendations to the management. Data modeling is a technique for defining, organizing and documenting the business data requirements to be stored in the database. Entity Relationship Diagram (ERD) are employed for data modeling, as it is the most popular modeling techniques. There are three of the developed data models. The first data model is name Context Entity Relationship Diagram which contains only previous discovered entities and nonspecific relationship entities as illustrated in Figure 3.1.

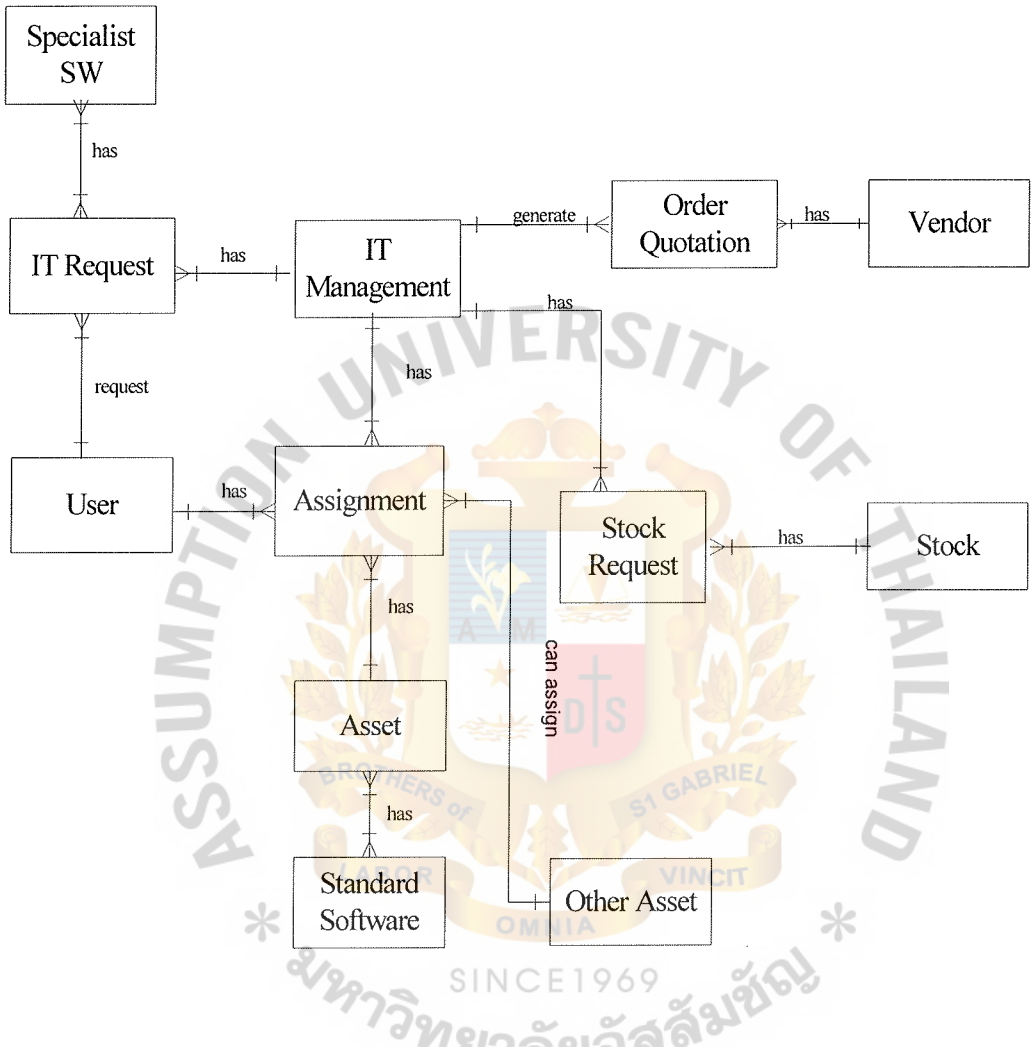

Figure 3.1. Context Entity Relationship Diagram of the Proposed System.

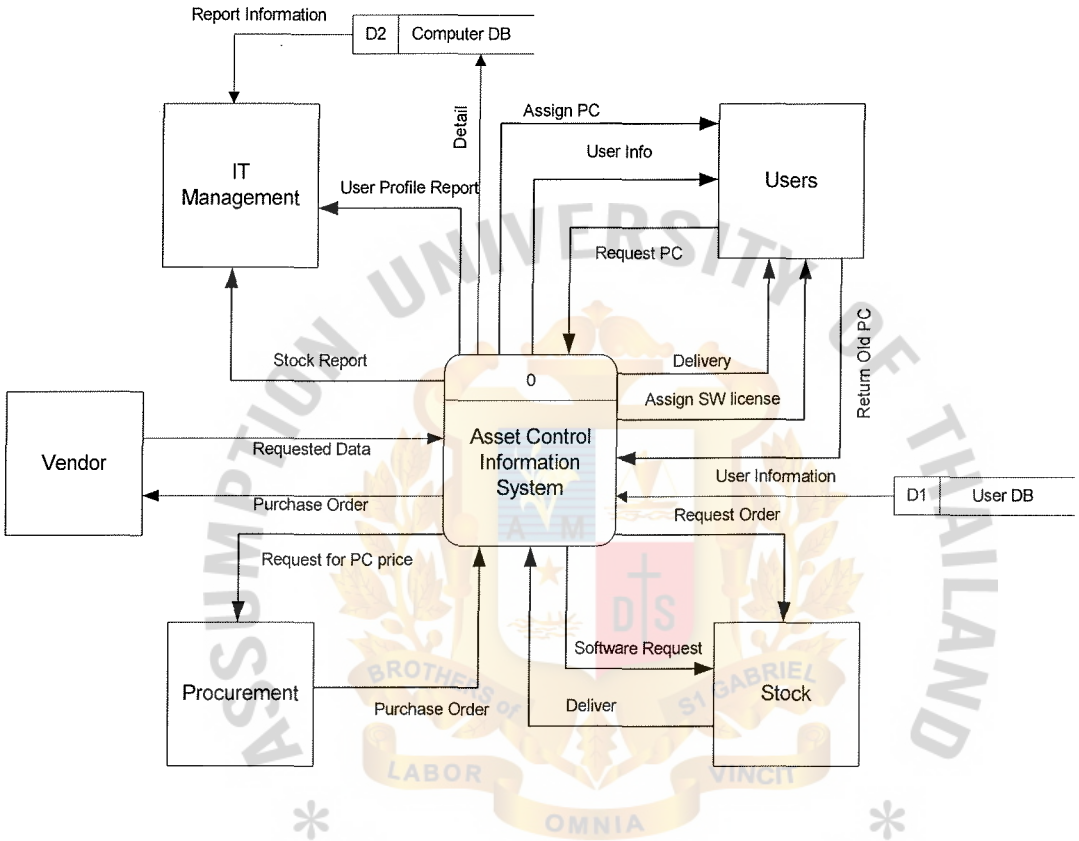

Figure 3.2. Context Data Flow Diagram of the Proposed System.

The second data model is called Key Based Entity Relationship Diagram which contains more details concerning entities by specifying primary key of each entity. It eliminates nonspecific relationship entities that are specified in the first data model by resolving them into associative entities.

Lastly, the third data model is named Fully Attributed Entity Relationship Diagram that includes all attributes for each entity. The Key Based Entity Relationship Diagram and Fully Attributed Entity Relationship Diagram are depicted in Appendix A.

3.2.1 Candidate Systems Matrix

To find out the solution that can support business requirements, three candidate solutions are proposed as shown in Table 3.1. This table shows the characteristics of each candidate for system designer and users to make a comparison.

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.	Inventory Control Application would be purchased and customized to satisfied services.	Develop in house system with administrators and coordinators in relations to fulfillment.	Same as candidate 2
Benefit Brief description of the business benefits that would be realized for this candidate.	This solution can be implemented quickly because its a purchased solution	Fully supports user required business processed for EDS.	Same as candidate 2
Servers and Workstations A description of the servers and workstations needed to support this candidate.	Technical architecture dictates UNIX SUN system, MS Windows2000 Professional	Technical architecture dedicates Pentium III, MS Windows 2000 Professional.	Same as candidate 2

Table 3.1. Candidate System Matrix (Continued).

Characteristics	Candidate 1	Candidate 2	Candidate 3
Software tools needed Software tools needed to design and build the candidate (e.g., database management system).	MS Visual Basic 6.0 for customization of package to provide report writing and integration.	Microsoft Access 2000	Borland Delphi 6.0
Application software A description of the software to be purchased, build, accessed, or some combination of these technique.	Package Solution	Custom Solution	Same as candidate 2
Method of data processing Generally some combination of on-line batch, deferred batch, remote batch.	Client/Server architecture	Same as candidate 1	Same as candidate 1
Output devices A description of output devices that would be used, special output requirements (e.g., network).	HP 4000 series Laser Printer.	Same as candidate 1	Same as candidate 1
Input devices A description of input method to be used, input devices (e.g., keyboard)	Keyboard & mouse	Same as candidate 1	Same as candidate 1
DBMS and Storage devices Brief description of what data would be stored, what data would be accessed from existing stores.	SyBase with 100 GB capability	MS SQL Server DBMS with 100 GB arrayed capability	Same as candidate 2

The summary of three candidates are as following:

(1) Candidate 1: The Portion of the system that would be computerized, Inventory Control Application Software would be purchased to support. This solution can be implemented quickly because it is a purchased solution. This package software runs on UNIX on the server and the clients use MS Windows 2000 Professional is used for the client computer. Software to

provide report writing and integration is MS Visual Basic 6.0. This solution uses keyboard and mouse to input data and use LAN printer to output data. The storage capacity is 100 GB and DBMS software is SyBase.

(2) Candidate 2: This candidate is custom solution as built in house. It can support required business processes for the organization. The solution uses LAN with MS Windows 2000 Server and Windows 2000 Professional client. The software tool to implement and provide reports is MS Access 2000. Input devices are Keyboard and mouse. Output device is laser printer on the network. DBMS software is MS SQL server which runs on the fault tolerance RAID 5 (100 GB disk arrayed capacity.) for future need.

(3) Candidate 3: This candidate is custom solution developed by using Borland Delphi 6.0. It can support user required business process for the organization. This solution uses Windows 2000 server and Windows 2000 Professional client. The input devices are keyboard and mouse and output device is Laser printer via the network. The storage device is 100 GB disk arrayed capability to support MS SQL Server for DBMS.

3.2.2 Requirement Statements

The purpose of required statements is to identify alternative candidate solutions for the business requirements defined during the system analysis. The required statements are to be assigned to a specific category as:

(1) E: Essential

(2) D: Desirable

(3) N: Nice to have

The required statements of the Asset Control System are shown in Table 3.2.

Table 3.2. Requirement Statement.

Requirement	Category	Candidate 1	Candidate 2	Candidate 3
Record problem history, system administrator can reduced the time of problem solving	E	✓	✓	✓
The monthly report of each system administrator	E	✓	✓	✓
To monitor the status of problem.	E	✓	✓	✓
To respond to the customer request.	E	✓	✓	✓
To track and report the time to solve problem.	D		✓	✓
To setup the priority of customer problem	D	✓	✓	
Classify the customer	N		✓	✓

3.2.3 Feasibility Analysis

The feasibility analysis is used to analyze the alternative candidate, using the four criteria for evaluating the feasibility as Operational Feasibility is a measure of how well people will work in the organization, Technical Feasibility is an assessment of the maturity and availability of technology, Economic Feasibility is measure of the cost effective of a project and Schedule Feasibility is an assessment of how long the solution will take to implement. The weight for first three feasibility has been assign to 30% and the last one is 10% because prioritization of the time that the project will take is less concern than the others. All of the criteria are evaluated and the weight for each of the criteria must be identified to evaluate the candidate solution as shown in Table 3.3. Feasibility Analysis Matrix.

Table 3.3. Feasibility Analysis Matrix.

Feasibility	Wt.	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility	30%	Support user requirement and current business processes would have to be modified to take advantage of software functionality but there are many features more than requirement of the organization. Score: 85	Fully supports user required functionality. Score: 100	Same as candidate 2. Score: 100
Technical Feasibility	30%	Current production release of Vantive package is version 7.0 and other software package, which is excel aren't compatible. It requires another software to perform modification for integration requirements. Score: 80	The current technical staff has experience in MS environment, it easy to implement. MS Access 2000 also supports MS SQL that is Client/Server. Score: 95	Delphi is a good software development but the company never deal with Delphi while the company join with Microsoft which could purchase the software in low cost. Score: 85
Economic Feasibility • Cost to develop • Payback period • Net present value • Detail Calculation	30%	 1,021,100 Baht 4 Years 1,022,924 Baht See Appendix I Score: 80	 771,100 Baht 3 Years 1,324,775 Baht See Appendix I Score: 90	 1,069,500 Baht 5 Years 949,336 Baht See Appendix I Score: 85
Schedule Feasibility	10%	4 months Score: 90	3 months Score: 95	6 months Score: 85
Ranking	100%	83.7	94.5	89.5

Feasibility Analysis Summary.

From the candidate System Matrix, Required Statement and Feasibility Analysis Matrix show that Candidate2 meets the requirement and the ranking score is the highest. This candidate is custom solution. It can support user required business process for the organization between Staff and System Administrator staff. The solution uses LAN on MS Windows 2000 Server and Windows 2000 Professional for client/server. The software tool to implement and provide report is MS Access 2000. Input devices are Keyboard and mouse. Output device is laser printer on the network. DBMS software is MS SQL server, which runs on the fault tolerance RAID 5 (100 GB disk arrayed capacity.)

3.3 Application Architecture

The best candidate from feasibility analysis is selected for Asset Control System of EDS Electronic Data System (Thailand) Co., Ltd. then, we prepared to design the information application architecture. Application architecture defines the technologies to be used by one, more, or all information systems in terms of its data, process, interface, and network components. It serves as a framework for general design.

(1) Network Architecture

Asset Control System of EDS (Thailand) Co., Ltd. will be implemented on two-tiered Client/Server architecture. In client/server computing information system's database, software, and interfaces are distributed across a network of clients and servers that communicate and cooperate to achieve system objectives. Despite the distribution of computing resources, each system user perceives that a single computer is doing all the work. In the EDS all computers connected together using BUS network topology via Ethernet LAN Interface 10/100 Mbps (LAN : Local

Area Network). We use database server to store the database and file server for files sharing as illustrated in Figure 3.2.

(2) Data Architecture

The most suitable data architecture for Asset Control System is the relational database that stores data in a tabular form meaning each file is implemented as a table. Each field is a column in the table. Each record in the file is a row in the table. Related records between two tables are implemented by intentionally duplicating columns in the two tables. Relational Database Management System (RDBMS) is chosen for this system because database commands can be executed on server and it also provides more sophisticated backup, recovery, security, integrity, and processing.

(3) Interface Architecture

The interface architecture for the system is on-line processing. Client/server applications are simply a new form of on-line processing. Input editing and output formatting occur on client computers in an on-line mode. Input transactions and information requests are transmitted on-line to several computers for processing.

(4) Process Architecture

For process architecture, the software languages and tools that will be used to develop the business logic and development programs for the system is the Microsoft Access 2000. In addition, for system management, we use Microsoft SQL Server and Microsoft Windows 2000.

3.4 System Design

The Proposed Functions

The proposed system uses a context diagram to represent data flow in and out of the system and the process of the data. The proposed system is introduced to improve the performance of all tasks of all related departments to provide an effective, efficient and accurate data of the business process.

The data flow diagram is used to present the proposed system step by step. The data flow diagram is a modeling tool that allows the user to picture the proposed system. In structured analysis and design, a context diagram and a data flow diagram will be presented for discussion.

The new system design divides the whole system into 5 subsystems as follows:

(1) Process 1: Information Process

This process records all the data that relates to the system such as customer information, IT staff information, product category and subcategory. Data in this process can be updated but rarely changed.

(2) Process 2: Inventory Process

This process keeps and tracks the information about the computer items and computer facilities. It also records lease and expired date of the product. Data in this process is frequently updated.

(3) Process 3: Assign Computer

This process records all computer items, which is assigned to particular user for temporary or permanent.

(4) Process 4: Order

This process stores data about computer item ordering with particular vendor.

(5) Process 5: Return Process

This process records all computer items returned, stored, and waited to be assigned to the next person.

Data Flow Diagrams

Data Flow Diagrams show the flow of operations. Data Flow Diagrams are represented in Appendix B.

Data Dictionary

Data Dictionary defines each data and procedure in the data flow diagram. Data dictionary is represented in Appendix F.

Process Specification

The process specification provides further description of element-level processes as shown in Appendix D.

E-R Diagrams

Data Model shows the relationship between entities. The Data Model Diagram is represented in Appendix A.

Structure Chart Diagram

The Structure Chart Diagram for all processes are represented in Appendix C.

User Interface Design

The User Interface designs are the design of the entire interface screens for the proposed system. The User Interface design is represented in Appendix G.

Output Design

The report designs are the reports that are generated by the proposed system. The report designs are represented in Appendix H.

Database Design

The File Layout shows the table name, the element name in each table, which is called an attribute name and the column name. It also shows whether each attribute is primary key or foreign key. Elements that fall into each table or that regularly combine with several other elements in many structures should be placed together into a structure record. Database design is shown in Appendix E.

The Asset Control System extensively uses spreadsheet application and part of other database program to produce reports. The proposed system will add database management application to the existing application with full support of data transfer and maintaining some necessary features. The computer screens are all GUI (Graphical User Interface) with user-friendly interface using windows based program. Since the new Database Management System (DBMS) is compatible with existing spreadsheet application, all computer related reports would be converted and produced in a form of database application.

System input and output documentation consists of heading and fields. Mostly text and numeric fields are used for computer related data. The code field is alphanumeric, of which the length is predefined to prevent error in entering. Some alphabetic fields are used for written description of the code elements e.g. Serial Code, Bar Code, Description and etc.

The system input has the same appearance as system output. Most are in form of tables, fields and text, which usually link together.

The following controls are added to system input to ensure the correctness of data in key entering:

(1) Numeric Test

To determine that the data keyed in consist of numeric characters.

(2) Range Test

To determine whether the number keyed in fall within the predefined range.

The system input screens, output screens and examples of report are shown in Appendix G respectively.

As for the database design, relational database model is used because the Asset Control System data rely much on the relationship of computer item, user and several summary reports can be simply developed by using relational operation e.g. SELECT, JOIN AND PRODUCT. Its tabular representation is familiar and not a different conventional spreadsheet. Its flexibility in concatenation data from several sources also suits the purposes. Entity Relationship diagram of the database is shown in Appendix A.

3.5 Hardware and Software Requirements

The proposed Asset Control System requires computer network to link several PCs within department and also connects to computer system of other departments i.e. Procurement, Accounting, and etc.

Client/Server computing is used to manage the network with all data management and storage put on server side and data processing on client machines.

TCP/IP is used as communications software to support distributed applications. This will allow the functions of the system split between the clients and the server in such a way to optimize network resources. In the case of Asset Control System, most application logic is located at client while the server is essentially maintaining the

database. Interaction between the client and server or database access by client is done by using structured query language (SQL).

Graphical User Interface is used to facilitate the user interaction with the system. The presentation services modules on user screens are thus easy to use.

Figure 3.3 illustrates the LAN connection of all computer systems in the company. The server, as database server, will be located and controlled by Information Technology Department. The network links computer of all departments i.e. Procurement, Accounting, Sales and Marketing, Human Resources and Legal.

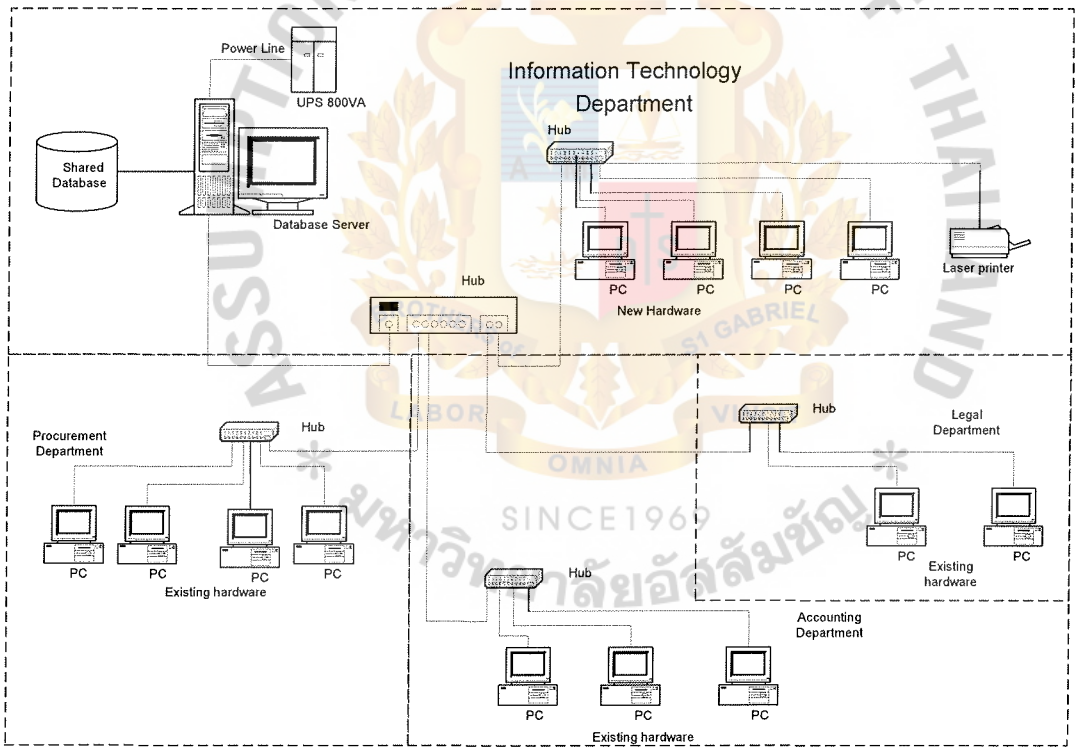

Figure 3.3. Computer Network Architecture Diagram.

The proposed LAN system with one database server connecting to five client PCs of Asset Control System and other PCs from several departments. The proposed system requires the following Hardware components:

(1)	Server	1	Set
(2)	Client Personnel Computer	4	Sets
(3)	Network Printer	1	Set
(4)	Switching Hub 10/100 Manage	1	Set
(5)	UPS 800 VA	1	Set

The hardware and software specification are shown in the following table.

Table 3.4. The Hardware Specification for Server Computer.

Hardware	Specification
CPU	PIII 1.7 GHz.
Cache	128 KB
Memory	1 GB SDRAM
Hard Disk @ 3	18.2 GB Hot Plug up to 109.2 GB
SCSI Controller	Dual Channel Wide Ultra3 SCSI
CD-ROM Drive	52X
Floppy Drive	1.44 MB
LAN	Fast Ethernet NIC 10/100
Monitor	15" Digital SVGA

Table 3.5. The Hardware Specification for Client Computer.

Hardware	Specification
CPU	PIII 1 GHz.
Cache	128 KB

Table 3.5. The Hardware Specification for Client Computer (Continued).

Hardware	Specification
Memory	256 MB SDRAM
Hard Disk	40 GB IDE
CD-ROM Drive	52X
Floppy Drive	1.44 MB
LAN	10/100 on Board
Monitor	15" Digital SVGA

Table 3.6. The Software Specification for Client Computer.

Software	Specification
Operating System	Microsoft Windows 2000 Professional
Programming Software	Microsoft Office 2000 Professional
DBMS Software	Microsoft SQL 2000

Table 3.7. The Other Hardware.

Hardware	Specification
Printer	HP LaserJet 4000 DN
Switching hub	3Com Super Stack II Baseline Dual Speed Hub
UPS	APC Smart UPS 800 VA with Power Management

Software Requirements

The software required for the system are:

Server unit:

(1) Windows 2000 Server Operating System

(2) Microsoft Office 2000 Professional

(3) Microsoft SQL Server 2000 Enterprise Edition

Client units:

(1) Microsoft Access 2000

3.6 Security and Control

The proposed Asset Control System provides protection scheme for information security in the computer network. The database of the system is under "share via access limitation". This means the operating system checks the permissibility of each access by a specific user to specific object or data, or/and to ensure authorized access.

Normally user-oriented access control is enforced as control from user side. It requires user log on by entering user identifier and password. As the network of centralized distributed environment, it provides log on service to determine who is allowed to use the network.

In case of more sensitive data protection such as at time of preparing asset cost proposal for new asset assignment or new project bidding, apart from user access control procedure, data oriented access control is also used as control from server side. The Database Management System (DBMS) at the server side will enforce control access to specific records of data as another level of security check. Only selected individuals, such as Information Technology manager or Project manager may then have access to the information.

The password strategy uses "proactive password checker scheme" which allows the user to select his or her owns password. The following rules are enforced in selecting password:

(1) Passwords must be at least eight characters long.

(2) Passwords must include uppercase, lowercase and numeric digits.

As for anti-virus approach, the system uses full-featured protection of scanning and activity trap components. The ant-virus software, once purchased, can be updated new dat file from time to time via Internet from the manufacture's website.

Backup file scheme is also used for security reasons. The backup is kept in ZIP drive disks, which have much storage capacity and need only one cabinet to keep. Transaction files require daily backup and master files will be backup weekly.

3.7 System Cost Evaluation and Comparison

3.7.1 Cost Analysis

The cost of the existing and the proposed system needs to be justified to prove that it renders cost saving and cost-avoidance benefits in appropriate time after implementation. Quantitative estimates of costs and benefits have been studied for the system owner to make a decision on the system development. The analysis technique for cost and benefits are used to indicate the value for implementing the proposed system along with break-even, payback period and net present value analysis technique used in the proposed system. There is a needs to use several techniques as the net present value concurrently with payback period because of the payback technique just adding up the future cash flow with no discounting involved. Then, the time value of money is completely ignored.

The cost of the system could be classified into:

(1) Development Cost (fixed cost)

There is a requirement to have computer unit to accomplish their task and it will cost only once as an investment. However, the maintenance cost will take place for the later years.

(2) Operating Cost (variable cost)

It is classified into two types, which are personnel cost, it covers salary expenses of staff that is involved in the process; while office supplies and miscellaneous cost are also included.

All costs of the existing system will rise every year and detail of the calculation presented in Table 3.8.

Table 3.8. The Cost of Manual System, Baht.

Cost Items	Year 1	Year 2	Year 3	Year 4	Year 5
Operating Cost					
Salary Cost:					
Helpdesk 5 persons @ 15,000	900,000	990,000	1,089,800	1,197,900	1,317,690
Staff 4 persons @ 7,000	336,000	369,000	406,560	447,216	491,938
Solution Manager 1 person @ 30,000	360,000	396,000	435,600	479,160	527,026
Total Annual Salary Cost	1,596,000	1,755,600	1,931,160	2,124,276	2,336,704
Office Supplies & Miscellaneous Cost:					
Stationary	10,000	11,000	12,100	13,310	14,641
Paper	12,000	13,200	14,520	15,972	17,569
Printer Toner	12,000	13,200	14,520	15,972	17,569
Utilities	50,000	55,000	60,500	66,550	73,205
Miscellaneous	5,000	5,500	6,050	6,655	7,320
Total Annual Office Supplies & Miscellaneous	89,000	97,900	107,690	118,459	130,304
Total Manual System Cost	1,685,000	1,853,500	2,038,850	2,242,735	2,467,008

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

Year	Manual Cost	Accumulated Cost
1	1,685,000	1,685,000
2	1,853,500	3,538,500
3	2,038,850	5,577,350
4	2,242,735	7,820,085
5	2,467,008	10,287,093
Total	10,287,093	-

In developing the proposed system, there are two major costs concerns which are system development cost and system operating cost. The system developing cost covers hardware, software and implementation cost, however the system operating cost concern the hardware and software maintenance cost, employee cost and office supplies and miscellaneous cost. Calculations of each candidate solution are illustrated in Table 3.10 and more detailed in Appendix I.

Table 3.10. The Cost of the Computerized System, Baht.

Cost Items		Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost						
Computer Server Cost:						
Computer Server Cost		60,000	60,000	60,000	60,000	60,000
Workstation		50,000	50,000	50,000	50,000	50,000
Network		14,000	14,000	14,000	14,000	14,000
Printer		16,000	16,000	16,000	16,000	16,000
UPS		24,000	24,000	24,000	24,000	24,000
Total Hardware		164,000	164,000	164,000	164,000	164,000
Maintenance Cost		-	-	-	28,000	30,000
Software Cost:						
Windows 2000 Server		8,000	8,000	8,000	8,000	8,000
Windows 2000 Professional	5 Set @ 4,000 / Annum	20,000	20,000	20,000	20,000	20,000
Microsoft Office 2000	5 Set @ 2,000 / Annum	10,000	10,000	10,000	10,000	10,000
Microsoft SQL	5 Set @ 1,500 / Annum	7,500	7,500	7,500	7,500	7,500
Microsoft Access 2000	4 Set @ 400 / Annum	1,600	1,600	1,600	1,600	1,600
Total Software Cost		47,100	47,100	47,100	47,100	47,100
Implementation Cost:						
Training Cost		80,000	-	-	-	-
Utilities Cost		300,000	-	-	-	-
Set up Cost		180,000	-	-	-	-
Total Implement		560,000	-	-	-	-
Total Fixed Cost		771,100	221,100	221,100	239,100	241,100
Operating Cost:						
Solution Manager	1 person @ 30,000	360,000	396,000	435,600	479,160	527,076
System Administrator	2 persons @ 18,000	432,000	475,200	522,720	574,992	632,491
Helpdesk	3 persons @ 15,000	540,000	594,000	653,400	718,740	790,614
Total Annual Salary		1,332,000	1,465,200	1,611,720	1,772,892	1,950,181
Office Supplies & Miscellaneous Cost:						
Stationary		7,000	7,700	8,470	9,317	10,248
Paper		6,000	6,600	7,260	7,986	8,784
Printer Toner		8,000	8,800	9,680	10,648	11,712
Utilities		10,000	11,000	12,100	13,310	14,641
Miscellaneous		31,000	34,100	37,510	41,261	45,387
Total Annual Operating Cost		1,363,000	1,499,300	1,649,230	1,814,153	1,995,568
Total Computerized System Cost		2,134,100	1,710,400	1,860,330	2,053,253	2,236,668

Table 3.11. Five Year Accumulated the Proposed System Cost, Baht.

Year	Computerized Cost	Accumulated Cost
1	2,134,100	2,134,100
2	1,710,400	3,844,500
3	1,860,330	5,704,830
4	2,053,253	7,758,083
5	2,236,668	9,994,751
Total	9,994,751	-

Table 3.12. The Comparison of Accumulated Cost between the Existing System and the Proposed System Cost, Baht.

Year	Manual Cost	Computerized Cost
1	1,685,000	2,134,100
2	3,538,500	3,844,500
3	5,577,350	5,704,830
4	7,820,085	7,758,083
5	10,287,093	9,994,751

The above table shows cost of both existing and proposed system that have been identified, the information will be used to calculate and evaluate the cost saving before implementing the system. The tables are illustrated in Table 3.12.

3.7.2 Benefit Analysis

The benefits of the proposed system include tangible and intangible benefits.

(1) Tangible Benefits

Tangible benefits are those that can be easily quantified. They are measured in terms of annual saving when comparing computerized system

with manual system. The tangible benefit analysis detail of the proposed system are as follows:

(a) Personnel Reduction

The proposed system will use less number of workers since some parts of the function will be replaced by computing. Therefore, the reduction of the employee salary led to cost saving in the organization.

(b) Operating Time Saving

Operating time is a critical concern in the workplace if we could save or use those time in an efficient manner it would bring profit to the company. It is expected to save a few hours a day for some employees and replace some groups by computing because the time saving will be based on the involvement of personnel with the system.

(c) Office Supplies Expense Reduction

According to the proposed system, it is expected that the number of office supplies would be reduced since all the information will be kept in the system.

(d) Facsimile Expense Saving

As users and all asset information can be kept into the system there will be no need to send out fax about all the details of information as routinely done in the existing system. Since each of the related department could access the database itself.

The detail for benefit of the proposed system is illustrated in Table 3.13 and more detail in Appendix I.

(2) Intangible Benefits

Intangible costs in the company include all the problems occurring in the existing system. The major intangible costs will be summarized as follows:

(a) Lower operation due to customer dissatisfaction.

(b) The weak control of operation.

(c) Redundant process and data. Employees work slowly in daily operations.

The organization can efficiently manage, store, view, and process all information with this computerized system. So the computerized information system gives much intangible benefits such as:

(a) Enhance communications.

(b) Leverage the organization's information: Imaging brings paper-based information into the organization's electronic information systems, where workers can access and use it more easily.

(c) Future cost avoidance.

(d) Integrate business application together to increase the efficiency of work and the accuracy of information for all management levels.

(e) Provision of information about customers.

(f) Improve security and control.

Table 3.13. The Benefit of the Proposed System, Baht.

Benefit Items		Amount
Personnel Reduction		
Helpdesk	3 persons @ 15,000	540,000
Staff	4 persons @ 7,000	336,000
Monthly Personnel Reduction Benefit	4 persons @ 3,000	144,000
Inventory Cost:		
Inventory Officer	1 person @ Day	5,000
Messenger		3,000
Inventory Staff	3 persons @ Day	5,000
Stock	1 person @ Day	3,000
Customer Center:		
Customer Service Representative	5 person @ 2 Hour / Day	5,000
Operating Time Saving:		
Solution Manager	1 person @ 1 Hour / Day	5,625
System Administrator	2 person @ 1 Hour / Day	5,500
Helpdesk	2 person @ 1 Hour / Day	4,500
Total Annual Time Saving		1,387,500
Office Supplies & Miscellaneous Cost:		
Stationary		3,000
Paper		6,000
Printer Toner		4,000
Utilities		40,000
Total Annual Operating Cost		53,000
Maintenance:		
Maintenance for Fax		24,000
Maintenance for Printer		20,000
Facsimile Expense Saving		
Facsimile Charge	10% of 150 Calls / Staff / Day @ 5 Baht	530,000
Facsimile Toner	10,000 Baht / Annum	20,000
Total Benefits from Implementing Computerized System Cost		1,990,500

3.7.3 Payback Period

There are several analyzed or evaluated technique that can be used to select candidate solution by looking at recovery of the investment cost. One of the techniques that have been chosen is named Payback period. Payback period measures amount of time, it takes consumers to recover the assumed higher purchase expense of more energy efficient equipment through lower operating cost. It calculates and determines the number of years that the investment of proposed system is recovered.

Table 3.14. Payback Period for the Proposed System, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost:						
Annual operating cost	-771,100	-1,363,000	-1,710,400	-1,860,330	-2,053,253	-2,236,668
Discount factor for 13%	1	0.893	0.797	0.712	0.636	0.567
Time Adjust Cost (Adjusted To Present Value)	-771,100	-1,217,159	-1,363,189	-1,324,555	-1,305,869	-1,268,191
Cumulative Time-Adjusted costs over life time	-771,100	-1,988,259	-3,351,448	-4,676,003	-5,981,872	-7,250,062
Benefit derived form operation of the new system	0	1,990,500	2,189,550	2,408,505	2,649,356	2,914,291
Discount factor for 13%	1,000	0.893	0.797	0.712	0.636	0.567
Time Adjusted benefit (Adjusted to Present Value)	0	1,777,517	1,745,071	1,714,856	1,684,990	1,652,403
Cumulative time-adjusted benefit over life time	0	,777,517	3,522,588	5,237,443	6,922,434	8,574,837
Cumulative Life Time Time-Adjusted Costs+Benefit	-771,100	-210,743	171,140	561,441	940,562	1,324,774

3.7.4 Break-Even Analysis

Figure 3.4 illustrates the comparison between the cost of existing system and the cost of proposed system as shown in Table 3.10. The cost of the existing system begins at 1,685,000 Baht and climbs to 10,287,093 at year five. The cost of proposed system begins at 2,134,100 Baht and climbs to 9,994,751 at year five. The two curves intersect approximately around 3 years, which is the break-even point. Therefore, the investment of the proposed system will be recovered within the period of 3 years.

Breakeven Analysis is the regular form of cost comparison. Comparing the cost of the proposed system and the cost of the existing system to determine the point that the costs of the both systems become equal. Normally, cost of the proposed system will be the highest at the first year because of system development cost such as installation of new hardware and software. The proposed system costs will drop rapidly after the system has already implemented. On the other hand cost of the existing system will increase every year. The major factor that affected the existing system is employee salary and office utilities because it is fixed cost. The accumulated cost comparison for five year between the existing system and the proposed system is shown in Table 3.12. The Figure 3.4 shows the break even-point indicates that the proposed system is more economical than the existing system.

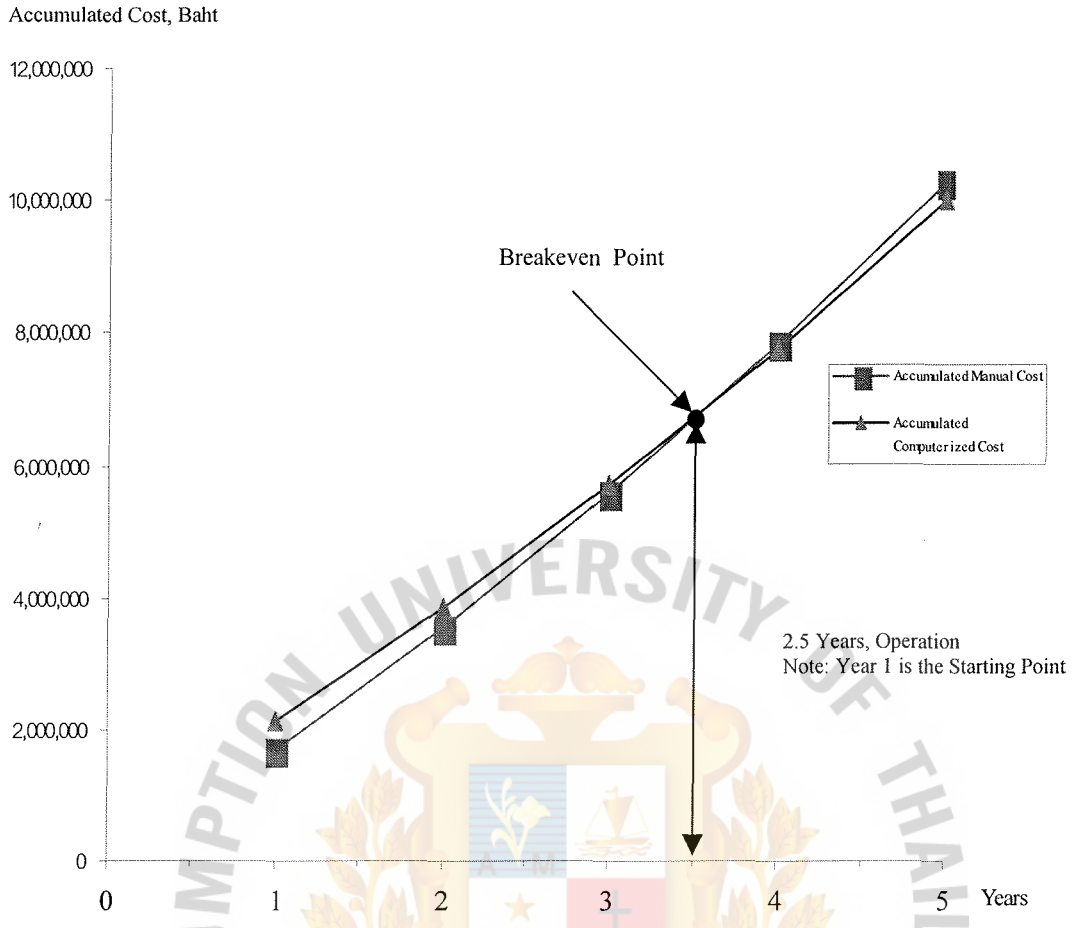

Figure 3.4. Break Even Point Analysis.

3.7.5 Net Present Value

Another technique used to analyze discount cash flow is cal Net Present Value. It is a practical evaluating method since it includes the discount rate of the present value for all cash flow occurs in the project. The discount rate is the required rate of return on investment which equal to interest rate of that investment amount would receive if the investment is not made. As shown in Appendix I the candidate 2 give the highest positive net present value of 1,324,774 Baht among all alternatives.

IV. PROJECT IMPLEMENTATION

4.1 System Implementation

System Prototyping

The proposed system uses contract programming for installation of the network management software – Windows 2000 Server and database management software Microsoft SQL and Microsoft Access 2000. The selected software's are domain-independent-begin builds for variety of processing environments and their specifications are suitable for the Asset Control System requirements. The interface of input, output, databases, modules and controls can be easily reviewed.

Working model of asset information system is created to determine if the design meet user needs and expectations.

Prototypes include the screen data entry and data reporting facilities. The steps are as follows:

(1) Design screen and data files. Identify the fields on data entry screen and corresponding fields for each record to be stored on files.

(2) Collect some data for sampling.

(3) Produce report based on information stored on files.

(4) Identify problems with the report format and contents.

(5) Collect some new data.

(6) Report on the files.

(7) Return to step 4 if the report continues to show problem.

With all the system design documentation illustrated in context diagrams, data flow diagrams and structure charts, the users can evaluate the requirements of processing and determine if the proposed design meets their requirements.

Documenting computer code or to identify and explain the steps of processing is shown in Appendix D – Process specification.

4.2 System Testing

The proposed softwares have been tested to assure that they are easy to use and good for the purposes of the system. Then test plan must be set to accomplish this which includes:

(a) Stress test, which is used to test for system capacity and determine throughput and response time characteristics of the system. It is expected that the system will be able to handle lots of information such as Barcode and unique fields.

(b) Normal path test is used to see if the system can handle valid data so that all valid inputs bring about valid results.

(c) Error path test is used to see how the system handles invalid data.

(1) Database Test

(a) Using Live Test Data

After a system has been partially constructed, programmers or analysts often ask users to key in a set of data from their normal activities.

(b) Creating Test Data

Data testing can be done by creating an extensive set of test data to cover all interconnecting program testing.

(2) New Software Test

(a) Unit Testing

It concentrates first on the modules, independently of one another, to locate errors, detecting errors in coding and logic that are contained within that module alone.

(b) System Testing

Running the whole system to make sure that the whole system programs runs completely carries out system testing.

(c) Performance Time Testing

It is the length of time used by the system to process transaction data. Sharing common data and files when many users process at the meantime can test it.

(3) Network Test

Testing function of all the network equipment connected to the system, such as printer, Hub, LAN cable etc., whether they are able to be linked and communicate together.

(4) Backup and Restart Process Test

The testing program should be carried out after the new system functions properly. To be accurate the testing of the new system should be done in parallel with the existing system. This method would guarantee in case rollback process is required since the existing system still use. The system testing should be carried out for a period of six months until all the problems are eliminated as well as all processes, output reports and files are correct. Then migrating process to the new system can be done.

4.3 System Conversion

The installation of system software's is just adding new features to the existing computer-based operation. The activities in system conversion include:

(1) Creating new database

(2) Installing new system

(3) Completing all work procedure

(4) Completing all documentation

(5) Training the users

The conversion uses parallel method on system change over. The old operation can still be undertaken in concurrent with the new system until the users and company are ready to fully comply with the new system. The results of the new system can be compared to the old one. If any deviation occurs in the results, rollback process or corrective action can be taken immediately. This would include changing or modifying the coded instructions.

4.4 User Training

Training session is required to provide the users with hand-on experience with the new system. The comprehensive/progressive training programs are organized for the asset control system. The program covers all system functions, operation procedures and system maintenance method. The training course starts with three days classroom training and followed by three months on the job training. The period is adequate to provide the user time to learn about the new system environment. Since the system is designed to be interactive, users can easily try out the software, with only little supervision from the analysis team.

4.5 System Maintenance

To keep the software current with the changing processing requirements, to fix the errors of defects of the software and to keep up with changes in computer technology, system maintenance plan have been developed. The plan includes adaptive maintenance, corrective maintenance and effective maintenance.

Adaptive maintenance will be undertaken when the programs need to be modified to incorporate new system requirements. Routine maintenance tasks using utility programs include:

(1) File copying and back-up

To copy data files and database and store them in safe locations to be retrieved or restored when needed.

(2) File reorganization

(3) Since the system deals with extensive volume of data, reorganization of master files need to be done periodically when records are deleted and written to overflow areas.

(4) Table update

Data in tables need to be regularly updated when required to keep the system information reliable and valid.

Corrective maintenance is required in response to software failure. To track the problems, critical incident reports will log the software failures; their probable cause and corrective or rollback process action will be taken. These reports help identify classes of errors: program logic error, system errors, operation errors and users errors.

Effective maintenance is to improve or maintain program efficiency. One example is to modify program data structures by simplifying the organization of data structure.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Electronic Data System (Thailand) Co., Ltd. has designed to implement a new computerized system in order to manage and process the information efficiently. The area under development is the Asset Control System which has found problems on redundant, inaccurate information, time consumption, losts of information, and so on. There are many things, which we would take into account before replacing an existing system such as cost comparing between the existing system and proposed system, also whether the information will be useful for the strategic and management level in decision making. Table 5.1 illustrates the comparison of time between the proposed system and the existing system in the asset control process.

Table 5.1. The Degree of Achievement of Proposed System.

Process	Existing System	Proposed System
Asset Data Entry	30 Minutes	10 Minutes
Inquiry	30 Minutes	5 Minutes
Data Verification	1 Hour	5 Minutes
Report Generation	1 Hour	10 Minutes

The main purpose of implementing a new system is making the clerical worker to complete task in efficient ways and use time optimization by reducing the repetitive work which will use less number of workers. Then, they could concentrate on other activities or role in the organization instead of focusing on entering data only. The new computerized system may allow the same function to be carried out with half of the number of users or even less. Moreover, the tactical benefit is the saving that comes from being able to process business transactions more quickly. Faster turnaround not

only reduce the clerical costs but it can lead to better cash flow for the organization. Thus, an advance information system could provide both good internal and external information in order to make decision for the management levels. Furthermore, the developments of the system in Information Technology Department, which use Excel system, are quite insufficient. The proposed new system as MS Access 2000 for storing and retrieving the data, would provide the benefits such as time optimization, cost optimization and eliminate redundant activities. The new system will be implemented on two-tiered Client/Server architecture. As a result, the new system will increase the efficiency of work, reduce cost of worker, reduce repetitive work, and maximize the utilization of the resources.

5.2 Recommendations

Together with the system implementation, standard data definitions from application to application up until department to department need to be initiated for data integrity purpose. Such data consistency, under careful administrative control, is essential in developing management information. Tracking and reporting on license and number of assets status with full supportive information from other related business function is possible.

Database system, once designed, may need to be modified from time to time to keep up with different levels of purpose and requirement. From initial phase, it is expected to meet short-term application-oriented goals of routine transaction processing. After that, long-term data-oriented goals of managing information as corporate resource should be upcoming needed to anticipate. However, the organization will be growing and other new requirements may arise, thus the following recommendations should be considered in order that the system can support the future changes. The recommendations are as follows:

(1) Making the whole organization become completely paperless by using computerized system; then the information can be sent, tracking and tracing via online system. There will be more collaboration processed among departments and some of the information can be shared as well.

(2) Equipment tool such as barcode reader should be taken into account to read each of the asset items because it can eliminate the mistakes from human errors entering the information and it would provide detail for a specific user or item. The time will be reduced for process stock or information checking.

(3) This application could be applied the concept to be used with other departments such as Office Supplies could change some modification in the system to add more index, detail, types, and report format.

(4) The organization could make use of wireless equipment tool for accessing the information such as PocketPC, iPaq and Palm. This technology would provide capabilities to access the information remotely. As a result, management people would not waste time to gather the information only in the office.

APPENDIX A

ENTITY RELATIONSHIP DIAGRAM

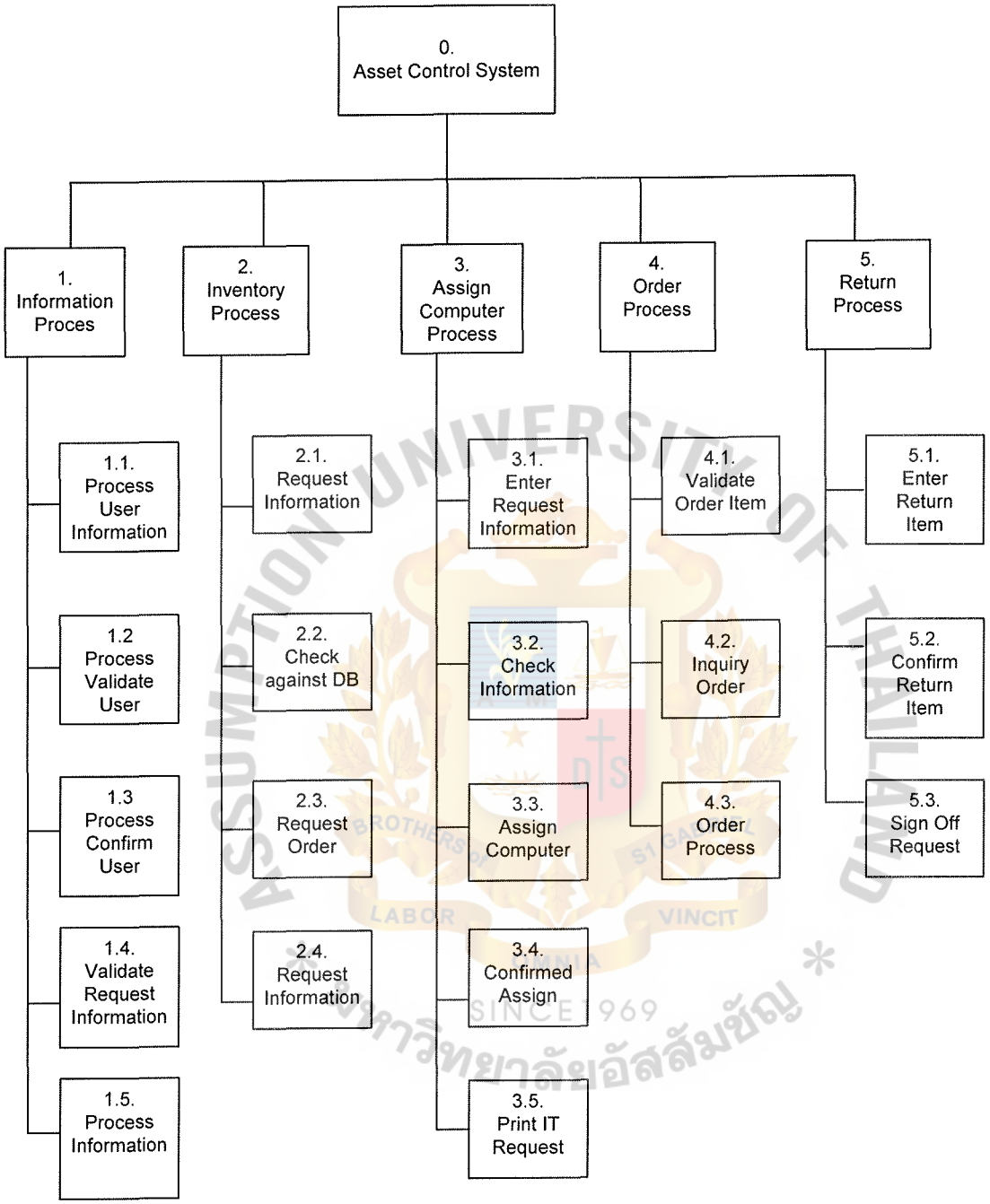

Figure A.1. Decomposition Diagram of Asset Control System.

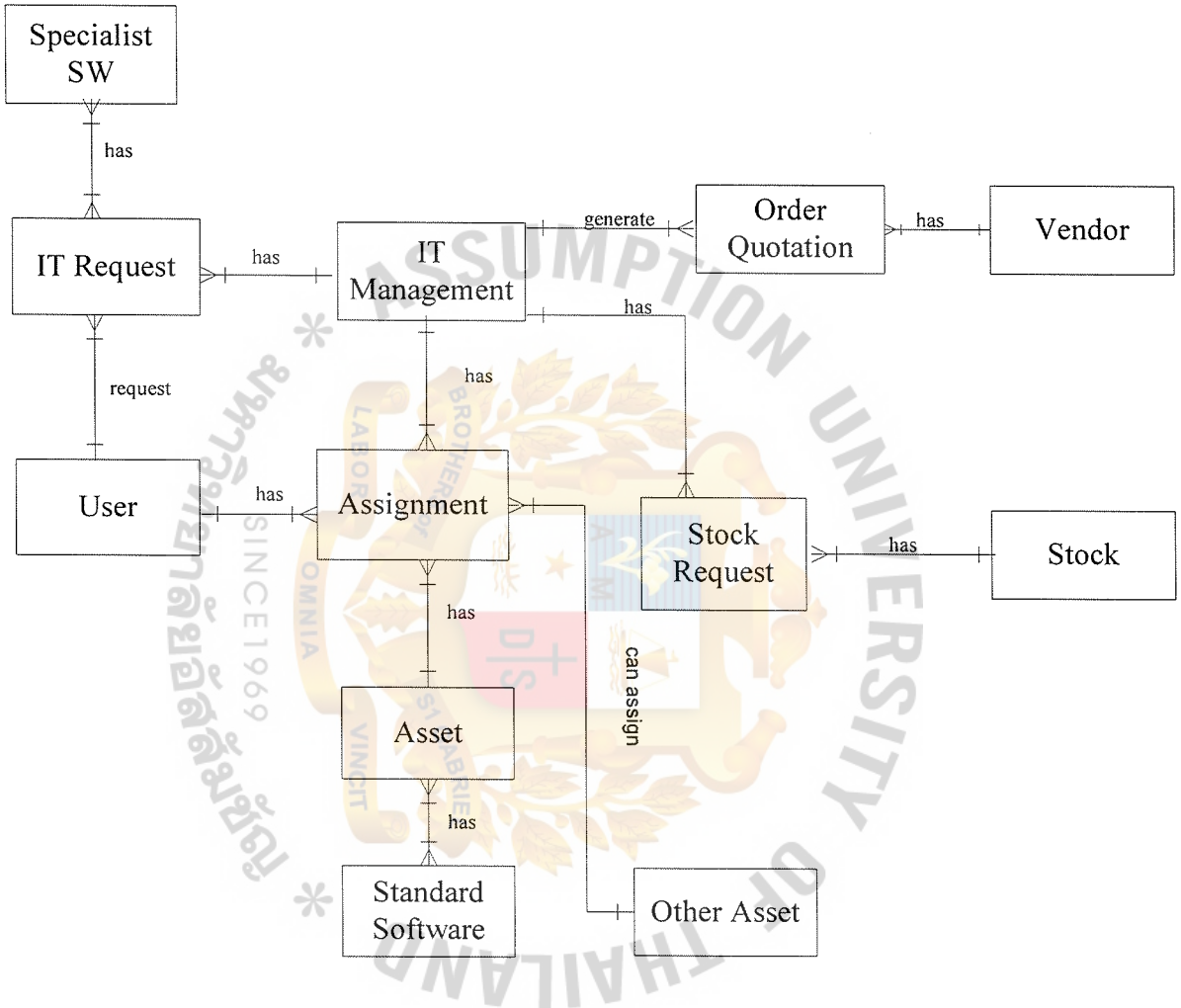

Figure A.2. Context Data Model Diagram.

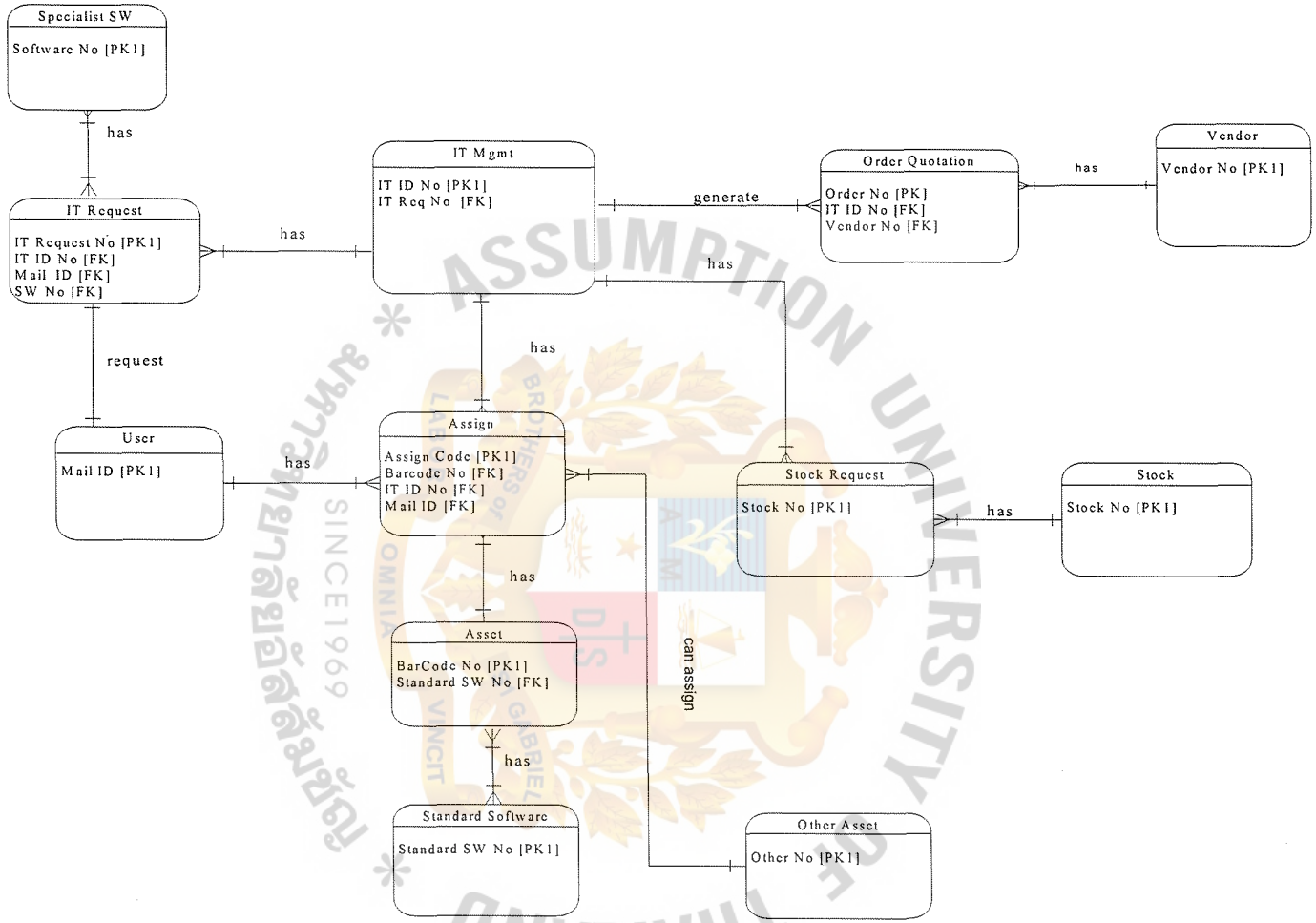

Figure A.3. Key-Based Data Model Diagram of Asset Control System.

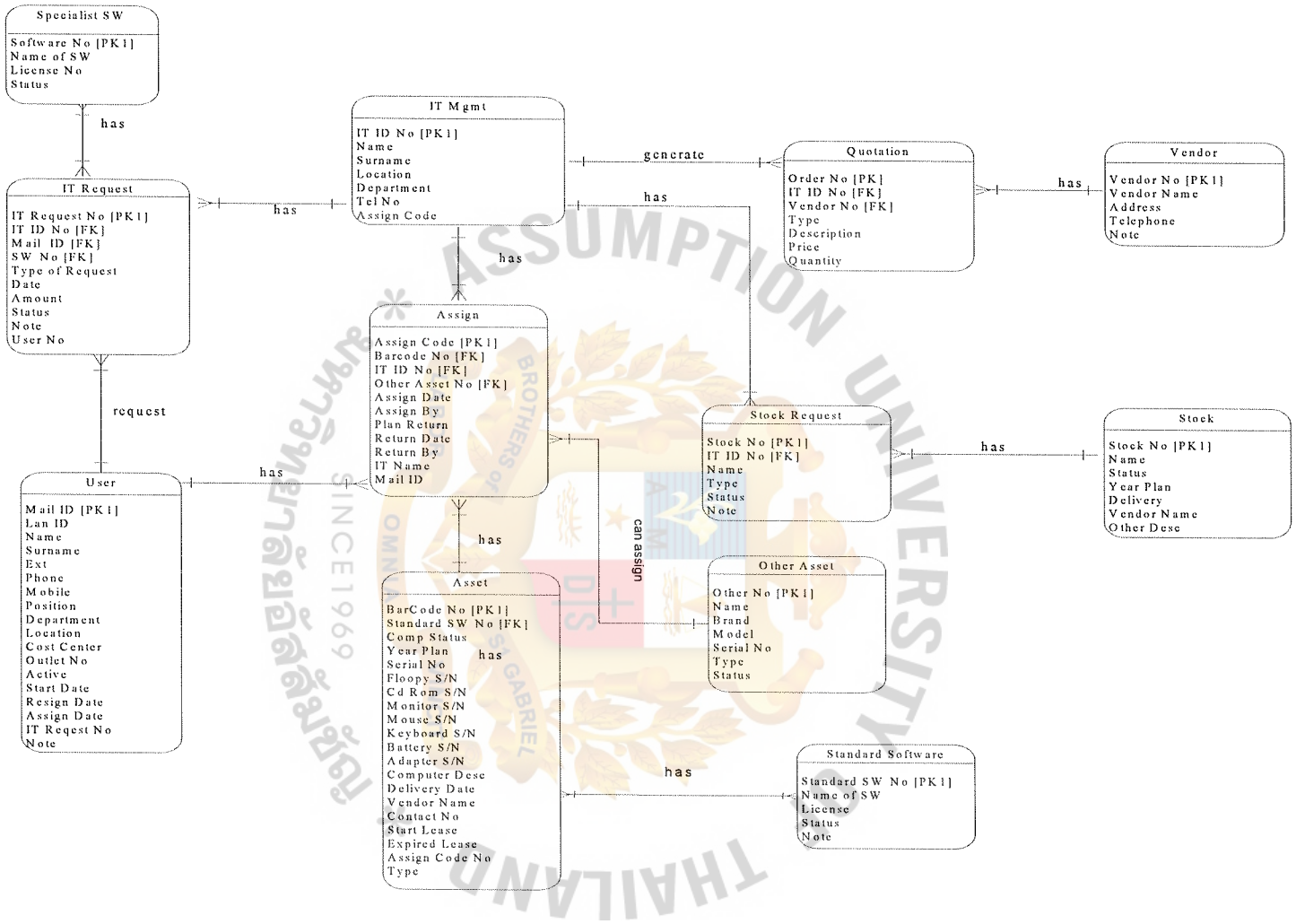

Figure A.4. Fully Attributed Data Model Diagram of Asset Control System.

APPENDIX B

DATA FLOW DIAGRAM OF PROPOSED SYSTEM

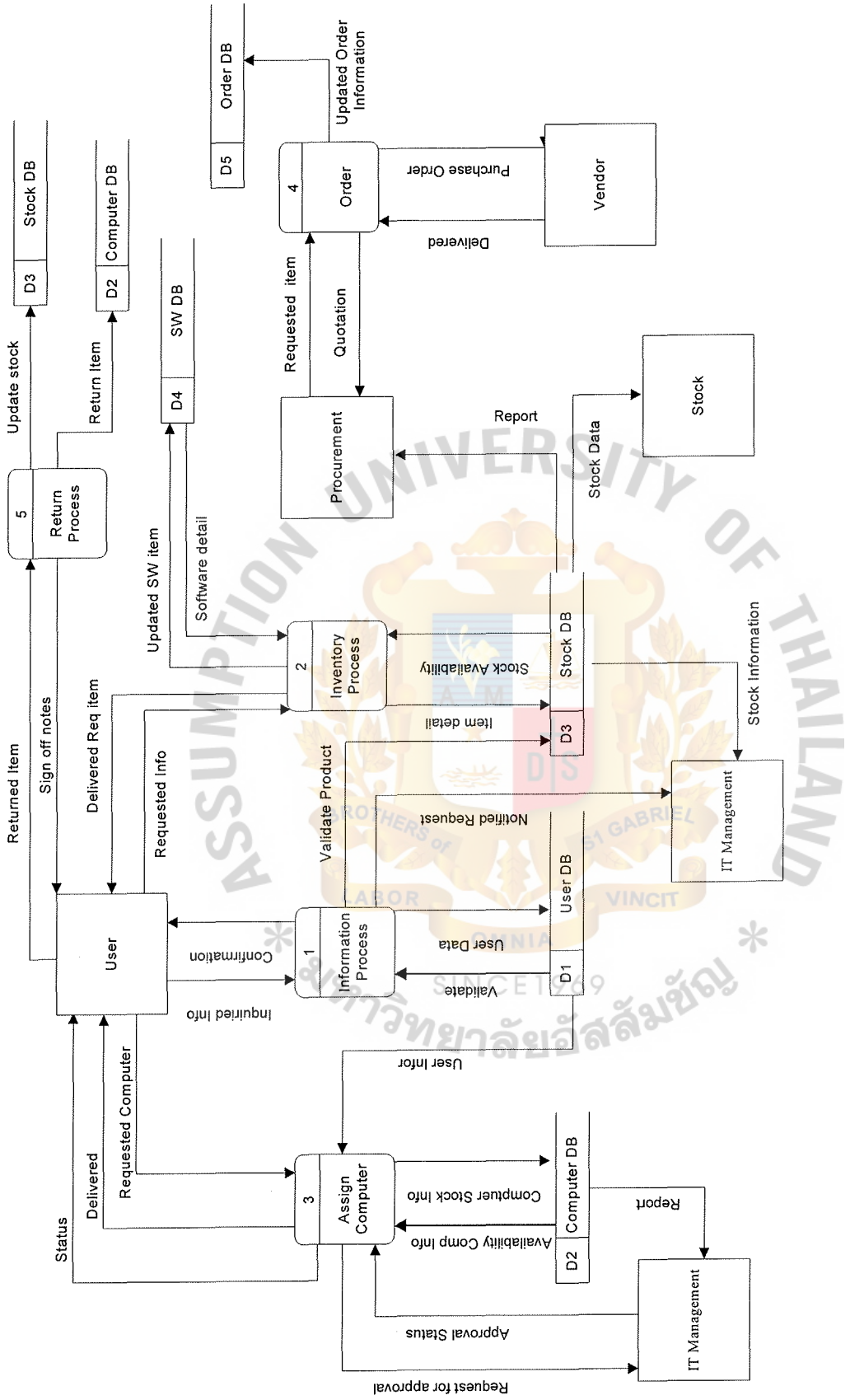

Figure B.1. Level 0 Dataflow Diagram of Proposed System.

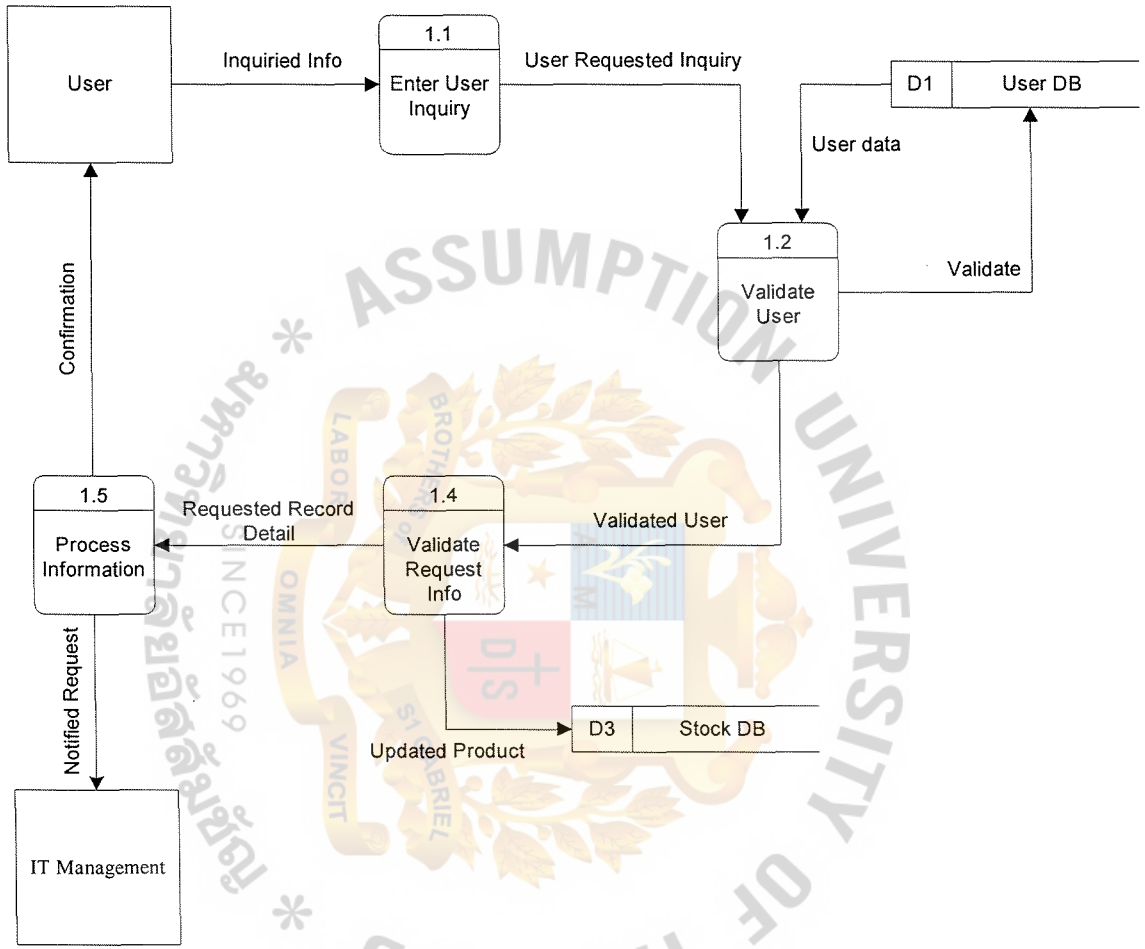

Figure B.2. Level 1 Dataflow Diagram of Information Process System.

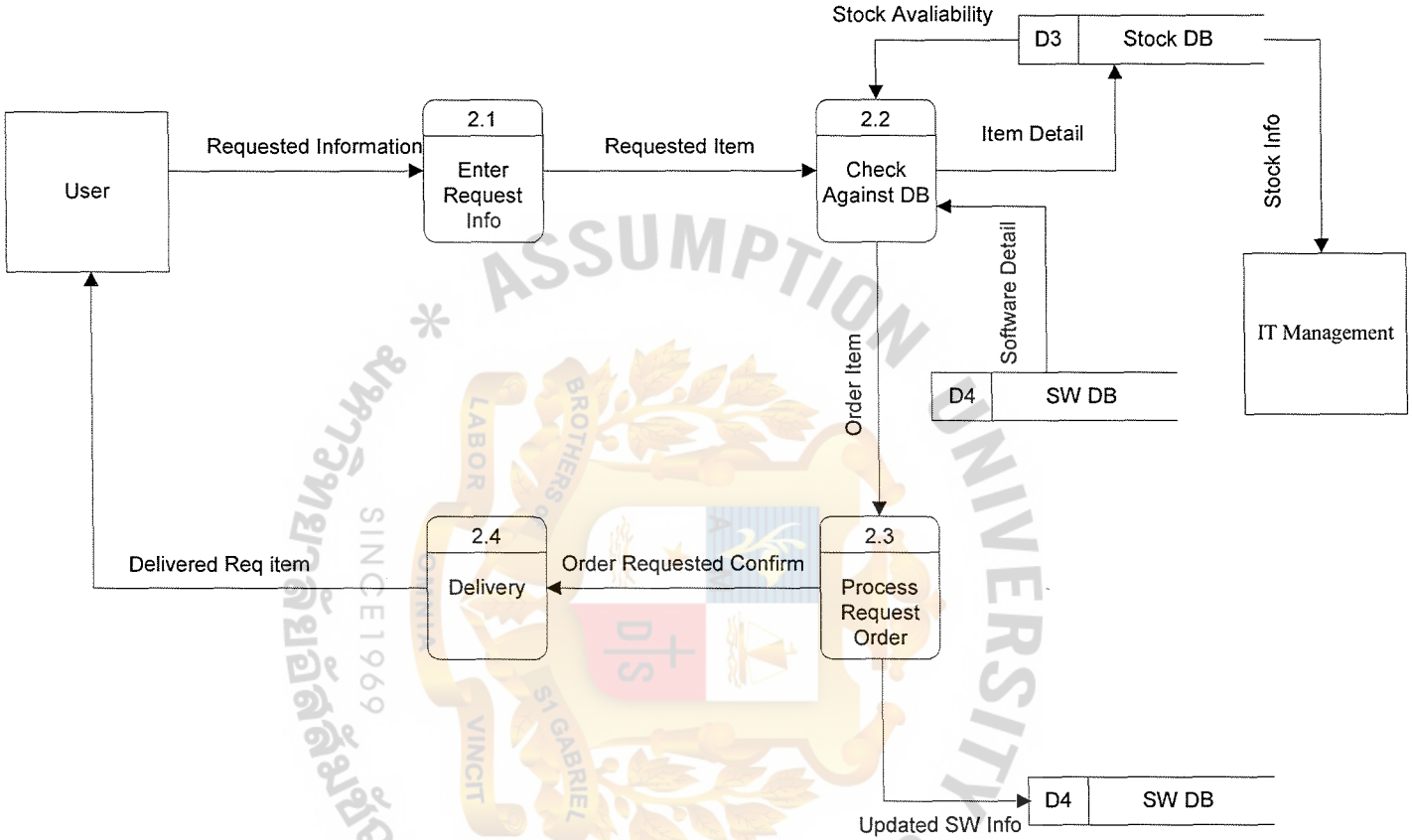

Figure B.3. Level 1 Dataflow Diagram of Inventory Process System.

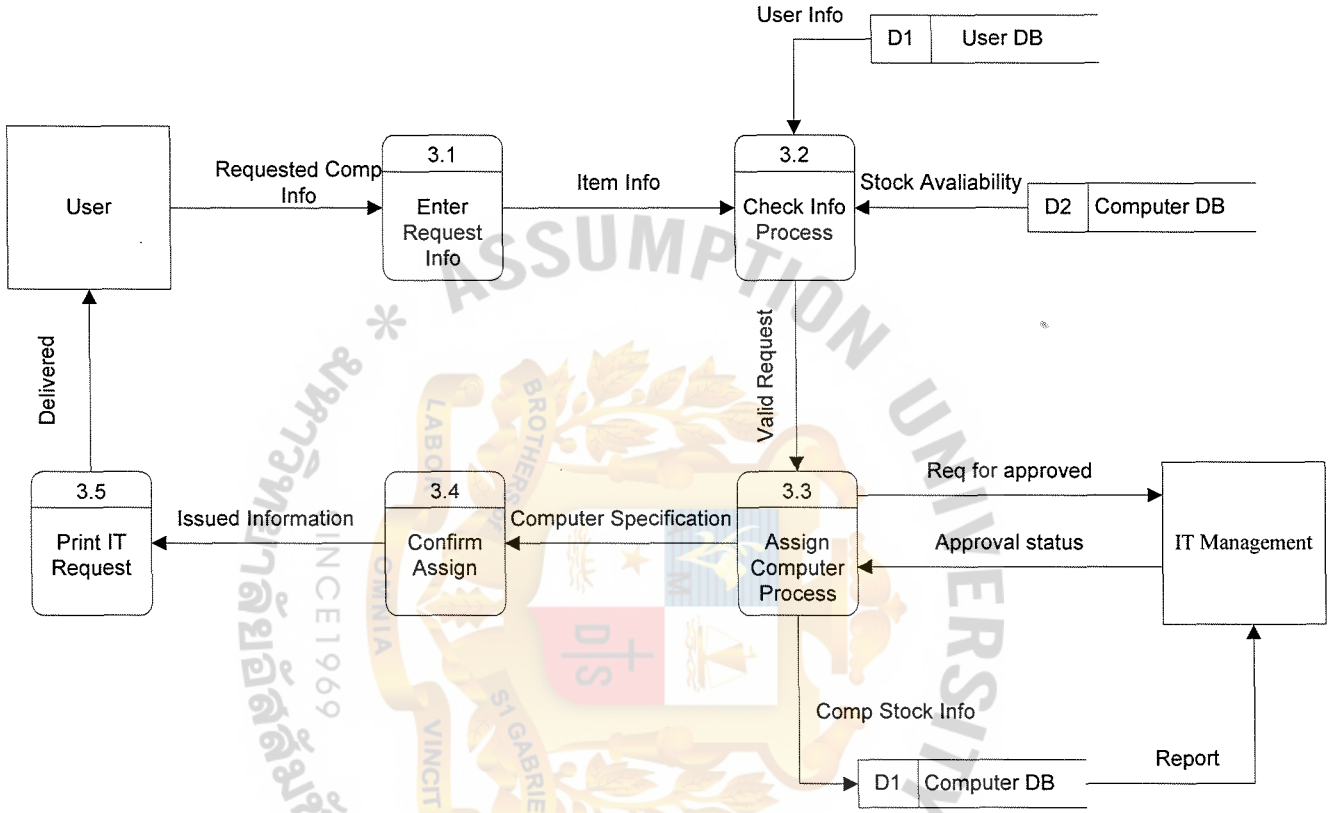

Figure B.4. Level 1 Dataflow Diagram of Assign Computer Process System.

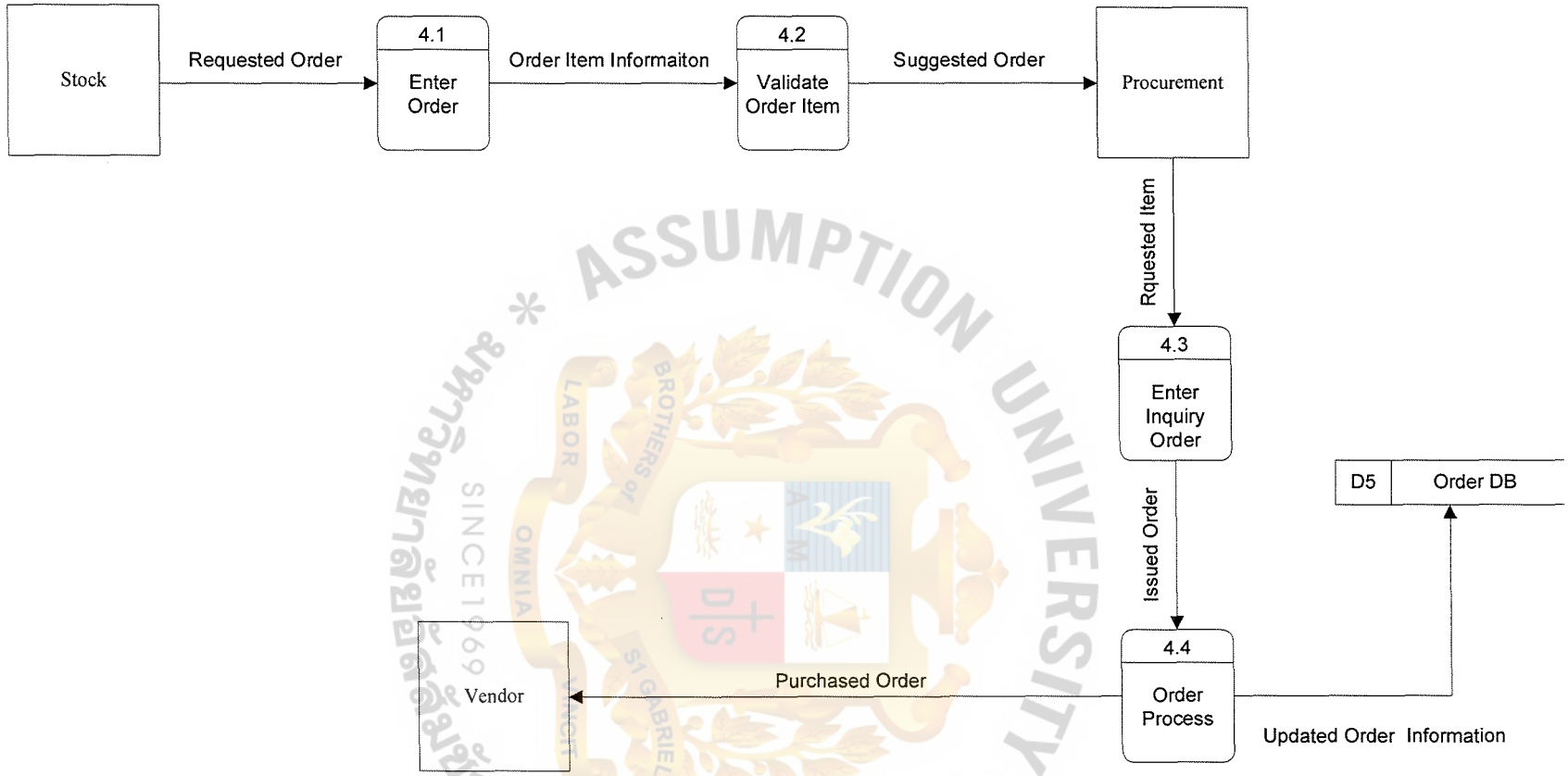

Figure B.5. Level 1 Data Flow Diagram of Order Process System.

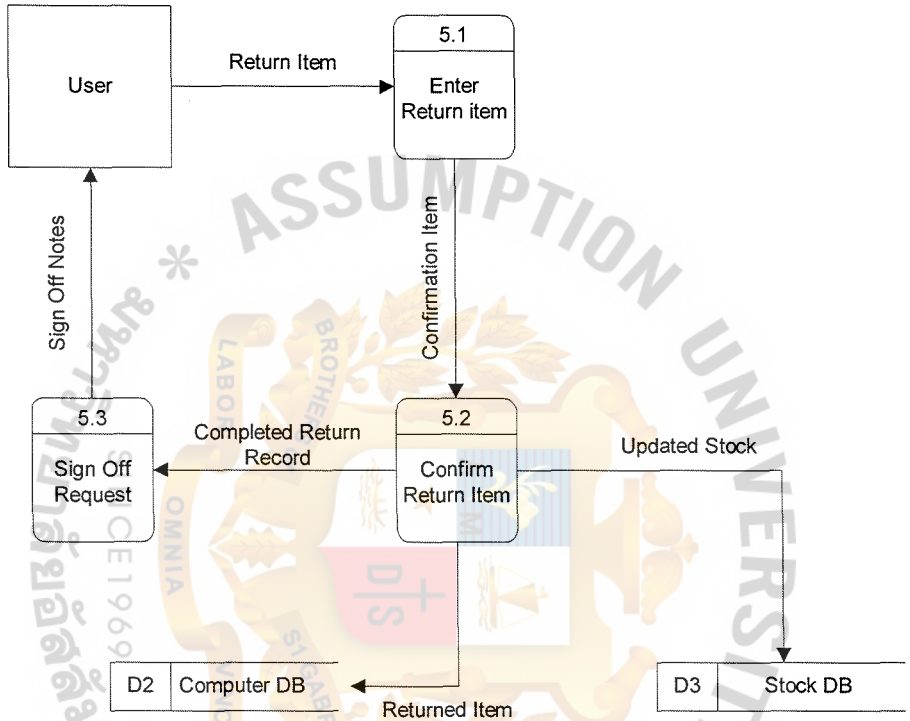

Figure B.6. Level 1 Data Flow Diagram of Return Process System.

APPENDIX C

STRUCTURE DESIGN

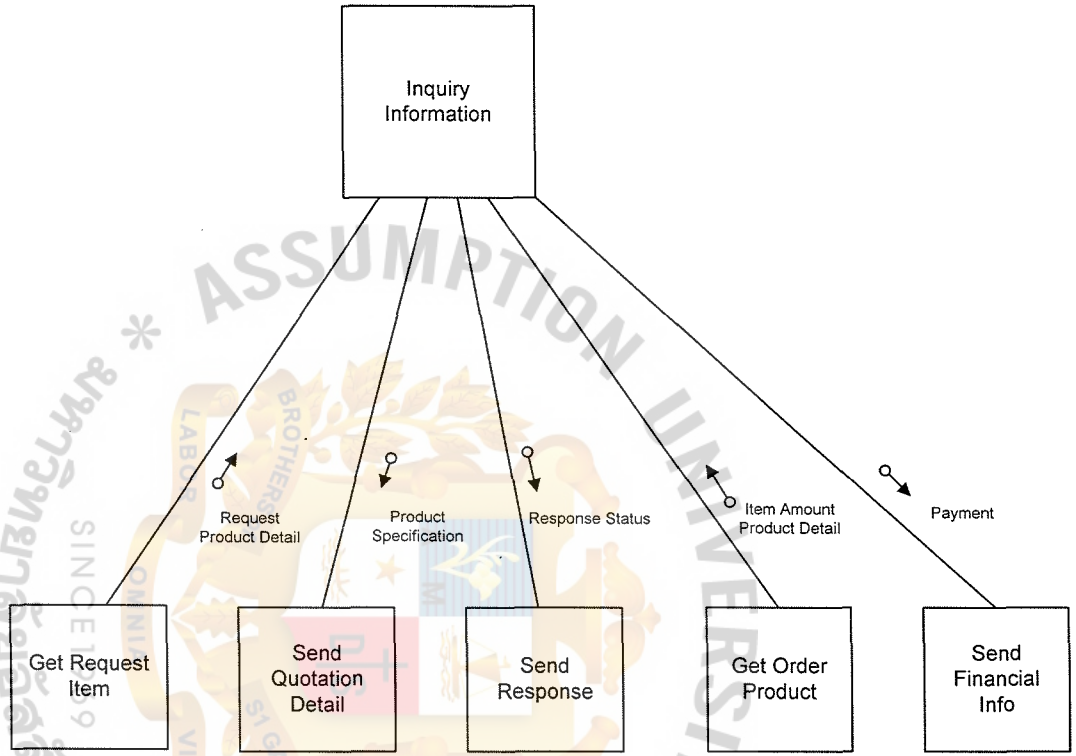

Figure C.1. Process Inquiry Information Chart Diagram.

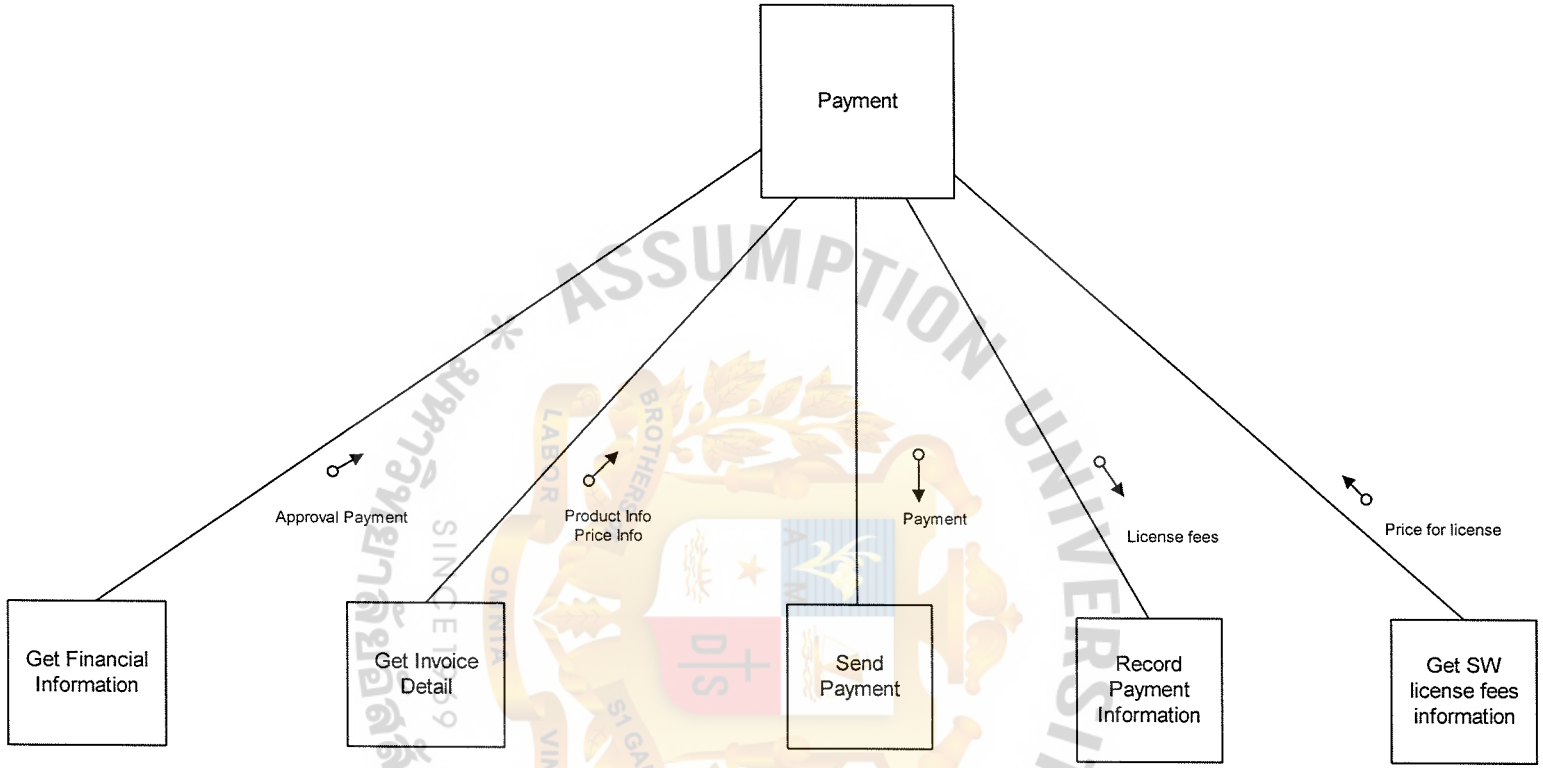

Figure C.2. Payment Chart Diagram.

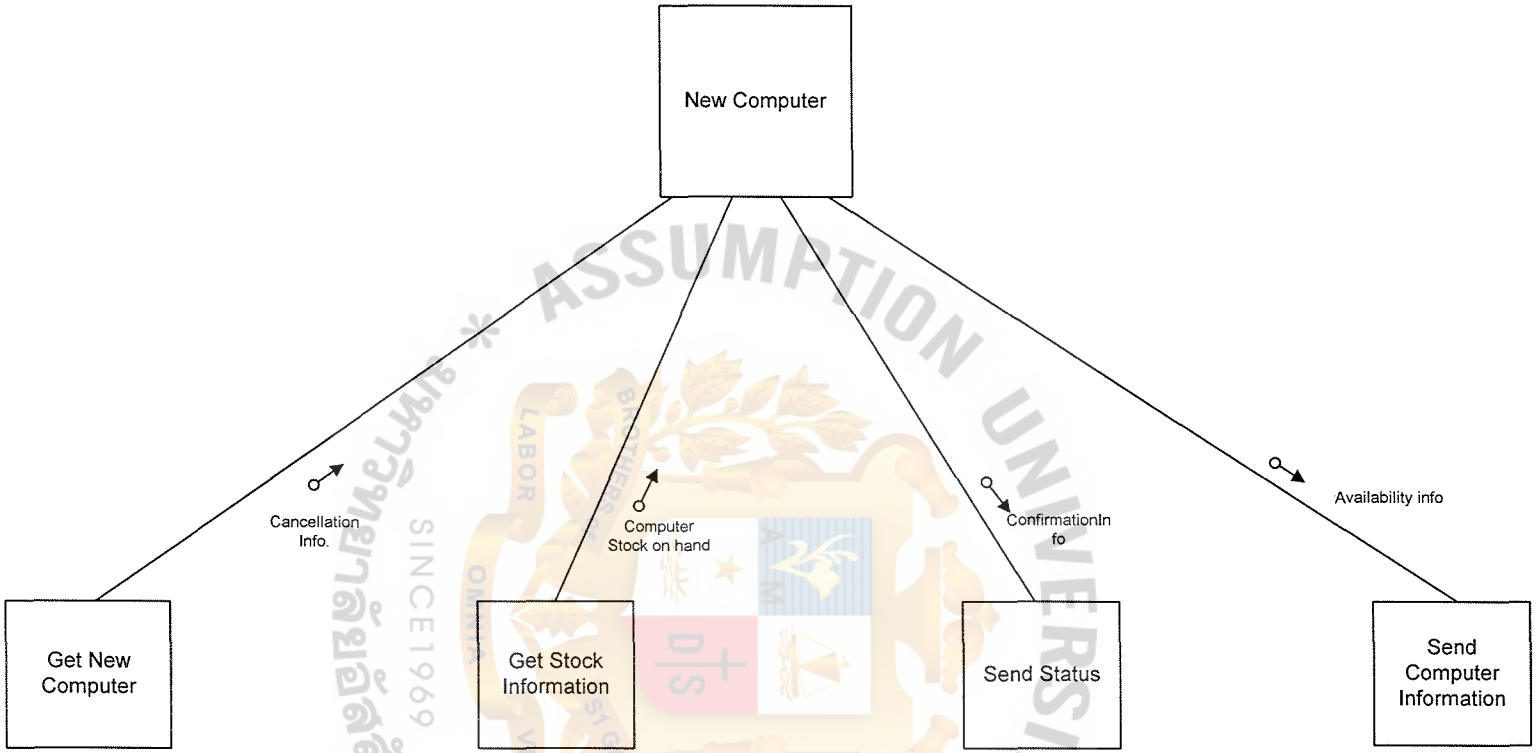

Figure C.3. New Computer Chart Diagram.

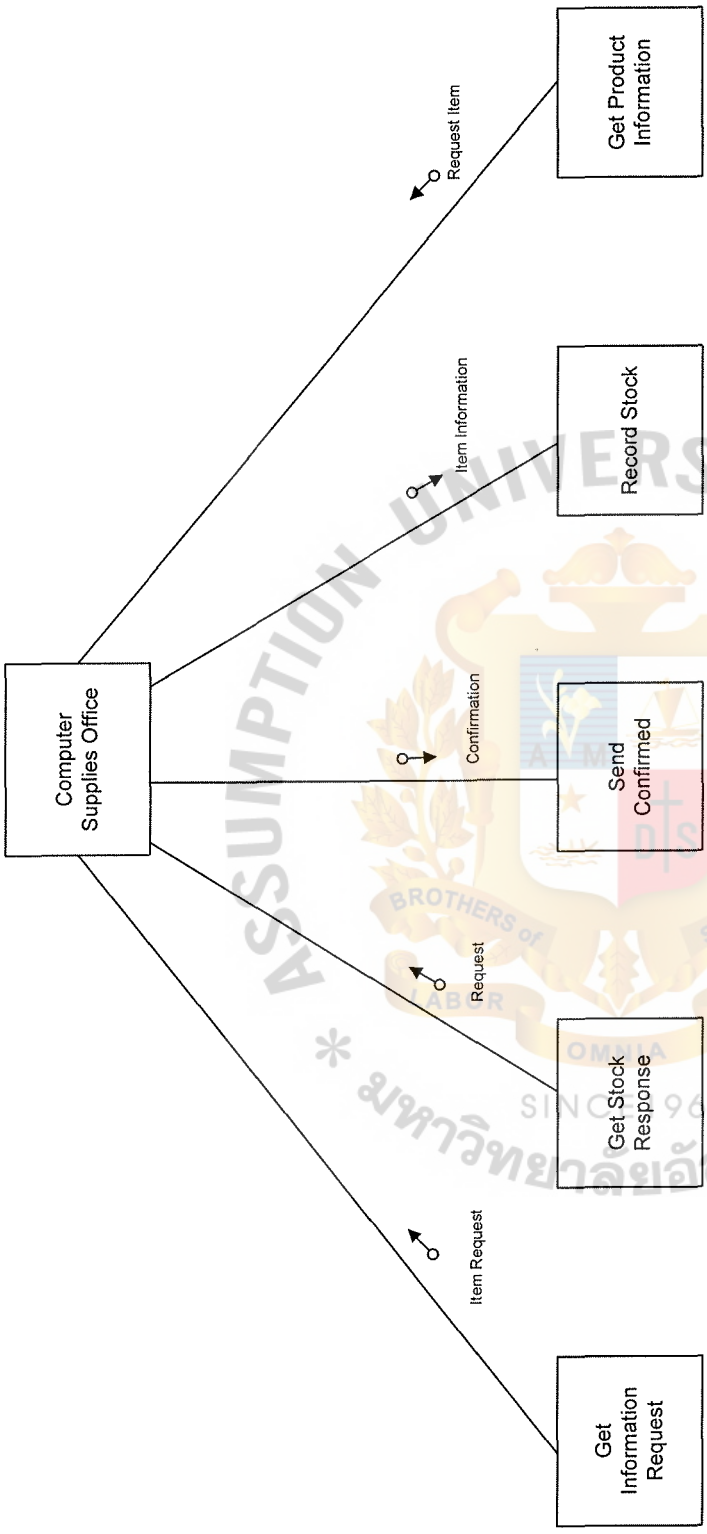

Figure C.4. Computer Supplies Office Chart Diagram.

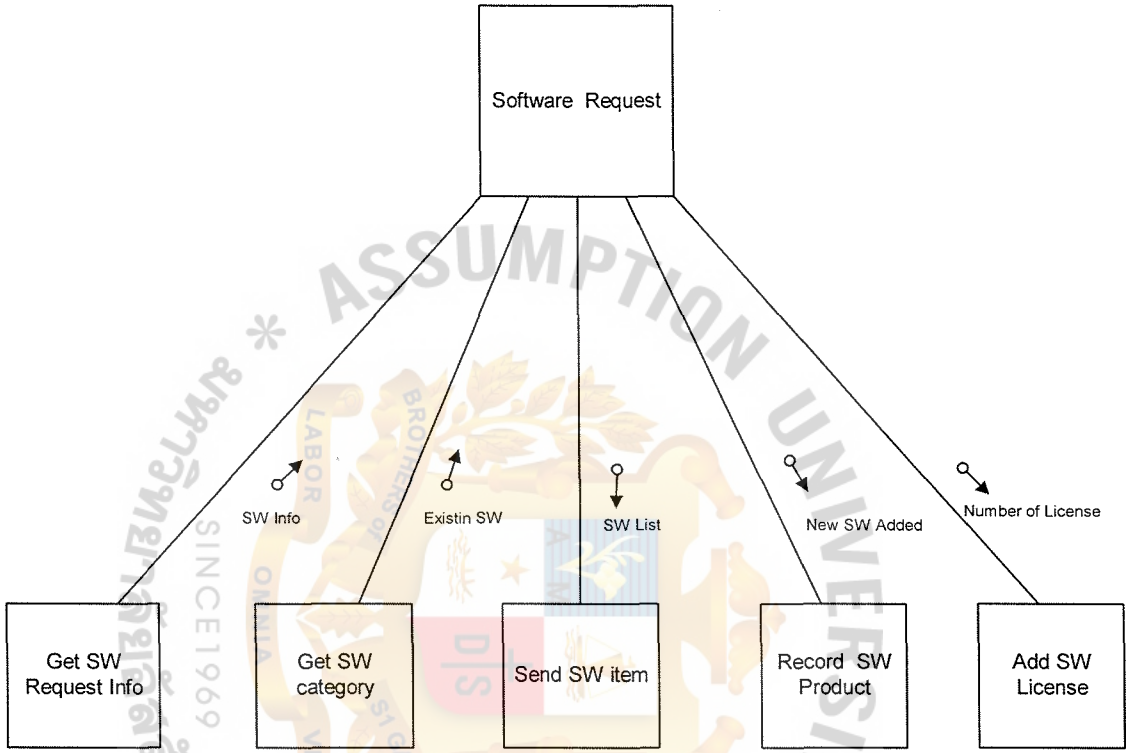

Figure C.5. Software Request Chart Diagram.

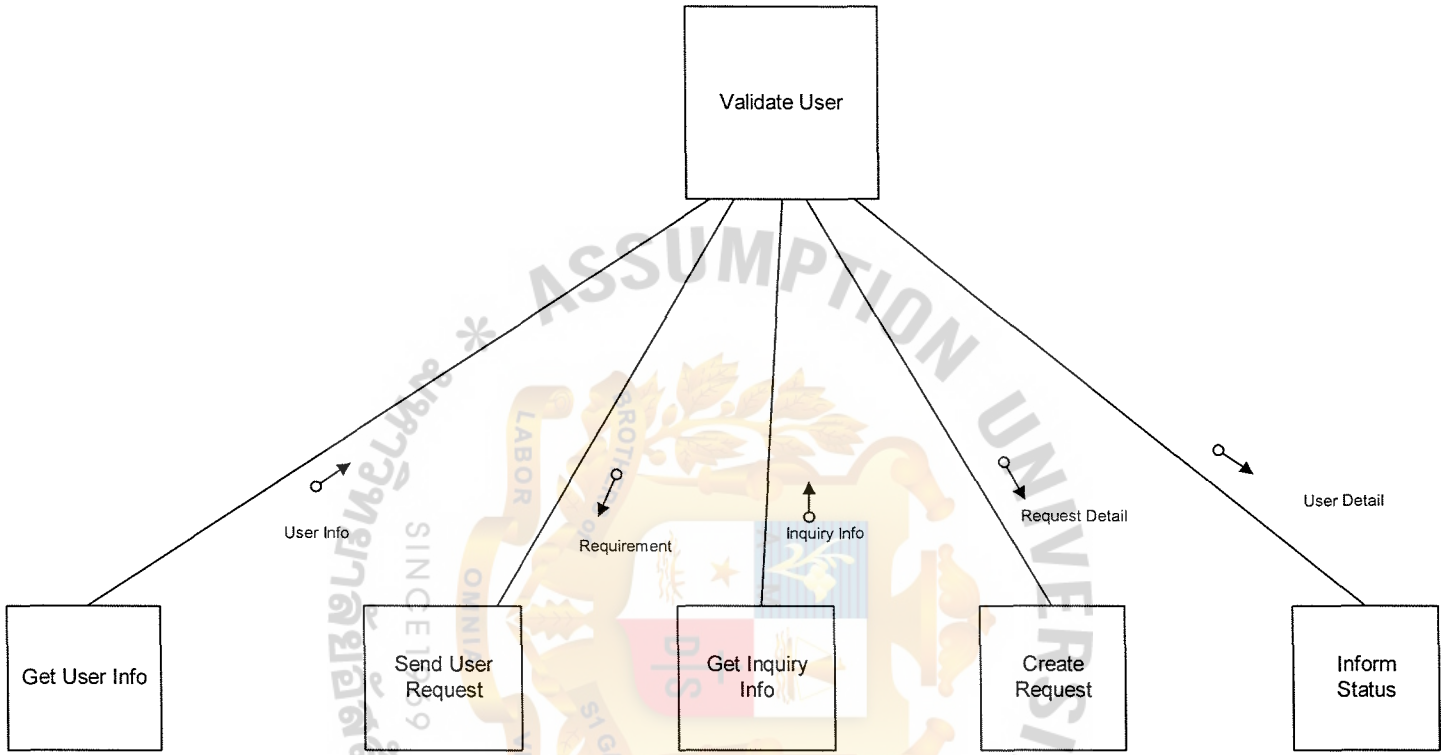

Figure C.6. Validate User Chart Diagram.

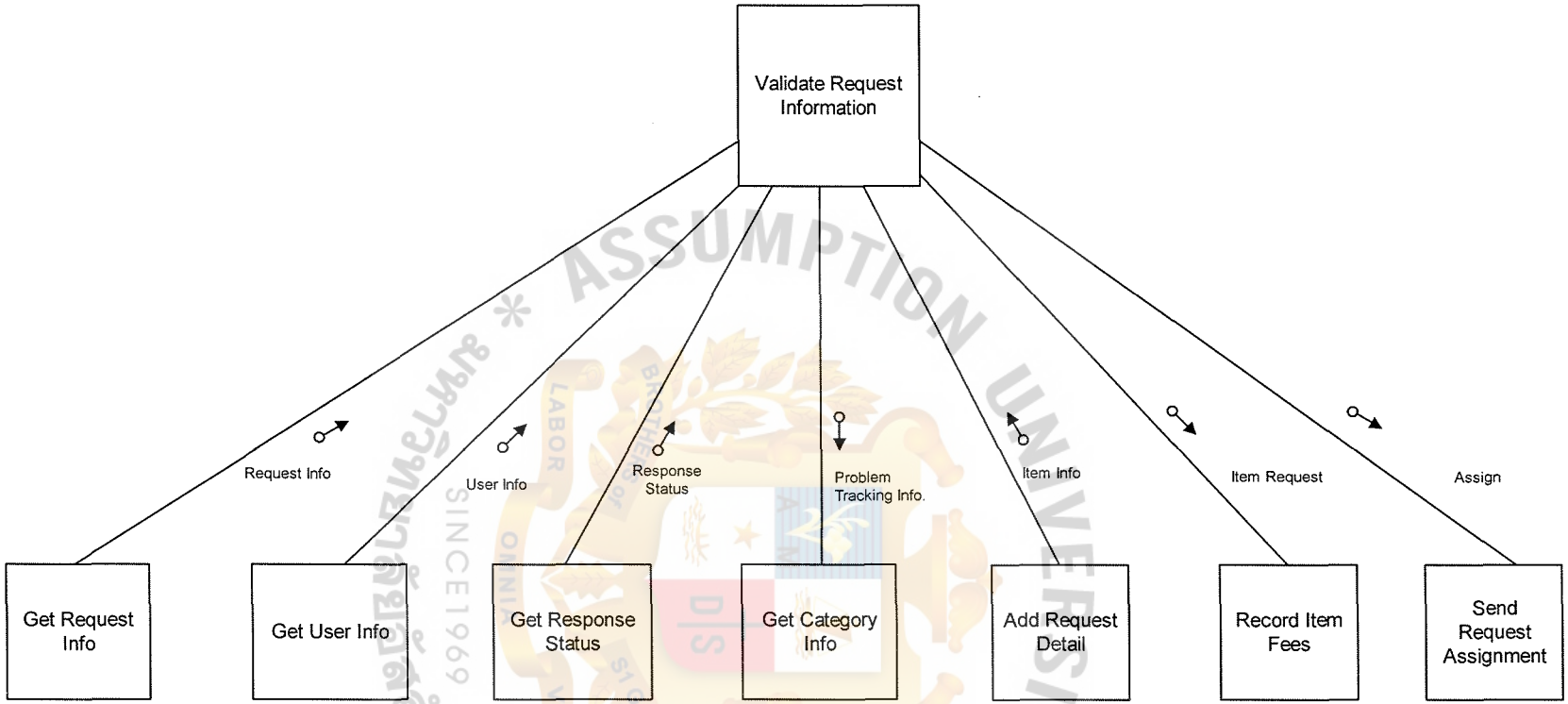

Figure C.7. Validate Request Information Chart Diagram.

APPENDIX D

PROCESS SPECIFICATION

Table D.1. Process Specification of Process 1.1.

Items	Description
Process Name:	Enter User Inquiry
Data In:	Inquiry Information
Data Out:	User Information
Process:	1. Receive an inquiry from the user 2. Create New User inquiry information 3. Send User Information to Validate User Process
Attachments:	1. User

Table D.2. Process Specification of Process 1.2.

Items	Description
Process Name:	Validate User
Data In:	User Request Information Detail of User
Data Out:	Verification Request Information
Process:	1. Receive User Request Information from Enter User Inquiry Process 2. Receive User Detail from User database 3. Send verified data to Confirm User Process 4. Update User information to User Database
Attachments:	1. Data Store (User)

Table D.3. Process Specification of Process 1.3.

Items	Description
Process Name:	Validate Request Information
Data In:	Verification User Information Request
Data Out:	Information Request Detail Check Product in Stock Database Update Stock Record
Process:	1. Receive Validate User Information from Validate User Process 2. Check the request item against the Stock Database 3. Send Request Detail to Process Information
Attachments:	1. Data Store (Stock)

Table D.4. Process Specification of Process 1.4.

Items	Description
Process Name:	Process Information
Data In:	Request Record Detail
Data Out:	Inform Status Report
Process:	1. Receive the Request Record Detail from Validate Request Information Process 2. Summaries Request Information 3. Send Request Status to informed user 4. Send Notification about request to IT Management
Attachments:	1. User 2. IT Management

Table D.5. Process Specification of Process 2.1.

Items	Description
Process Name:	Enter Request Information
Data In:	Request Information
Data Out:	Suggested Order Item
Process:	1. Receive the Request Information from User 2. Read the Request Information from file 3. Create new Request Information 4. Send Suggested Order Item to Check Against Database Process
Attachments:	1. User

Table D.6. Process Specification of Process 2.2.

Items	Description
Process Name:	Check Against Database
Data In:	Suggested Order Item Stock Information Software Information
Data Out:	Order Information Item
Process:	1. Receive the Suggested Order Item from Enter Request Information 2. Receive the Stock Information from Stock Database 3. Receive the Software Information from Software Database 4. Read and Check Item Information for availability 5. Send the Order Item to Process Request Order
Attachments:	1. Data Store (Stock) 2. Data Store (Software)

Table D.7. Process Specification of Process 2.3.

Items	Description
Process Name:	Request Order
Data In:	Order Item
Data Out:	Confirmation Request Update Product in Stock Database Update Software Detail in Software Database
Process:	1. Receive the Order Item from the Check Against Database Process 2. Read the list of Request Item Information to check the availability of the item 3. Prepared to Order Item as requested 4. Update information Item in Stock Database 5. Update information Item in Software Database 6. Send Confirm Request to Delivery Process
Attachments:	1. Data Store (Stock) 2. Data Store (Software)

Table D.8. Process Specification of Process 2.4.

Items	Description
Process Name:	Delivery Item
Data In:	Confirm Request
Data Out:	Notification Status Delivery Item
Process:	1. Receive Confirmation Order from Request Order Process 2. Prepare the ordered item as per requested 3. Pack and check the item for being delivered 4. Send Delivery Request Item to User 5. Send Notification Status to IT Management
Attachments:	1. User 2. IT Management

Table D.9. Process Specification of Process 3.1.

Items	Description
Process Name:	Enter Request Information
Data In:	Request Information
Data Out:	Item Information
Process:	1. Obtain Request Information from User 2. Create New Request Information 3. Send New Request Information to Check Information Process
Attachments:	1. User

Table D.10. Process Specification of Process 3.2.

Items	Description
Process Name:	Check Information
Data In:	Item Information User Information Computer Information
Data Out:	Validate Request
Process:	1. Receive an Item Information from Enter Request Information Process 2. Receive User Information from User Database 3. Receive Computer Information from Computer Database 4. Read and check the information for availability of the Computer 5. Read and check the information for availability of the User 6. Send Validate Request information to Assign Computer Process
Attachments:	1. Data Store (User) 2. Data Store (Computer)

Table D.11. Process Specification of Process 3.3.

Items	Description
Process Name:	Assign Computer
Data In:	Validate Request
Data Out:	Computer Specification Update Computer Information Update User Information Update Software Information
Process:	1. Receive an Validate Request Information from Check Information Process 2. Perform checking with all information by assigning User name with Computer 3. Receive an approval from IT Management 4. Send Computer Specification with all information to Confirmed Assign Process 5. Send Update information to Computer Database 6. Send Update information to User Database 7. Send Update information to Software Database
Attachments:	1. Data Store (User) 2. Data Store (Computer) 3. Data Store (Software) 4. IT Management

Table D.12. Process Specification of Process 3.4.

Items	Description
Process Name:	Confirm Assignment
Data In:	Computer Specification
Data Out:	Issue Information
Process:	1. Receive Computer Specification from Assign Computer Process 2. Read and check that all information are correct and ready to be assign 3. Send Issue Information note to Print IT Request Process
Attachments:	

Table D.13. Process Specification of Process 3.5.

Items	Description
Process Name:	Print IT Request
Data In:	Issue Information
Data Out:	IT Request Notification IT Request Issue Copy
Process:	1. Receive the Issue Information from Confirm Assignment Process 2. Perform read and checking the information 3. Send IT Request to User to sign in 4. Send IT Request Issue Copy to IT Management for keeping record
Attachments:	1. User 2. IT Management

Table D.14. Process Specification of Process 4.1.

Items	Description
Process Name:	Enter Order
Data In:	Request Order
Data Out:	Order Item Information
Process:	1. Receive an inquiry from Stock 2. Create New Order Item information 3. Send Order Information to Validate Order Item Process
Attachments:	1. Stock

Table D.15. Process Specification of Process 4.2.

Items	Description
Process Name:	Validate Order Item
Data In:	Order Information Stock Information
Data Out:	Suggested Order
Process:	1. Receive the Order Information from Enter Order Process 2. Receive Stock Information from Stock database 3. Check order item against stock information 4. Update item status in Stock database 5. Send suggested order to Procurement
Attachments:	1. Stock 2. Data Store (Stock)

Table D.16. Process Specification of Process 4.3.

Items	Description
Process Name:	Enter Inquiry Order
Data In:	Order Detail
Data Out:	Issue Order
Process:	1. Receive the Order Record Detail from Procurement 2. Create new Order Inquiry Information 3. Send Issue Order to Order Process
Attachments:	

Table D.17. Process Specification of Process 4.4.

Items	Description
Process Name:	Order Process
Data In:	Issue Order
Data Out:	Purchase Order
Process:	1. Receive Issue Order from Enter Inquiry Order Process 2. Print out the Purchase Order 3. Send the Purchase Order to Vender 4. Update new Order information to the Order Database file
Attachments:	1. Vendor 2. Data Store (Order)

Table D.18. Process Specification of Process 5.1.

Items	Description
Process Name:	Enter Return Item
Data In:	Return Item Information
Data Out:	Item Information
Process:	1. Receive Return Item Information from User 2. Check Return Item Information 3. Send the Confirmation Item to Confirm Return Item
Attachments:	1. User

Table D.19. Process Specification of Process 5.2.

Items	Description
Process Name:	Confirm Return Item
Data In:	Confirmation Item
Data Out:	Complete Return Record Return Item Update Stock
Process:	1. Confirmation Item from Enter Return Item Process 2. Check Return Item against Stock and Computer Database information 3. Send an Update Return Item to Computer Database 4. Send an Update Stock Information to Stock Database 5. Send Complete Return Record to Sign Off Request Process
Attachments:	1. Data Store (Stock) 2. Data Store (Computer)

Table D.20. Process Specification of Process 5.3.

Items	Description
Process Name:	Sign Off Request
Data In:	Complete Return Record
Data Out:	Sign Off Notes
Process:	1. Receive Complete Return Record from Confirm Return Item Process 2. Check and Validate all Information 3. Find and Print out request to let user sign off 4. Send Sign Off Request to User to get acknowledge
Attachments:	1. User

APPENDIX E

DATABASE DESIGN

Table E.1. Structure of Asset Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
Bar Code	Text (11)	-	Assign	Primary Key
Computer Status	Text (1)	-	-	Attribute
Year Plan	Text (4)	-	-	Attribute
Serial No	Text (25)	-	-	Attribute
Floppy S/N	Text (25)	-	-	Attribute
CD Rom S/N	Text (25)	-	-	Attribute
Monitor S/N	Text (25)	-	-	Attribute
Keyboard S/N	Text (25)	-	-	Attribute
Battery S/N	Text (25)	-	-	Attribute
Adapter S/N	Text (25)	-	-	Attribute
Computer Description	Text (50)	-	-	Attribute
Delivery Date	Date/Time	Medium Date	-	Attribute
Vender Name	Text (50)	-	-	Attribute
Contact No	Text (50)	-	-	Attribute
Start Lease	Date/Time	Medium Date	-	Attribute
Expired Lease	Date/Time	Medium Date	-	Attribute
Assign code No	Text (20)	-	-	Attribute
Type	Text (10)	-	-	Attribute
Standard SW No	Number	Long Integer	Standard SW	Foreign Key

Table E.2. Structure of Assign Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
Assign Code	Text (20)	-	-	Primary Key
Bar Code	Text (50)	-	Asset	Foreign Key
Assign Mail	Text (50)	-	Users	Foreign Key
Assign Date	Date/Time	Medium Date	-	Attribute
Assign By	Text (10)	-	-	Attribute
Plan Return	Date/Time	Medium Date	-	Attribute
Return Date	Date/Time	Medium Date	-	Attribute
Return By	Text (10)	-	-	Attribute
IT ID No	Number	Long Integer	Management	Foreign Key
IT Name	Text (50)	-	-	Attribute
Mail ID	Text (15)	-	-	Attribute
Other Asset No	Number	Long Integer	Other Asset	Foreign Key

Table E.3. Structure of Management Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
IT ID No	Number	Long Integer	Assign	Primary Key
Name	Text (30)	-	-	Attribute
Surname	Text (30)	-	-	Attribute
Location	Text (10)	-	-	Attribute
Department	Text (10)	-	-	Attribute
Tel No	Text (12)	-	-	Attribute
Assign Code	Text (20)	-	-	Attribute

Table E.4. Structure of Other Asset Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
Other No	Number	Long Integer	Assign	Primary Key
Name	Text (50)	-	-	Attribute
Brand	Text (20)	-	-	Attribute
Model	Text (30)	-	-	Attribute
Serial No	Text (30)	-	-	Attribute
Type	Text (30)	-	-	Attribute
Status	Text (10)	-	-	Attribute

Table E.5. Structure of Quotation Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
Order No	Number	Long Integer	-	Primary Key
Type	Text (20)	-	-	Attribute
Description	Text (50)	-	-	Attribute
Price	Currency	-	-	Attribute
Quantity	Text (50)	-	-	Attribute
IT ID No	Number	Long Integer	Management	Foreign Key
Vender No	Number	Long Integer	Vender	Foreign Key

Table E.6. Structure of Request Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
IT Request No	Number	Long Integer	-	Primary Key
Type of Request	Text (50)	-	-	Attribute
Date	Date/Time	Medium Date	-	Attribute
Amount	Currency	-	-	Attribute
Status	Text (20)	-	-	Attribute
Note	Text (50)	-	-	Attribute
User No	Number	Long Integer	-	Attribute
IT ID No	Number	Long Integer	Management	Foreign Key
Special Software No	Number	Long Integer	Special SW	Foreign Key
Mail ID	Text (15)	-	Users	Foreign Key

Table E.7. Structure of Specialist Software Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
Special Software No	Number	Long Integer	Request	Primary Key
Name of Software	Text (30)	-	-	Attribute
License No	Text (20)	-	-	Attribute
Status	Yes/No	-	-	Attribute

Table E.8. Structure of Standard Software Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
Std SW No	Number	Long Integer	Asset	Primary Key
Name	Text (20)	-	-	Attribute
License No	Text (20)	-	-	Attribute
Status	Text (10)	-	-	Attribute
Note	Text (50)	-	-	Attribute

Table E.9. Structure of Stock Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
Stock No	Text (50)	-	Stock Request	Primary Key
Name	Text (20)	-	-	Attribute
Status	Text (2)	-	-	Attribute
Year Plan	Text (4)	-	-	Attribute
Delivery	Date/Time	Medium Date	-	Attribute
Vender Name	Text (50)	-	-	Attribute
Other Description	Text (50)	-	-	Attribute

Table E.10. Structure of Stock Request Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
Stock Request No	Text (50)	-	-	Primary Key
Name	Text (20)	-	-	Attribute
Type	Text (50)	-	-	Attribute
Status	Text (10)	-	-	Attribute
Note	Text (50)	-	-	Attribute
IT ID No	Number	Long Integer	Management	Foreign Key
Stock No	Text (50)	-	Stock	Foreign Key
Mail ID	Text (15)	-	-	Attribute

Table E.11. Structure of Users Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
Mail ID	Text (15)	-	Request,Assign	Primary Key
LAN ID	Text (10)	-	-	Attribute
Name	Text (20)	-	-	Attribute
Surname	Text (50)	-	-	Attribute
Ext	Text (4)	-	-	Attribute
Phone	Text (12)	-	-	Attribute
Mobile	Text (15)	-	-	Attribute
Position	Text (50)	-	-	Attribute
Department	Text (25)	-	-	Attribute
Location	Text (15)	-	-	Attribute
Cost Center	Text (5)	-	-	Attribute
Outlet No	Text (4)	-	-	Attribute
Active	Text (3)	-	-	Attribute
Start Date	Date/Time	Medium Date	-	Attribute
Resign Date	Date/Time	Medium Date	-	Attribute
Assign Code	Text (20)	-	-	Attribute
IT Request No	Number	Long Integer	-	Attribute
Note	Text (50)	-	-	Attribute

Table E.12. Structure of Stock Vender Table.

Name	Data Type	Format	Foreign Key to Table	Key Type
Vender No	Auto Number	Long Integer	Quotation	Primary Key
Vender Name	Text (30)	-	-	Attribute
Address	Text (50)	-	-	Attribute
Telephone	Text (20)	-	-	Attribute
Note	Text (50)	-	-	Attribute

APPENDIX F

DATA DICTIONARY

Table F.1. Data Dictionary for Asset Control System Database.

Field Name	Meaning
Active	Demonstrate status of user as "YS" = active user, "NO" resigned user
Adapter S/N	Contain Laptop Adapter Serial No.
Address of Vendor	Information of Vender address
Amount	Price List for software request
Asset Barcode	Desktop Barcode Number.
Assign By	Name of IT person who is responsible for assignment of computer item
Assign Code	Code that run for assign computer
Assign Code (Management)	Code assign asset to user as reference
Assign Date	Starting date of assignment computer item
Assign Mail	Mail ID of user that can be use as a reference for identity
Barcode	Barcode number that assign specifically for each computer item
Battery S/N	Laptop Battery Serial Number.
Brand	Brand name of the asset
CD ROM S/N	CD Rom serial number
Computer Description	Description for the computer specifically
Computer Status	Information of computer status as Status 1 = Active, 2 = Spare, 3 = Maintenance, 4 = Expire
Contact Number	Reference number of supplier contact number
Cost Center	Cost center number of user
Date	Request item date
Delivery Date	Date of delivery item
Department	Information of a person that belong to which department
Description	More precise information about item
Expired Lease	Leasing expiry date
Extension	Contain extension number for specific person
Floppy S/N	Floppy Disk Drive Serial No.
IT ID No	Information of IT ID staff number uniquely assign to each one
IT Name	Name of IT staff
IT Request No	Running number for tracking each of the IT request
Keyboard S/N	Keyboard Serial No.

Table F.1. Data Dictionary for Asset Control System Database (Continued).

Field Name	Meaning
LAN ID	LAN Identification for user uses for accessing the network facilities
License No	Information about Software license
Location	Specific Location (Suntower, BT, ROC, RD etc)
Mail ID	Mail Identification for purpose of e-mail and use for identify user
Mobile	Information about mobile number of user
Model	Model type of computer asset
Monitor	Information about Monitor Serial No.
Mouse	Information about Mouse Serial No.
Specialist Software Name	Information about specialist software name
IT Name	IT staff name
Other Asset Name	Other Asset Name
Standard Software Name	Name of standard software
Stock Name	Stock item name
Stock Request Name	Stock Request Item Name
Name of User	User name
Note	Related information about specific product or item
Order No	Running Order no for tracking on quotation
Other Asset Number	Running Other Asset number for tracking item
Other Description	Explanation about related item
Other Number	Running Other Number for other asset
Outlet No	Information about outlet number that user plug in for LAN
Phone	Telephone number for specific user
Plan Return	Returning date for assign item
Position	Explaining position for user
Price	Contain price list for quotation
Quantity	Amount of quantity on quotation note
Resign Date	Date of user resignation
Return By	Specify name of person who is return computer item
Return Date	Specify date for return computer item
Specialist Software No	Running special software number use for tracking and reference
Standard Software No	Running standard software number use for tracking and reference

Table F.1. Data Dictionary for Asset Control System Database (Continued).

Field Name	Meaning
Start Date	Contain starting date of user to work in organization
Start Lease	Start leasing date of computer item
Status	Contain available and unavailable status of specific item
Standard Software No	Reference number on standard software number
Stock No	Stock number that available for specific item
Stock Request No	Stock request number that available for specific item as requested
Surname	Surname of person who is in organization department
Tel No	Telephone number for user
Telephone	Telephone number for vendor
Type of Request	Specify type of request
Type	Explanation asset item type
Vendor Name	Vendor name who supply item to company
Vendor No	Reference number for vendor
Year Plan	Plan for replacement item

Table F.2. Data Dictionary of Dataflow Diagram.

Name	Type	Description
Approval	Data Flow	Name of IT management person who is grant an approval for assigning request
Assign Computer Process	Process	Verify the confirm data for both request and an approval
Check Against DB	Process	Verify request information against stock and software database
Check Information Process	Process	Verify information of requested item against user and computer database
Complete Return Record	Data Flow	Fully complete of the return item record
Computer Database	Data Store	Store Computer information that exist in the database
Computer Specification	Data Flow	Information of requested computer item that will be assign to the requester
Confirm Return Item	Process	Make note of the receive computer item
Confirmation Item	Data Flow	Information of the return item that need to be confirm
Confirmed Assign	Process	Checking the data item with an existing information to be assign to the requester
Deliver Request Item	Data Flow	Information status for the delivery requested item to user
Delivery	Process	Information about deliver the request item
Enter Inquiry Order	Process	Enter order data detail
Enter Order	Process	Input item that request to be order
Enter Request Information	Process	Input Request information record
Enter Return Item	Process	Input information of the return item
Enter User Inquiry	Process	Input User and Inquiry information
Inform Status	Data Flow	Result and status of the user request send to User
Inquiry Information	Data Flow	Raw data of Inquiry Information for each User
Issue Information	Data Flow	Make notes on the request item with all necessary information
Issue Order	Data Flow	Make notes on the inquiry order
IT Management	External Entities	Person who manage and control all of the Asset Control operation
IT Request	Data Flow	Result of a report file that contain information about the requested item and requester
IT Request Issue Copy	Data Flow	Result of a report file which contain necessary information about the request data

Table F.2. Data Dictionary of Data Flow Diagram (Continued).

Name	Type	Description
Item Information	Data Flow	Information for specific item that has been requested from user
Notification Status	Data Flow	Issue note after delivery request item to the user
Notify Request	Data Flow	Complete the user request status distribute to IT Management
Order Database	Data Store	Store transaction of ordering all items
Order Detail	Data Flow	Detail of the order item
Order Item	Data Flow	Result item after check item in database that needed to be order
Order Item Information	Data Flow	Contain Information about Order Item
Order Process	Process	Making order as suggested
Order Request Confirm	Data Flow	Confirmation for the order that has been issue out
Print IT Request	Process	Inquire requesting information and make a report file
Process Information	Process	Information after verifying request and generate Notification for the request
Process Request Order	Process	Create an order as requested from user
Procurement	External Entities	Department that is responsible for the ordering process
Purchase Order	Data Flow	Making an order confirmation note
Request Information	Data Flow	Raw data for request information that comes from User
Request Item	Data Flow	Result after request record has created
Request Order	Data Flow	Information about lack of item and needed to be order
Request Record Detail	Data Flow	User Request Information record generated
Return Item	Data Flow	Input and return item information into computer database
Return Item Information	Data Flow	Information about return computer item
Sign Off Notes	Data Flow	Make notes as a result of a report file to let user sign off
Sign Off Request	Process	Result of a report file that has an information of the specific item
Software Database	Data Store	Store information about software item
Software Information	Data Flow	Information about Software kept in database
Stock	External Entities	Store information of stock within the IT department

Table F.2. Data Dictionary of Data Flow Diagram (Continued).

Name	Type	Description
Stock Database	Data Store	Store information about item that is existing in Stock
Stock Information	Data Flow	Information about Stock kept in database
Suggested Order	Data Flow	Information about suggested order item
Update	Data Flow	Input an update User information into database
Update Computer	Data Flow	Input update status of computer item into computer database
Update Order Information	Data Flow	Input an update order information into order database
Update Product	Data Flow	Input the result of the request into Stock database
Update Software Information	Data Flow	Input update status of software item into software database
Update Stock Information	Data Flow	Input update status of stock item into stock database
Update Stock Item	External Entities	Result of order item input into stock database
User	Data Flow	Person who uses and request for services
User	Data Store	An information for particular user who is already in User database
User Database	Data Flow	Store Information about Users
User Request Inquiry	Data Flow	User Request Information
Valid User Information	Process	Result after verification user with user database
Validate Order Item	Data Flow	Verify Order item with stock information before send suggested order
Validate Request	Process	Contain information after verify request detail
Validate Request Information	Process	Verify Request Information against Stock database
Validate User	External Entities	Verify User Information result before input into User database
Vendor		Company that supplies product as follow purchase order detail

APPENDIX G

INTERFACE DESIGN

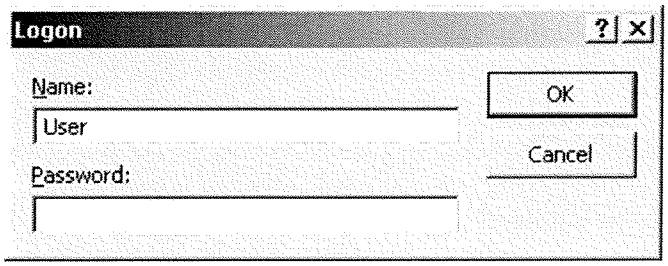

Figure G.1. Log In Menu as User.

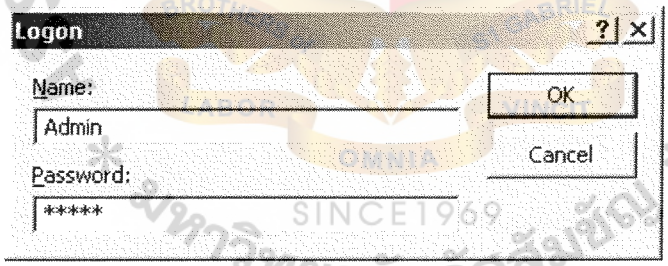

Figure G.2. Log In Menu as Admin.

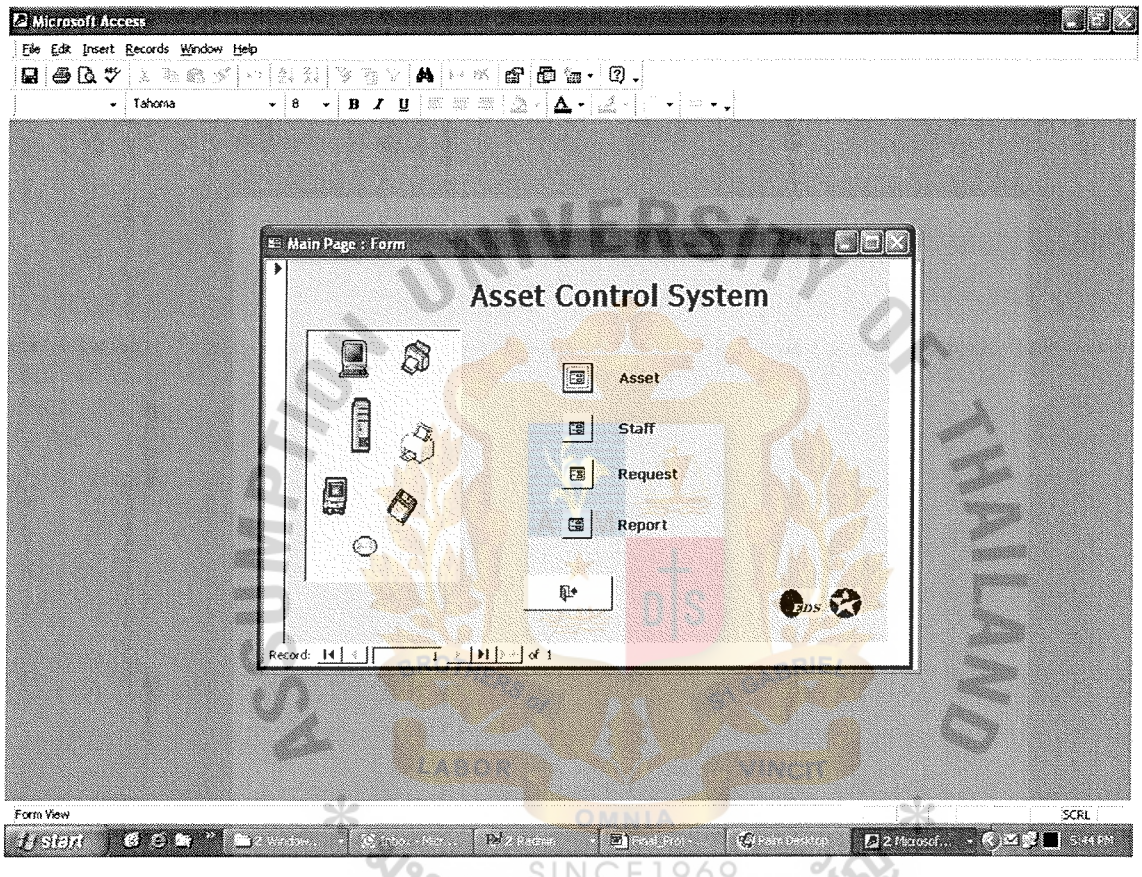

Figure G.3. Main Page of Asset Control System Menu.

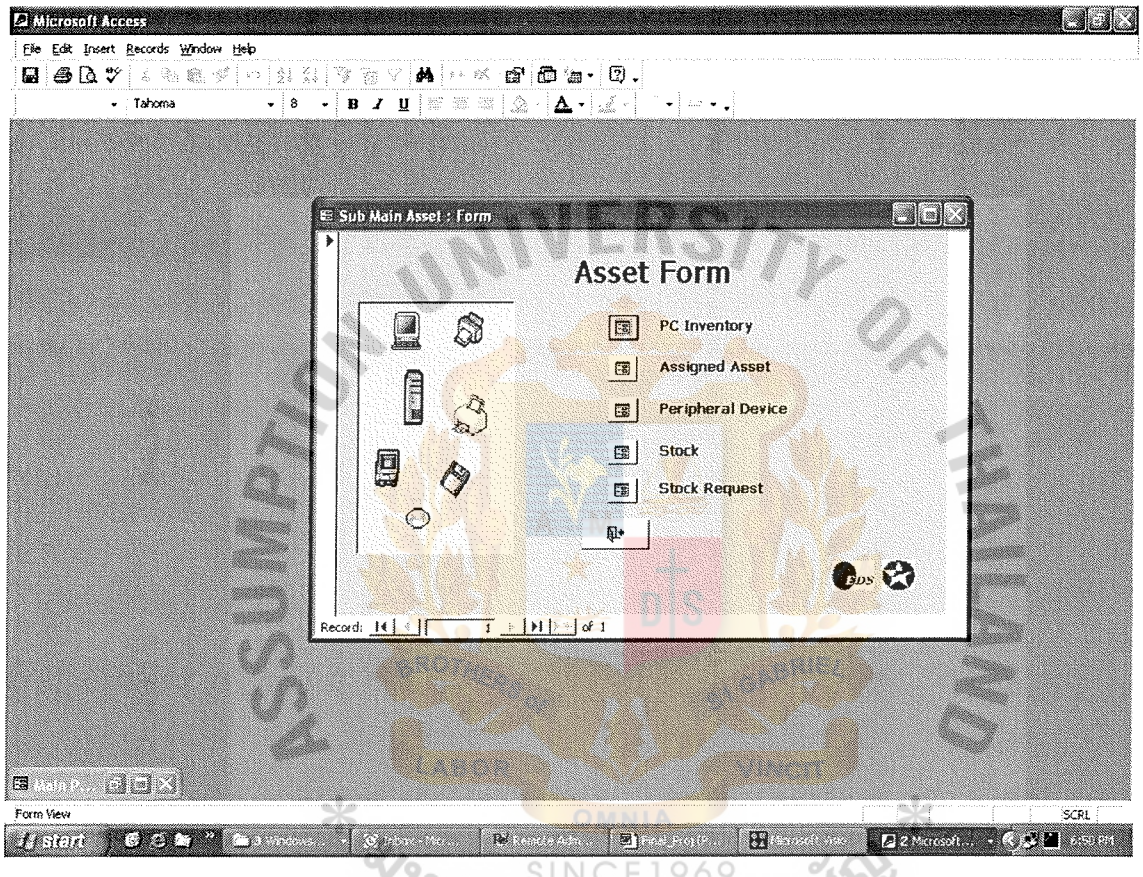

Figure G.4. Asset Form Menu.

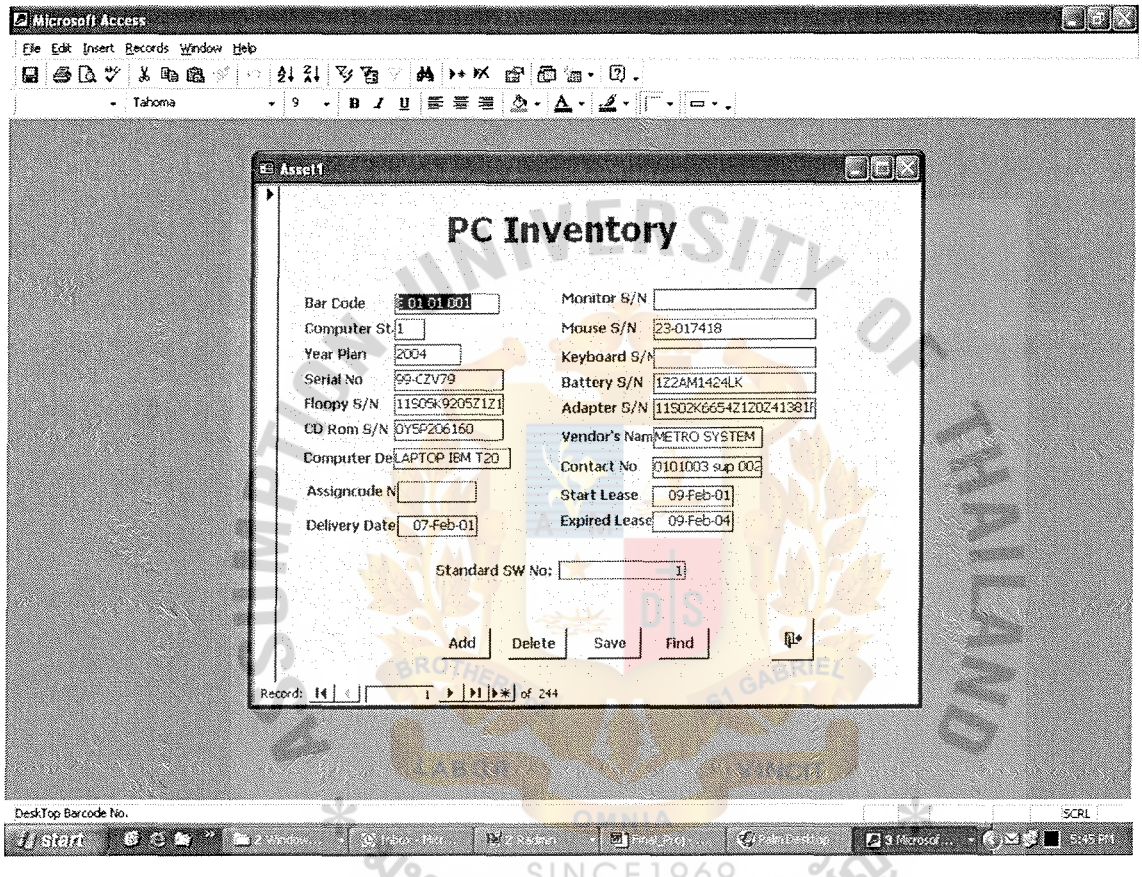

Figure G.5. PC Inventory Menu.

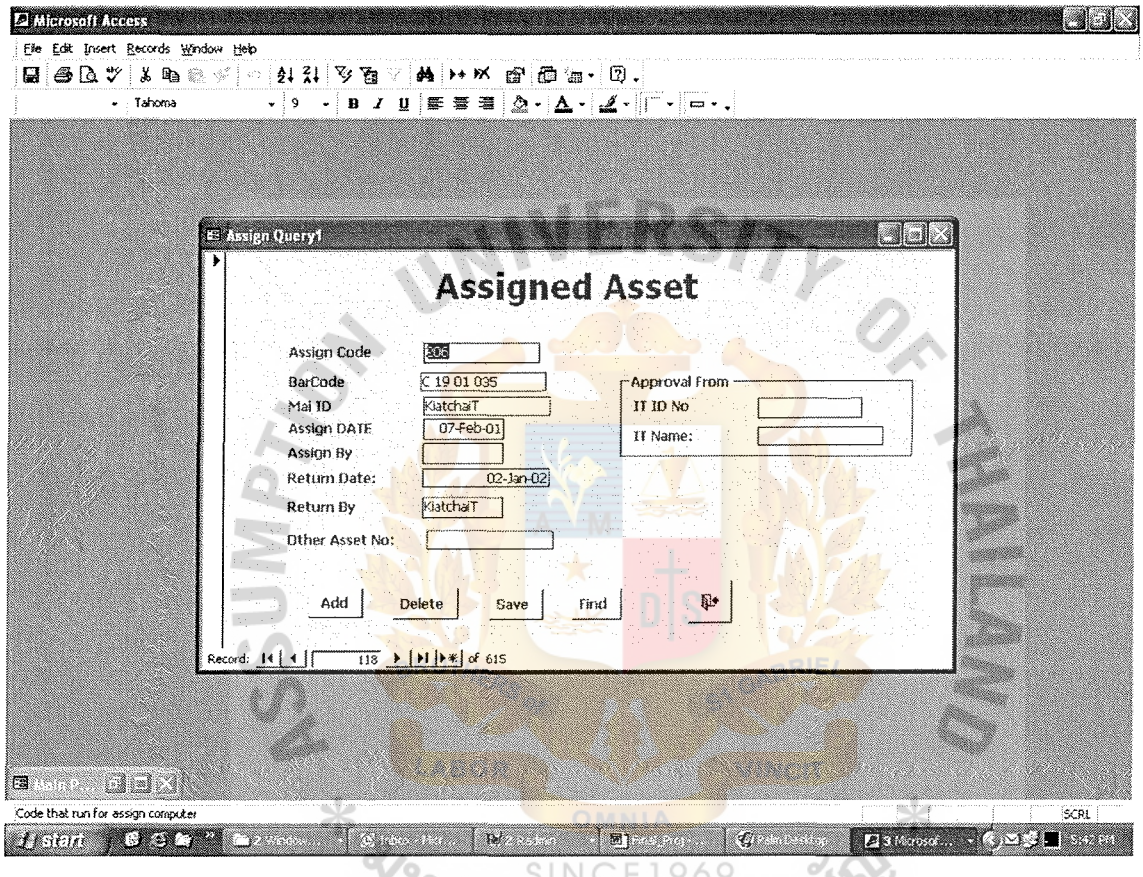

Figure G.6. Assigned Asset Menu.

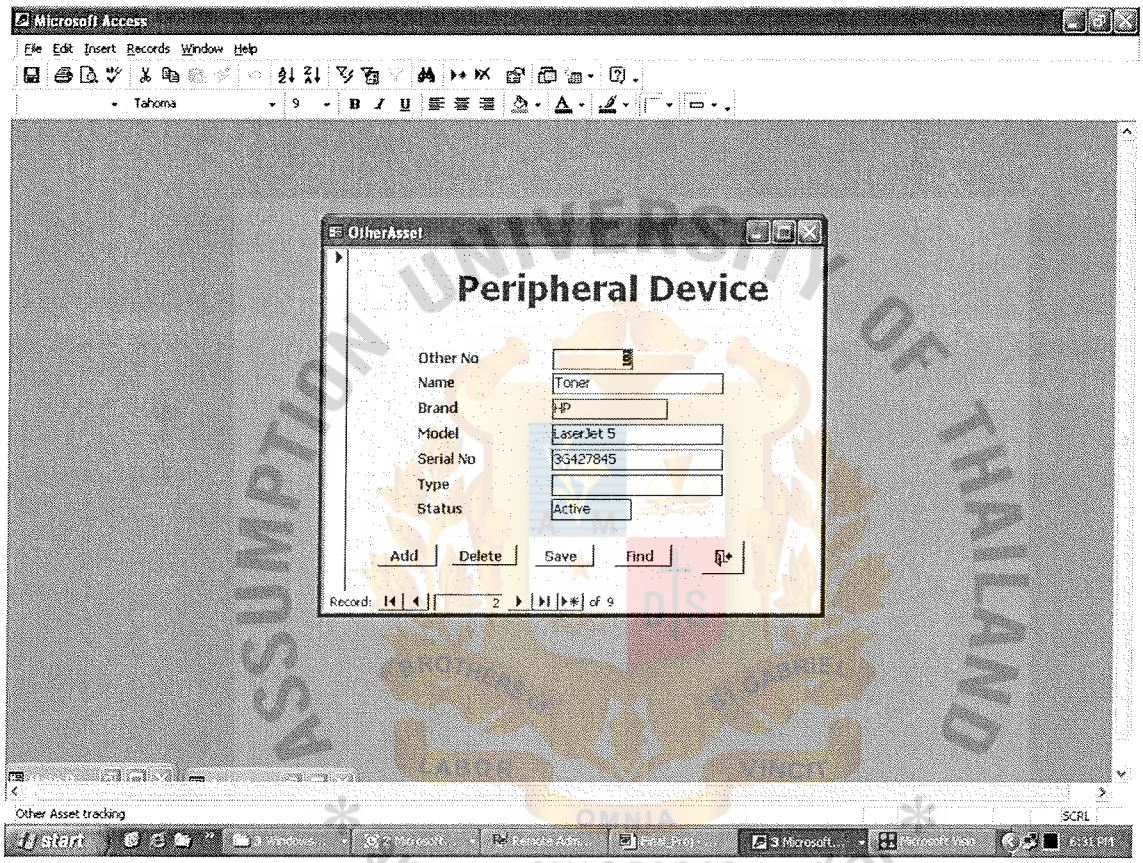

Figure G.7. Peripheral Device Menu.

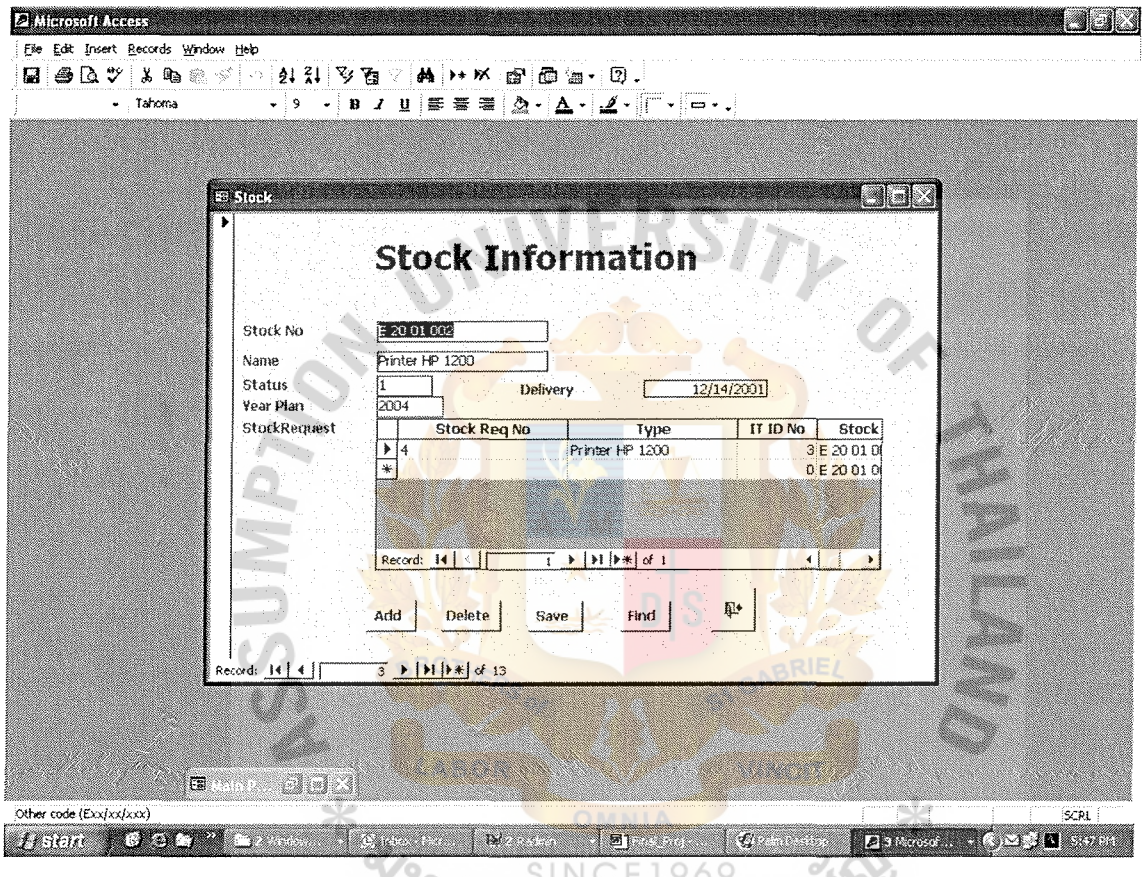

Figure G.8. Stock Information Menu.

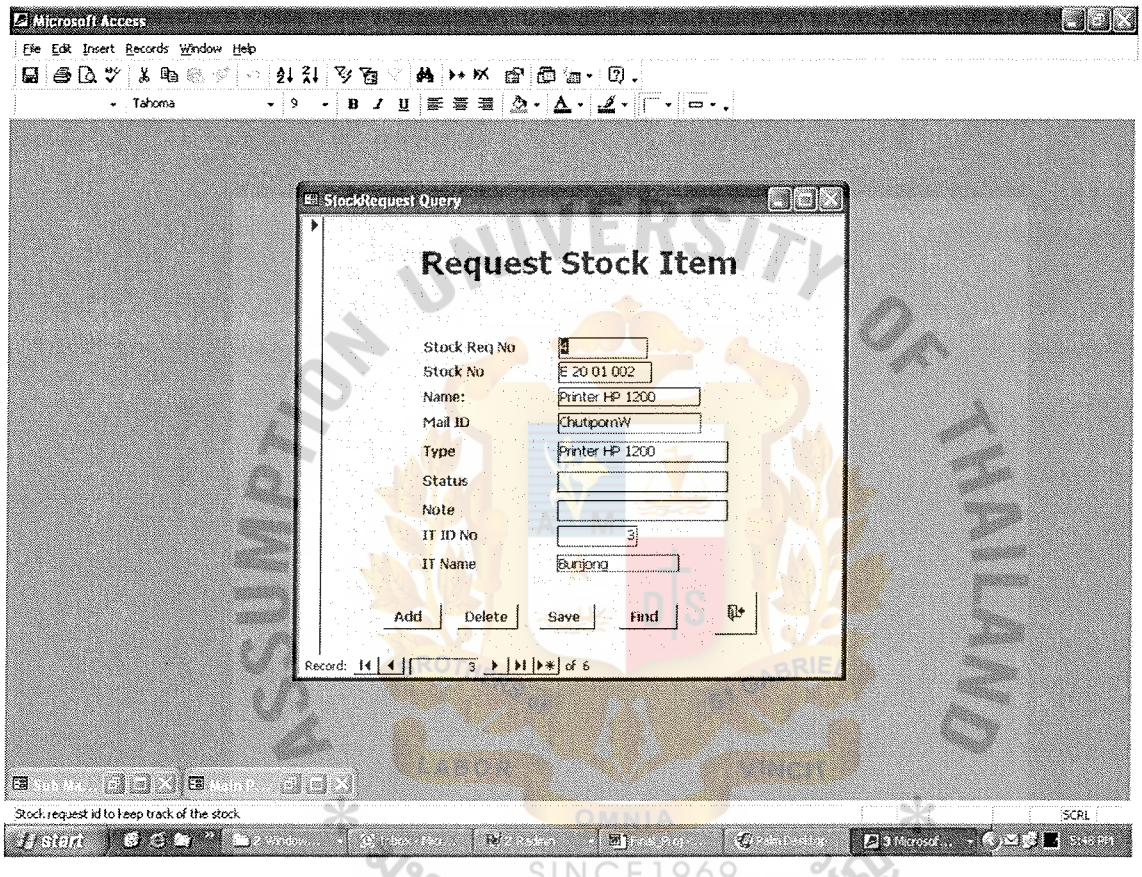

Figure G.9. Request Stock Item Menu.

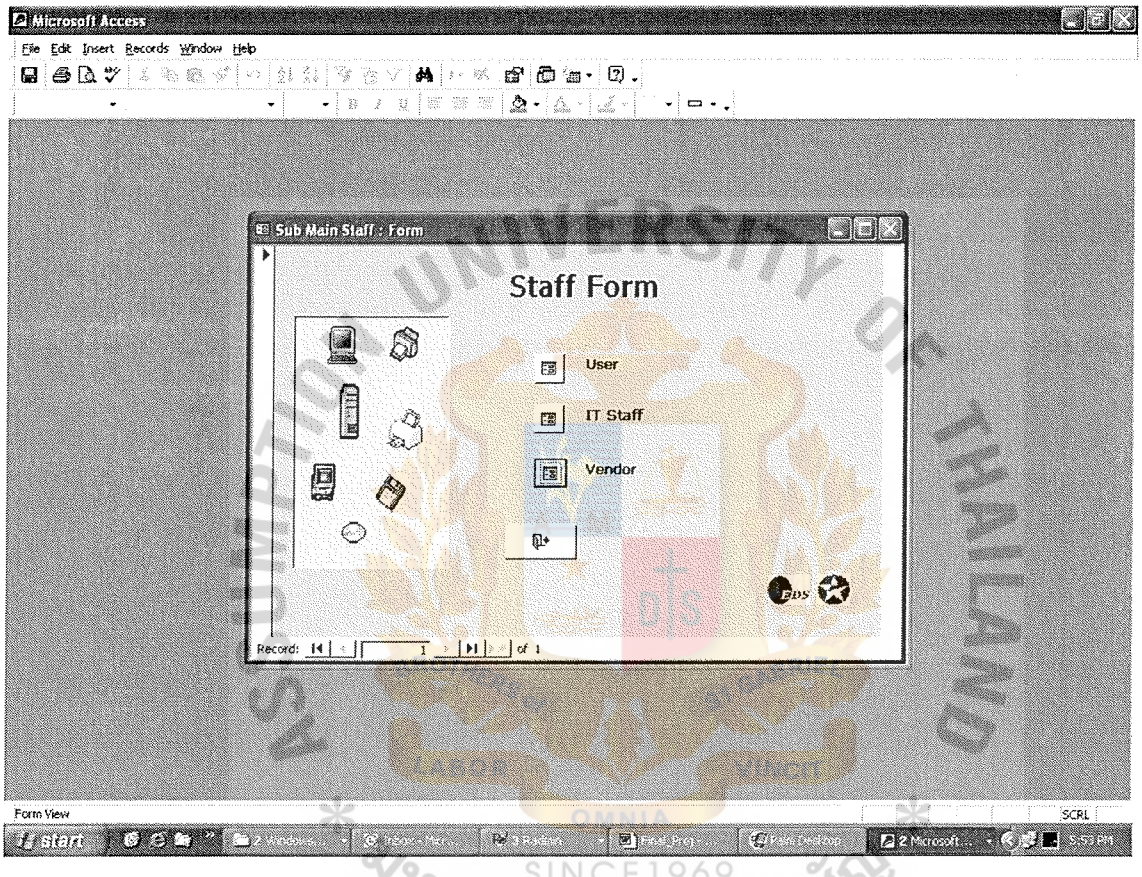

Figure G.10. Staff Form Menu.

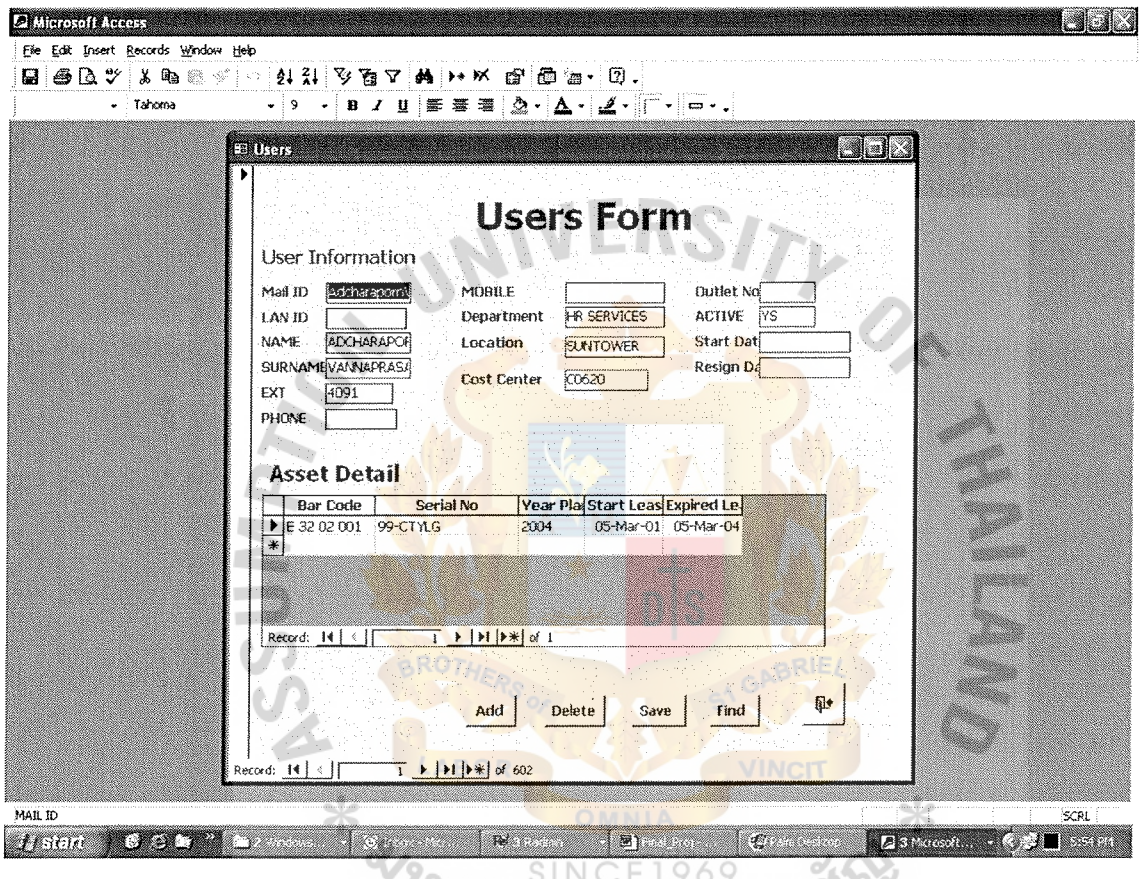

Figure G.11. Users Form Menu.

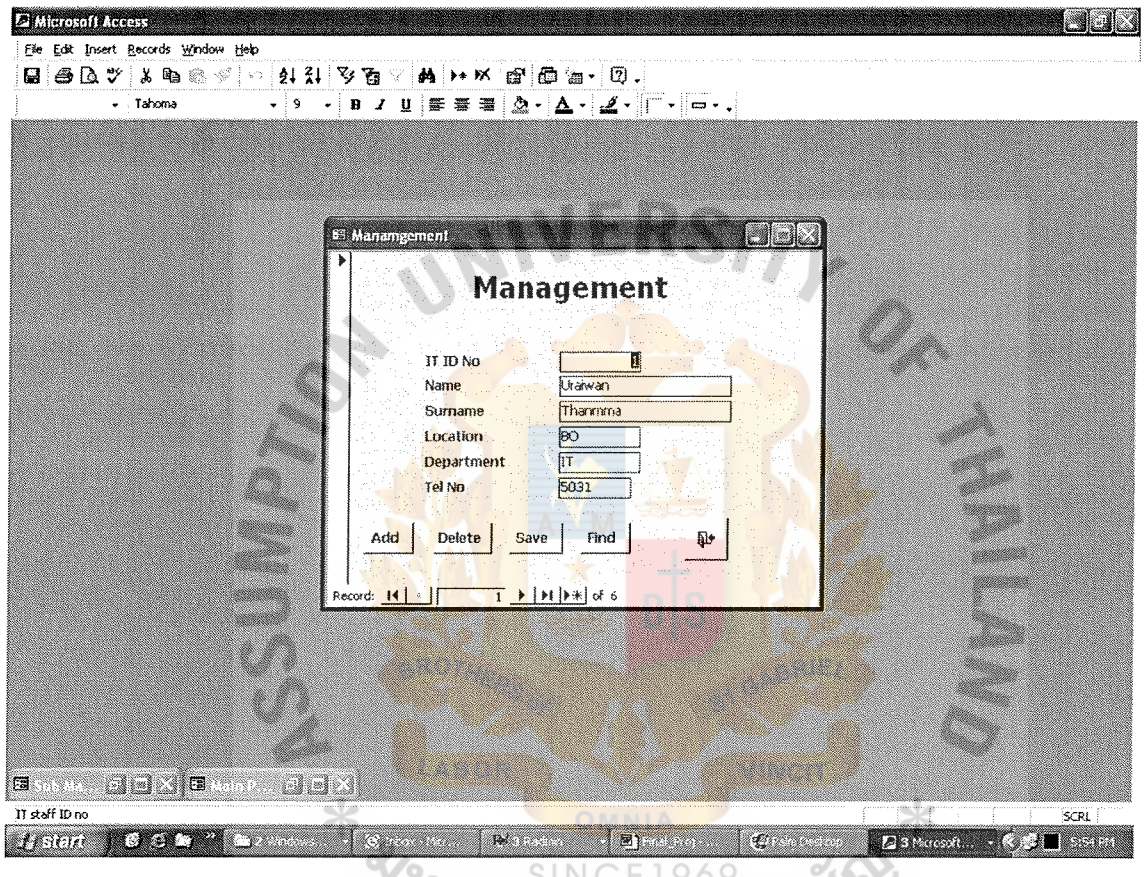

Figure G.12. Management Menu.

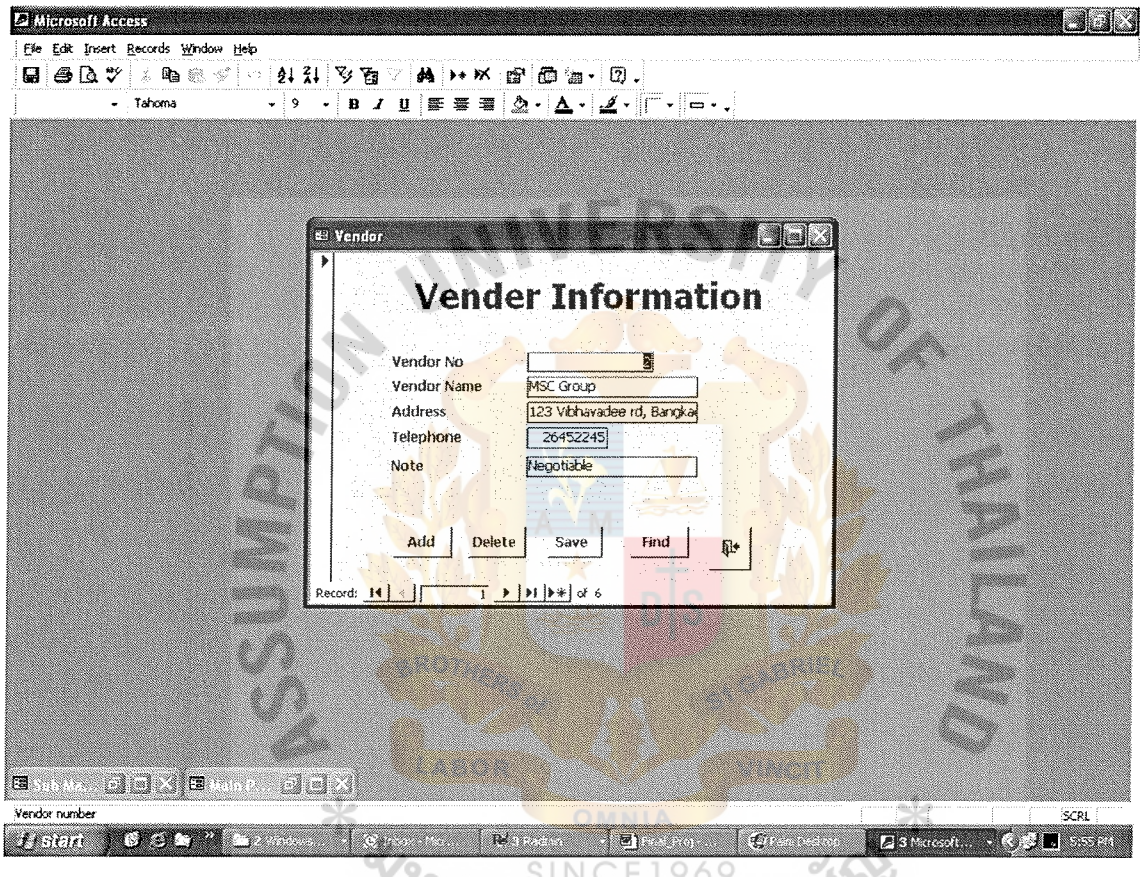

Figure G.13. Vender Information Menu.

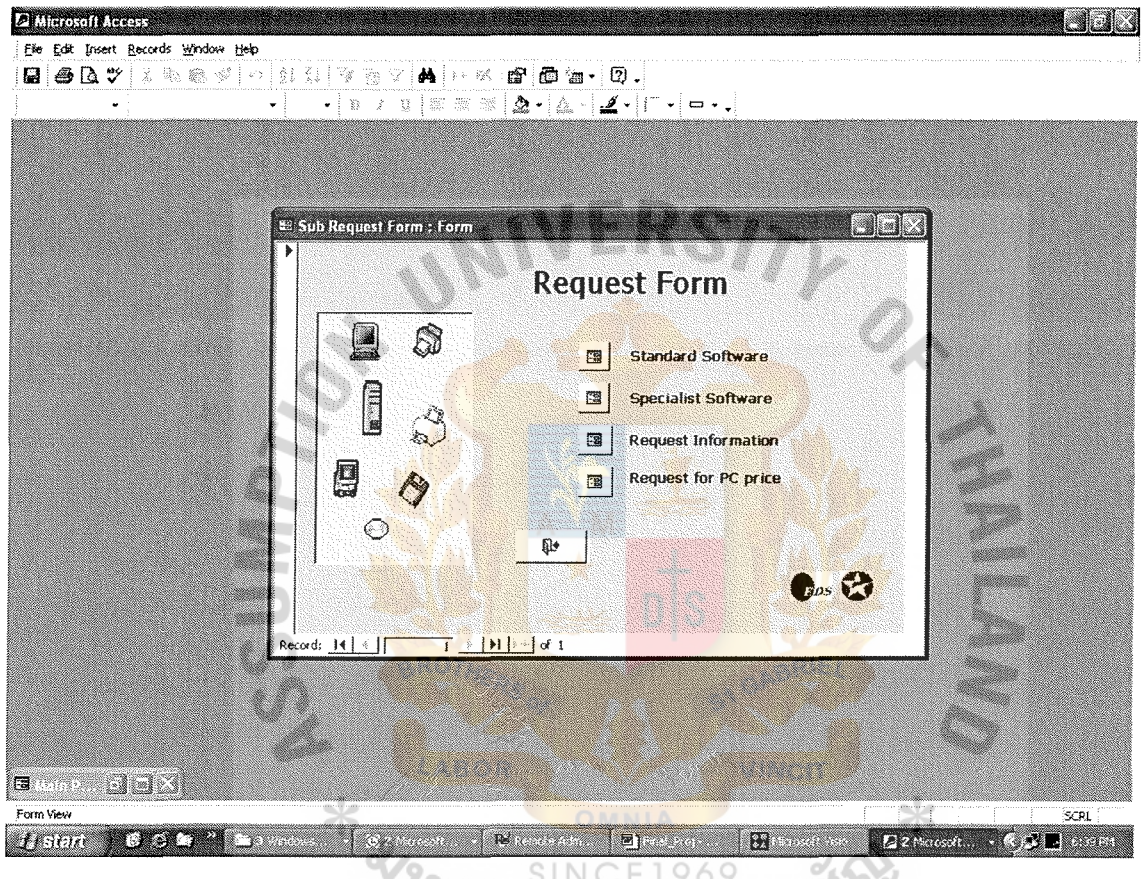

Figure G.14. Request Form Menu.

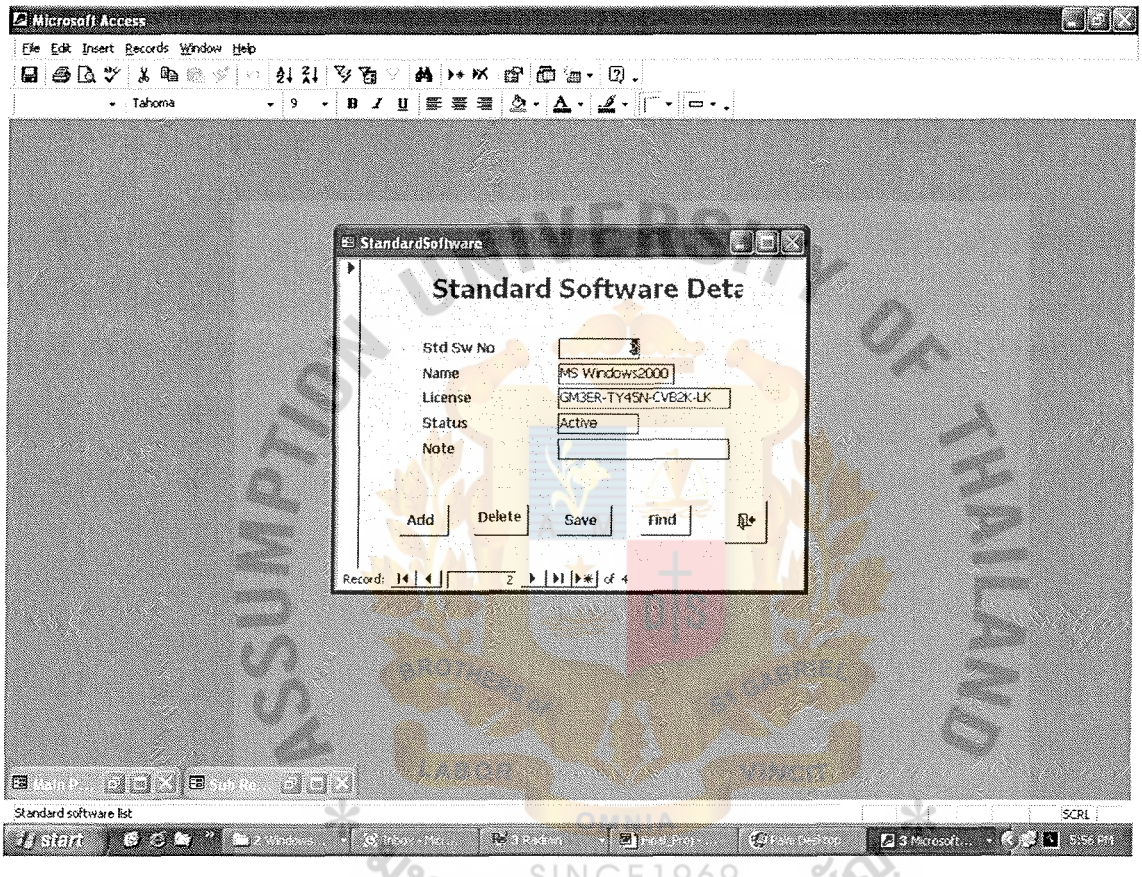

Figure G.15. Standard Software Menu.

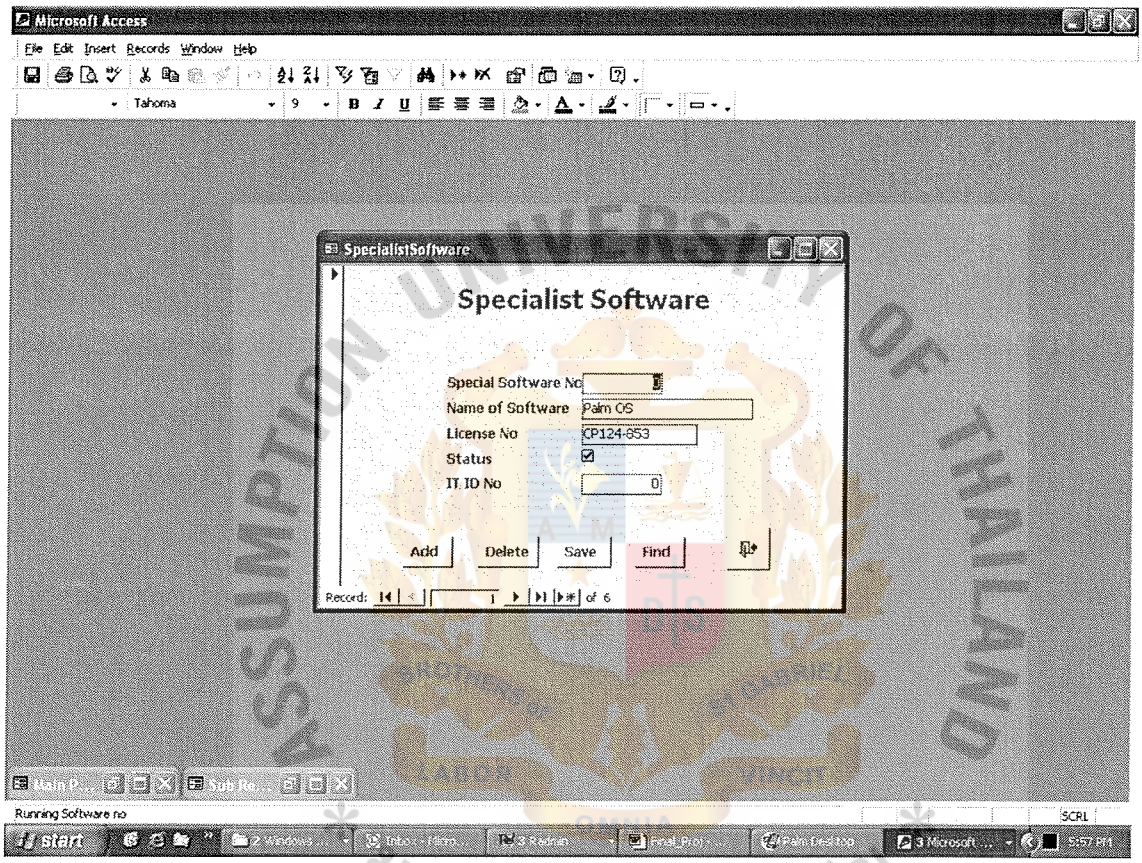

Figure G.16. Specialist Software Menu.

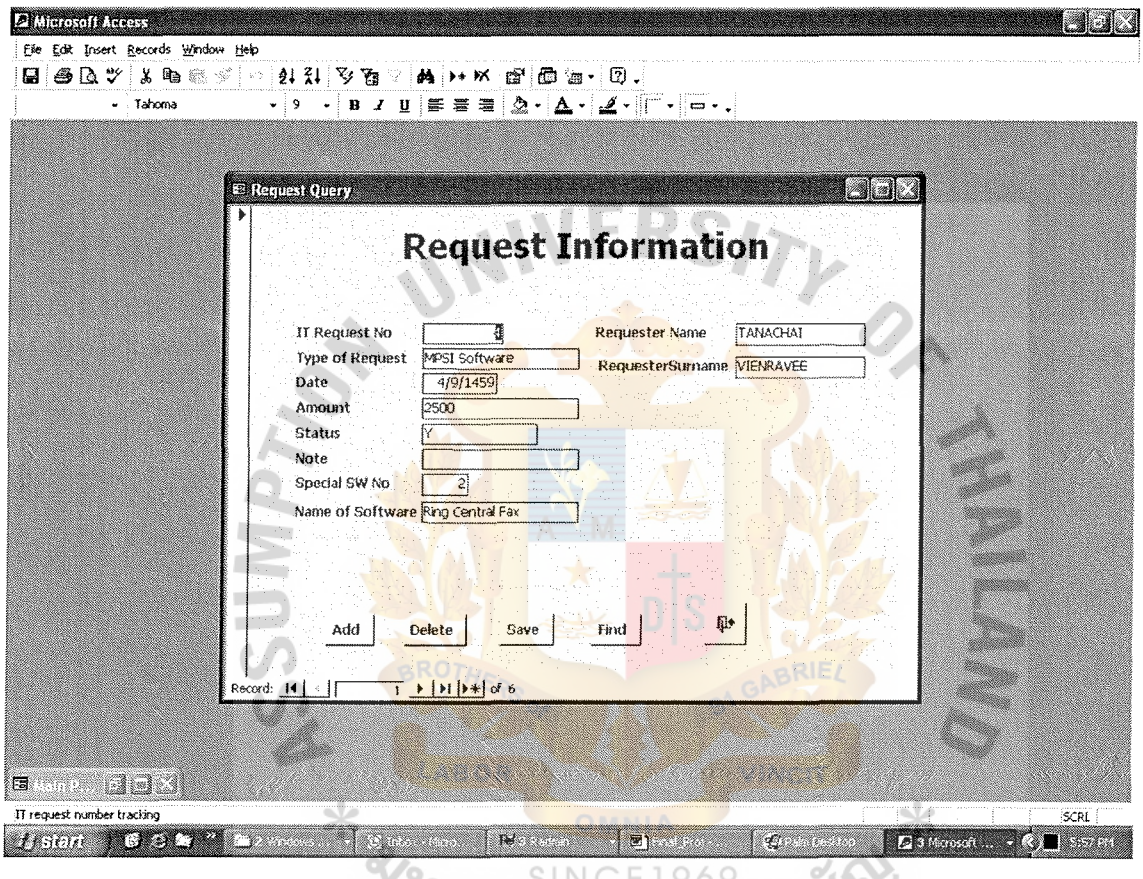

Figure G.17. Request Information Menu.

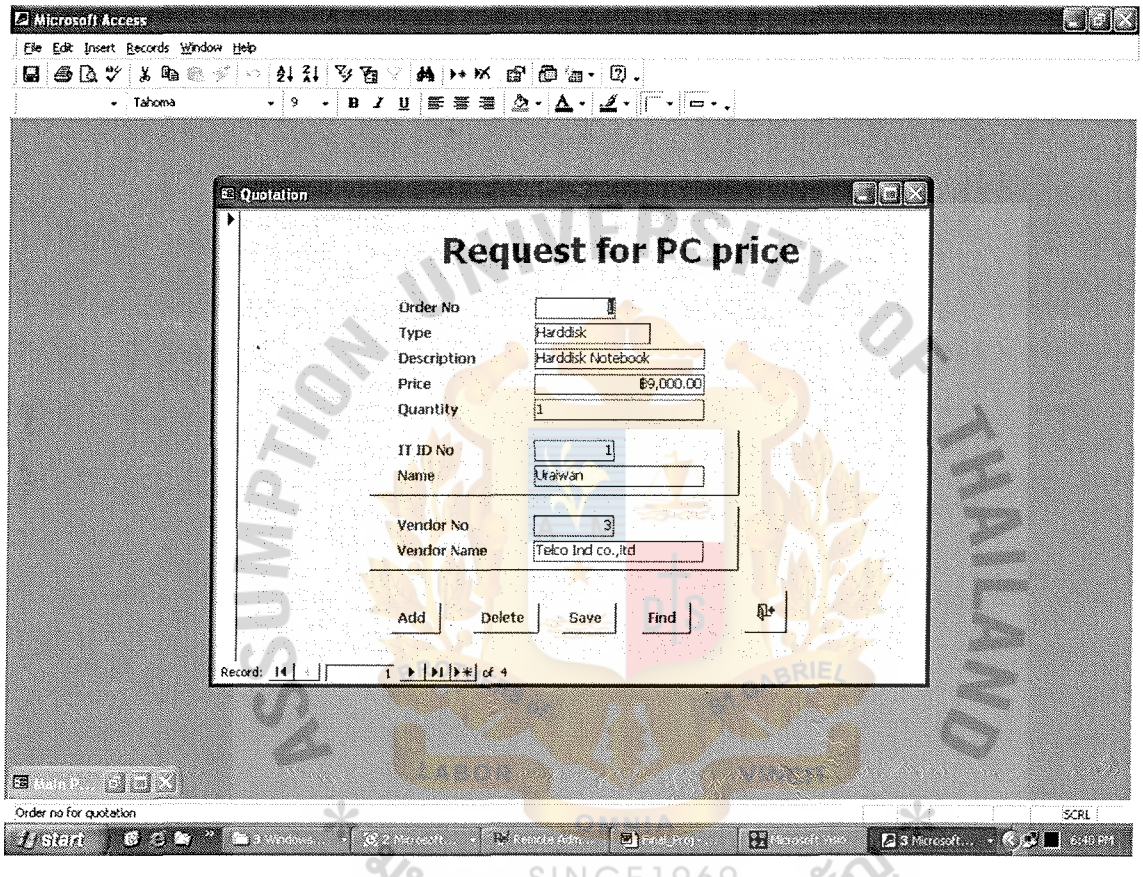

Figure G.18. Request for PC price Menu.

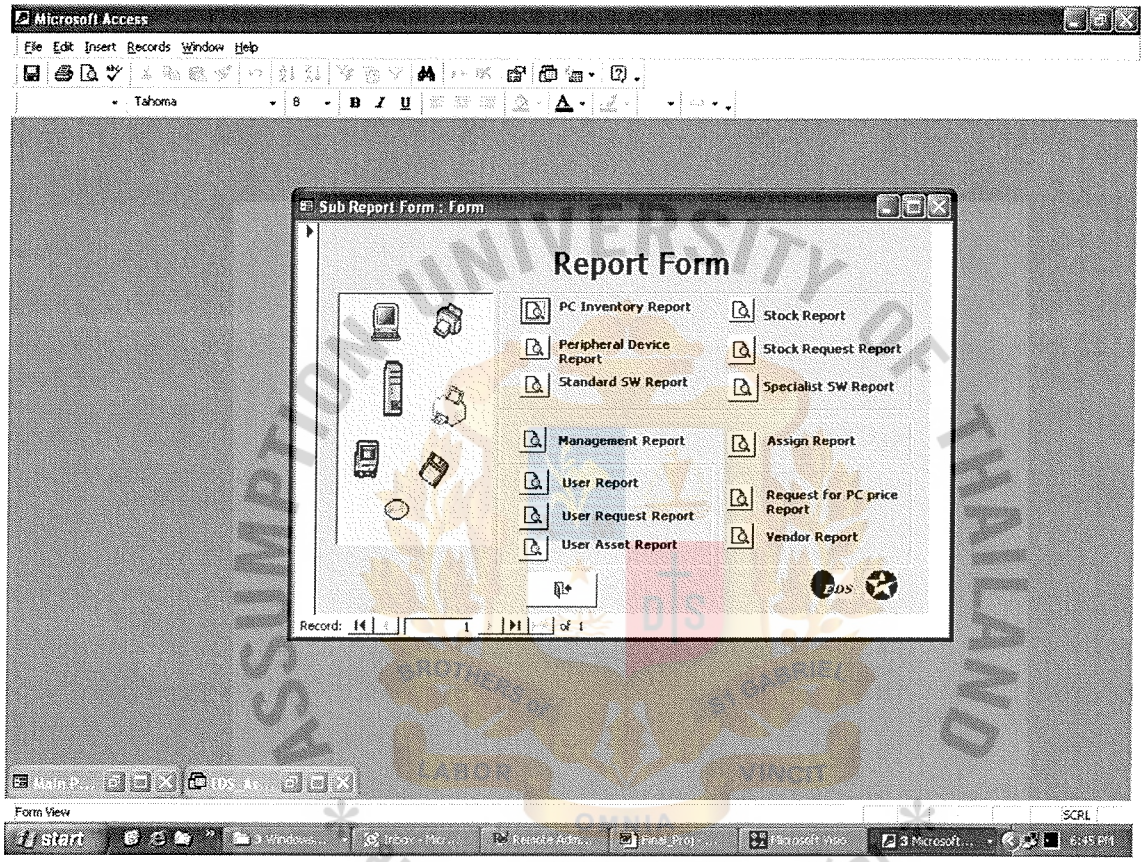

Figure G.19. Report Form Menu.

APPENDIX H

REPORT DESIGN

EDS

PC Inventory

No	Bar Code	Model	Serial No	Status	Delivery Date	Start Lease	Expired Lease
1	E 01 01 001	LAPTOP IBM T20	99-CZV79	1	07-ก.พ.-44	09-ก.พ.-44	09-ก.พ.-47
2	E 01 01 002	Laptop IBM T20	99-CAT98	1	07-ก.พ.-44	09-ก.พ.-44	09-ก.พ.-47
3	E 01 01 003	Laptop IBM T20	99-CZW21	1	07-ก.พ.-44	09-ก.พ.-44	09-ก.พ.-44
4	E 01 01 004	IBM T21	99-FMXG6	1	18-เม.ย.-44	09-เม.ย.-44	09-เม.ย.-47
5	E 01 01 005	IBM T21	99-FMYH9	1	18-เม.ย.-44	09-เม.ย.-44	09-เม.ย.-47
6	E 01 01 006	IBM T21	99-FMXM7	1	18-เม.ย.-44	09-เม.ย.-44	09-เม.ย.-47
7	E 01 01 007	IBM T21	99-FMYF6	1	18-เม.ย.-44	09-เม.ย.-44	09-เม.ย.-47
8	E 01 01 008	IBM T21	99-FMXF4	1	18-เม.ย.-44	09-เม.ย.-44	09-เม.ย.-47
9	E 01 01 009	IBM T21	99-FMYM3	1	18-เม.ย.-44	09-เม.ย.-44	09-เม.ย.-47
10	E 01 02 001	NETVISTA A40P	99CTYHD	1	07-มี.ค.-44	05-มี.ค.-44	05-มี.ค.-47
11	E 01 02 002	NETVISTA A40P	99CTYMY	1	22-มี.ค.-44	31-มี.ค.-44	31-มี.ค.-47
12	E 01 02 003	NETVISTA A40P	99CTYMV	1	22-มี.ค.-44	31-มี.ค.-44	31-มี.ค.-47
13	E 01 02 004	NETVISTA A40P	99CTYPC	1	10-เม.ย.-44	15-เม.ย.-44	15-เม.ย.-47
14	E 02 01 001	IBM T21	99-FNAT7	1	18-เม.ย.-44	09-เม.ย.-44	09-เม.ย.-47
15	E 02 01 002	IBM T21	99-FMYD7	1	18-เม.ย.-44	09-เม.ย.-44	09-เม.ย.-47
16	E 02 01 003	IBM T21	99-FMXW9	1	14-พ.ย.-44	15-เม.ย.-44	15-เม.ย.-47

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Figure H.1. PC Inventory Report.

EDS

Users Information

No	NAME	SURNAME	EXT	Department	Location	Start Date
	Resign					
1	ADCHARAPOR	VANNAPRASART	4091	HR SERVICES	SUNTOWER	
2	ADINAN	LATEH	6062	TRAINING	SUNTOWER	
3	ADIT	TOOPSUWAN	521	LUB	BT	
4	Adraino	Santos		DISTRIBUTION	BT	
5	AKAVIT	PRAYURASIDDHI	510	LUB	BT	
6	ANAN	KOHMAK	328	LAB	BT	
7	ANANTHACHAI	AUASIRISAK	234	BULK	BT	
8	Anartaya	Preechakornkolkit		EHS	BT	
9	ANEK	LAWANPRASERT	6010	MKT-PRICING	SUNTOWER	
10	Angkana	Jiraratpisan	251	Fiscal Services	ROC	
11	ANNIE	REGAL	6075	STAR MART	SUNTOWER	
12	Antonio	Casas		LBU	BT	
13	ANUCHA	EAMPAISARN	6032	RETAIL-SALE	SUNTOWER	
14	ANUPONG 16/6/254	DUANGPLEE	4011	FISCAL SVCS	SUNTOWER	26/9/2535
15	ANUSORN	TANCHAKUL	4099	HR SERVICES	SUNTOWER	
16	APICHAI	AKSORAMAK	541	LUB	BT	
17	ARADA	WATTANAAREEKUL	4023	FISCAL SVCS	SUNTOWER	
18	Araya	Boonprakob	5093	Brand	Suntower	
19	ARAYA	LOMJIT		CUS.SVCS	BT	
20	ARROM	SU-ANGKHA	516	LUB	BT	
21	ATHITAYA	SAREWONG	4093	HR SERVICES	SUNTOWER	
22	ATIKOM	TIRAWANNARAT	511	LUB	BT	
23	AUNGSANA	LEELAWUTHIPRASE	252	ROC		
24	AWMSIN	MANCHAKRA	4044	LEGAL	SUNTOWER	
25	BANGON	ITHIPHONGON	5047	BRAND /	SUNTOWER	
26	BENJAMAS 31/5/254	SRISUMONMOL	4013	FISCAL	SUNTOWER	11/5/2543
27	Boochita	Intaratat		Fiscal Services	ROC	
28	BOONDEE	CHAROENRATPANY	4034	PROCUREMENT	SUNTOWER	
29	BOONRUANG	RUANGPONGSRISU	6014	FISCAL	SUNTOWER	
30	BOONRUGSP	PANMAROENG		MBU	SUNTOWER	
31	BOONYARIT	LEELANUNARD	4038	PROCUREMENT	SUNTOWER	
32	BUNJONG	CHUTIGUSOL	503	IT SERVICES	SUNTOWER	
33	BURIN	THANITSALANUKUL	265	TRANSPORT	BT	
34	BARRY	W.ASHMAN	3017	BRANDED	SUNTOWER	
35	CHAIMARSH	SRINANG	3015	AVIATION	SUNTOWER	
36	CHAIPORN	CHARUJANTANAKU	521	LUB	BT	
37	CHAISIT	JAIPLUEM	5034	IT	SUNTOWER	
38	CHAIWAT	NIWATSIRIWONG	5078	SAM	SUNTOWER	

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Figure H.2. User Information Report.

EDS

Standard Software List

Std Sw No	*Name*	*License*	*Status*	*Note*
1	MS Office	JVD4K-3CSV5-OQ3ES-CT	Active	
2	MS Windows2000	GM3ER-TY45N-CVB2K-LK	Active	
3	Adobe Acrobat Reader	449887-5656-12234-55	Active	
4	SAP 4.6D	JUILE-98771-DFFSA	Active	

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Figure H.3. Standard Software List Report.

EDS

Specialist Software List

Special Software No	Name of Software	License No	Status
0	Palm OS	CP124-853	Active
1	Lotus Notes	1248-8694	Active
2	Ring Central Fax	GG 4856	Active
3	Thai Dictionary	78971-45556-78742	
4	Adobe Photophop	MM-4789-56565	
5	Sony Digital Camery	SSGU-879-1232	

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Figure H.4. Specialist Software List Report.

EDS

Manamgement Information

IT ID No	*Name*	*Surname*	*Location*	*Tel No*
1	Uraiwan	Thanmma	BO	5031
2	Vatunyoo	Horpasak	BO	5043
3	Bunjong	Sujira	BT	257
4	Amornratt	Namprampree	BO	5556
5	Panom	Terasakul	BO	5046
6	Lertlum	Pattrasuwee	BO	4063

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Figure H.5. Management Information Report.

EDS

Peripheral Device

No	Brand	Model	Serial No	Type	Status
1	Compaq	EP 350	99-1234	Desktop	Active
2	Compaq	EP 266	99-4567	Desktop	Active
3	HP	LaserJet 5	3G427845	Printer	Active
4	HP	LaserJet 4 Si	1209A451	Printer	Active
5	HP	LaserJet 4 P	1209A386	Printer	Active
6	HP	LaserJet 4100	3G48374	Printer	Active
7	HP	LaserJet	2AP1200	Printer	Active
8	HP	LaserJet 8500	3GAF547	Printer	Active
9	HP	LaserJet 2100	2AP7812	Printer	Active
10	HP	LaserJet 1200	HP41032	Printer	Active

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Figure H.6. Peripheral Device Report.

EDS

Stock

No	Stock Code	Name	Status	Replace Year	Delivery
1	E 13 03 001	Printer HP 8150	1	2004	20-เม.ย.-45
2	E 28 03 001	Printer HP 4050N	1	2003	22-ม.ค.-44
3	E 34 03 001	Printer HP 4050N	1	2004	
4	E 20 01 009	Printer HP 1200	1	2004	13-ธ.ค.-44
5	E 20 01 002	Printer HP 1200	1	2004	14-ธ.ค.-44
6	E 20 01 001	Printer HP 4100	1	2004	03-ธ.ค.-44
7	E 20 01 003	Printer HP 4100	1	2004	03-ธ.ค.-44
8	E 20 01 010	Printer HP 4050	1	2004	
9	E 20 01 004	Printer HP 4050	1	2004	22-เม.ย.-45
10	E 20 01 005	Printer HP 4100	1	2004	
11	E 20 01 006	Printer HP 4050	1	2004	
12	E 20 01 007	Printer HP 2100	1		
13	E 20 01 008	Printer HP 4000	1	2004	

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Figure H.7. Stock Information Report.

EDS

StockRequest

Stock Req No	Mail ID	Stock.Name	Type	Status	Manamgement	Stock No
1	AdinanL	Printer HP	Laptop		Uraiwan	E 13 03 001
3	AmornrattN	Printer HP	Printer		Vatunyoo	E 20 01 001
4	ChutipornW	Printer HP	Printer		Bunjong	E 20 01 002
5	AnekL	Printer HP	HP		Vatunyoo	E 20 01 003
6	TawatchaiH	Printer HP	Printer		Vatunyoo	E 20 01 004
7	YuphonC	Printer HP	HP		Amornratt	E 20 01 005

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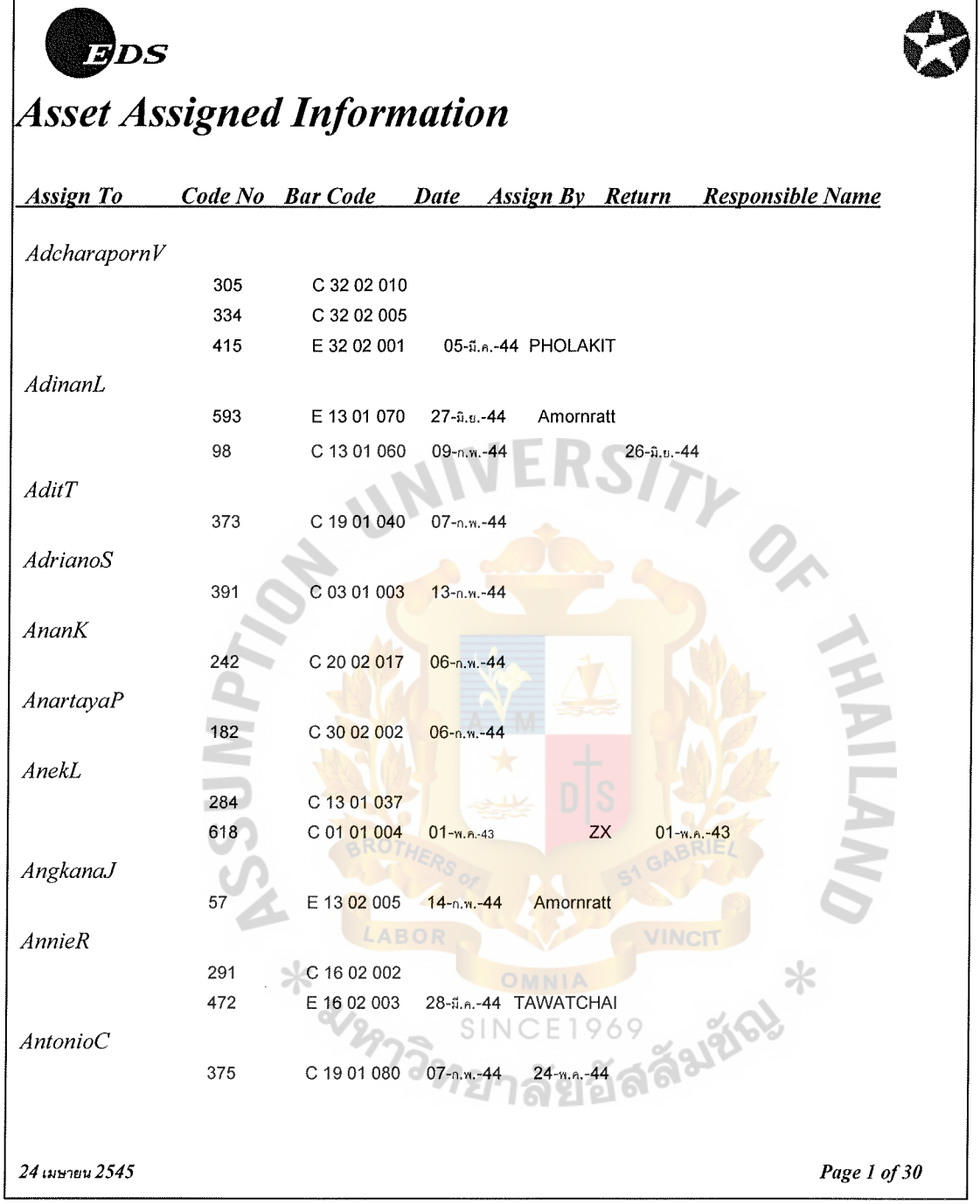
Figure H.8. Stock Request Report.



EDS

Asset Assigned Information

Assign To	Code No	Bar Code	Date	Assign By	Return	Responsible Name
AdcharapornV						
	305	C 32 02 010				
	334	C 32 02 005				
	415	E 32 02 001	05-มี.ค.-44	PHOLAKIT		
AdinanL						
	593	E 13 01 070	27-มิ.ย.-44	Amornratt		
	98	C 13 01 060	09-ก.พ.-44		26-มิ.ย.-44	
AditT						
	373	C 19 01 040	07-ก.พ.-44			
AdrianoS						
	391	C 03 01 003	13-ก.พ.-44			
AnanK						
	242	C 20 02 017	06-ก.พ.-44			
AnartayaP						
	182	C 30 02 002	06-ก.พ.-44			
AnekL						
	284	C 13 01 037				
	618	C 01 01 004	01-พ.ค.-43		ZX	01-พ.ค.-43
AngkanaJ						
	57	E 13 02 005	14-ก.พ.-44	Amornratt		
AnnieR						
	291	C 16 02 002				
	472	E 16 02 003	28-มี.ค.-44	TAWATCHAI		
AntonioC						
	375	C 19 01 080	07-ก.พ.-44	24-พ.ค.-44		

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Figure H.9. Asset Assigned Information Report.

EDS

User Request Information

Name	Surname	Req No	Date	Type of Request	Status	Special No	Software Name of Software
KAL	SANTASAWA	1	22/4/2	Software	Y	0	Palm OS
POLASI	SRINANG	6	19/4/2	Software		5	Sony Digital Camera
PURANE	BORIBURAN	2	22/3/2	Software		4	Adobe Photophop
TANACH	VIENRAVEE	4	9/4/20	MPSI	Y	2	Ring Central Fax
TERMD	KANCHANA	5	10/2/2	Software		1	Lotus Notes
WANIDA	CHANSANG	3	12/3/2	Software		3	Thai Dictionary

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Figure H.10. User Request Information Report.

EDS

List of Vendor

Vendor No	Vendor Name	Address	Telephone	Note
2	MSC Group	123 Vibhavadee rd, Bangkae, BKK 10500	26452245	Negotiable
3	Telco Ind co.,ltd	452/234 Tower Geocon, Ladpraw, Bangkapi 10100	24458723	
4	SingTel	56/89 Bangna rd, Bangna BKK	26148745	
5	Total Solution Co.,Ltd.	78/45 Sathorn rd,Yannnawa BKK 10210	27748745	
6	Modernform Co.,Ltd.	40/10 Bangna, Bangna BKK 10500	27148723	Negotiable
7	Sun Systems Co.,Ltd.	82 Ratchada rd, Wangtonglan BKK 10310	23715412	

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Figure H.11. Vender List Report.

EDS

Request for PC price

Order No	*Vendor Name*	*Type*	*Name*	*Description*	*Price*	*Quantity*
1	*Telco Ind co.,ltd*					
		Harddisk Uraiwan	Uraiwan	Harddisk	□9,000.00	1
		Uraiwan		Notebook		
2	*Telco Ind co.,ltd*					
		RAM Uraiwan	Uraiwan	Notebook	□2,500.00	1
3	*MSC Group*					
		LAN card Vatunyoo	LAN Card	10/100	800.00	Vatunyoo
4	*MSC Group*					
		Harddisk Bunjong	Bunjong	Harddisk	□8,500.00	1
				Notebook		

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Figure H.12. Request for PC price Report.

User Asset Details

NAME	SURNAME	EXT	Bar Code	Computer	Serial	NoAssign
ADCHARAPORN	VANNAPRASART	4091				
			E 32 02 001			
				NETVISTA A40	99-CTYLG	05-มี.ค.-44
ADINAN	LATEH	6062				
			E 13 01 070			
				Laptop IBM T22	99-FZ115	27-มี.ย.-44
Angkana	Jiraratpisan	251				
			E 13 02 005			
				IBM NETVISTA	99-CTYFW	14-ก.พ.-44
ANNIE	REGAL	6075				
			E 16 02 003			
				NETVISTA A40P	99CTYNP	28-มี.ค.-44
ARADA	WATTANAAREEKUL	4023				
			E 28 02 008			
				NETVISTA A40P	99CTYHW	09-มี.ค.-44
Araya	Boonprakob	5093				
			E 17 02 003			
				NETVISTA A40P	99CTYRD	28-มี.ค.-44
ATIKOM	TIRAWANNARAT	511				
			E 19 01 011			
				Laptop IBM T22	99-FZO96	05-ก.ค.-44
AUNGSANA	LEELAWUTHIPRASERT	252				
			E 13 02 014			
				IBM NETVISTA	99-CTYGC	14-ก.พ.-44
BANGON	ITHIPHONGON	5047				
			E 13 02 065			
				NETVISTA A40P	99CTYNB	26-มี.ค.-44
BARRY	W.ASHMAN	3017				
			E 13 01 065			
				IBM T2199-FMZN4	30-เม.ย.-44	

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Figure H.13. User Asset Details Report.

APPENDIX I

COST – BENEFIT ANALYSIS

Table I.1. The Cost of Manual System, Baht.

Cost Item	Year 1	Year 2	Year 3	Year 4	Year 5
Operating Cost					
Salary Cost:					
Helpdesk 5 persons @ 15,000	900,000	990,000	1,089,800	1,197,900	1,317,690
Staff 4 persons @ 7,000	336,000	369,000	406,560	447,216	491,938
Solution Manager 1 person @ 30,000	360,000	396,000	435,600	479,160	527,026
Total Annual Salary Cost	1,596,000	1,755,600	1,931,160	2,124,276	2,336,704
Office Supplies & Miscellaneous Cost:					
Stationary	10,000	11,000	12,100	13,310	14,641
Paper	12,000	13,200	14,520	15,972	17,569
Printer Toner	12,000	13,200	14,520	15,972	17,569
Utilities	50,000	55,000	60,500	66,550	73,205
Miscellaneous	5,000	5,500	6,050	6,655	7,320
Total Annual Office Supplies & Miscellaneous	89,000	97,900	107,690	118,459	130,304
Total Manual System Cost	1,685,000	1,853,500	2,038,850	2,242,735	2,467,008

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

Cost Item		Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost						
Computer Server Cost:						
Computer Server Cost		60,000	60,000	60,000	60,000	60,000
Workstation		50,000	50,000	50,000	50,000	50,000
Network		14,000	14,000	14,000	14,000	14,000
Printer		16,000	16,000	16,000	16,000	16,000
UPS 800 VA		24,000	24,000	24,000	24,000	24,000
Total Hardware		164,000	164,000	164,000	164,000	164,000
Maintenance Cost		-	-	-	30,000	32,000
Software Cost:						
Windows 2000 Server		8,000	8,000	8,000	8,000	8,000
Windows 2000 Professional	5 Set @ 4,000 / Annum	20,000	20,000	20,000	20,000	20,000
Microsoft Visual Basic 6.0		10,000	10,000	10,000	10,000	10,000
Microsoft Office 2000	5 Set @ 2,000 / Annum	10,000	10,000	10,000	10,000	10,000
Microsoft SQL	5 Set @ 1,500 / Annum	7,500	7,500	7,500	7,500	7,500
Microsoft Access 2000	4 Set @ 400 / Annum	1,600	1,600	1,600	1,600	1,600
Total Software Cost		57,100	57,100	57,100	57,100	57,100
Implementation Cost:						
Training Cost		150,000	-	-	-	-
Utilities Cost		400,000	-	-	-	-
Set up Cost		250,000	-	-	-	-
Total Implement		800,000	-	-	-	-
Total Fixed Cost		1,021,100	221,100	221,100	251,100	253,100
Operating Cost:						
Solution Manager	1 person @ 30,000	360,000	396,000	435,600	479,160	527,076
System Administrator	2 persons @ 18,000	432,000	475,200	522,720	574,992	632,491
Database Administrator	1 person @ 25,000	25,000	-	-	-	-
Helpdesk	3 persons @ 15,000	540,000	594,000	653,400	718,740	790,614
Total Annual Salary		1,357,000	1,465,200	1,611,720	1,772,892	1,950,181
Office Supplies & Miscellaneous Cost:						
Stationary		7,000	7,700	8,470	9,317	10,248
Paper		6,000	6,600	7,260	7,986	8,784
Printer Toner		8,000	8,800	9,680	10,648	11,712
Utilities		10,000	11,000	12,100	13,310	14,641
Miscellaneous		31,000	34,100	37,510	41,261	45,387
Total Annual Operating Cost		1,388,000	1,499,300	1,649,230	1,814,153	1,995,568
Total Computerized System Cost		2,409,100	1,720,400	1,870,330	2,065,253	2,248,668

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

Cost Item		Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost						
Computer Server Cost:						
Computer Server Cost		60,000	60,000	60,000	60,000	60,000
Workstation		50,000	50,000	50,000	50,000	50,000
Network		14,000	14,000	14,000	14,000	14,000
Printer		16,000	16,000	16,000	16,000	16,000
UPS 800 VA		24,000	24,000	24,000	24,000	24,000
Total Hardware		164,000	164,000	164,000	164,000	164,000
Maintenance Cost		-	-	-	28,000	30,000
Software Cost:						
Windows 2000 Server		8,000	8,000	8,000	8,000	8,000
Windows 2000 Professional	5 Set @ 4,000 / Annum	20,000	20,000	20,000	20,000	20,000
Microsoft Office 2000	5 Set @ 2,000 / Annum	10,000	10,000	10,000	10,000	10,000
Microsoft SQL	5 Set @ 1,500 / Annum	7,500	7,500	7,500	7,500	7,500
Microsoft Access 2000	4 Set @ 400 / Annum	1,600	1,600	1,600	1,600	1,600
Total Software Cost		47,100	47,100	47,100	47,100	47,100
Implementation Cost:						
Training Cost		80,000	-	-	-	-
Utilities Cost		300,000	-	-	-	-
Set up Cost		180,000	-	-	-	-
Total Implement		560,000	-	-	-	-
Total Fixed Cost		771,100	221,100	221,100	239,100	241,100
Operating Cost:						
Solution Manager	1 person @ 30,000	360,000	396,000	435,600	479,160	527,076
System Administrator	2 persons @ 18,000	432,000	475,200	522,720	574,992	632,491
Helpdesk	3 persons @ 15,000	540,000	594,000	653,400	718,740	790,614
Total Annual Salary		1,332,000	1,465,200	1,611,720	1,772,892	1,950,181
Office Supplies & Miscellaneous Cost:						
Stationary		7,000	7,700	8,470	9,317	10,248
Paper		6,000	6,600	7,260	7,986	8,784
Printer Toner		8,000	8,800	9,680	10,648	11,712
Utilities		10,000	11,000	12,100	13,310	14,641
Miscellaneous		31,000	34,100	37,510	41,261	45,387
Total Annual Operating Cost		1,363,000	1,499,300	1,649,230	1,814,153	1,995,568
Total Computerized System Cost		2,134,100	1,710,400	1,860,330	2,053,253	2,236,668

Table I.4. The Cost of the Candidate 3, Baht.

Cost Item		Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost						
Computer Server Cost:						
Computer Server Cost		60,000	60,000	60,000	60,000	60,000
Workstation		50,000	50,000	50,000	50,000	50,000
Network		14,000	14,000	14,000	14,000	14,000
Printer		16,000	16,000	16,000	16,000	16,000
UPS 800 VA		24,000	24,000	24,000	24,000	24,000
Total Hardware		164,000	164,000	164,000	164,000	164,000
Maintenance Cost		-	-	-	32,000	34,000
Software Cost:						
Windows 2000 Server		8,000	8,000	8,000	8,000	8,000
Windows 2000 Professional	5 Set @ 4,000 / Annum	20,000	20,000	20,000	20,000	20,000
Microsoft Office 2000	5 Set @ 2,000 / Annum	10,000	10,000	10,000	10,000	10,000
Delphi	5 Set @ 4,000 / Annum	20,000	20,000	20,000	20,000	20,000
Microsoft SQL	5 Set @ 1,500 / Annum	7,500	7,500	7,500	7,500	7,500
Total Software Cost		65,500	65,500	65,500	65,500	65,500
Implementation						
Training Cost		200,000	-	-	-	-
Utilities Cost		400,000	-	-	-	-
Set up Cost		240,000	-	-	-	-
Total Implement		840,000	-	-	-	-
Total Fixed Cost		1,069,500	229,500	229,500	261,500	263,500
Operating Cost:						
Solution Manager	1 person @ 30,000	360,000	396,000	435,600	479,160	527,076
System Administrator	2 persons @ 18,000	432,000	475,200	522,720	574,992	632,491
Database Administrator	1 person @ 25,000	25,000	-	-	-	-
Helpdesk	3 persons @ 15,000	540,000	594,000	653,400	718,740	790,614
Total Annual Salary		1,357,000	1,465,200	1,611,720	1,772,892	1,950,181
Office Supplies & Miscellaneous Cost:						
Stationary		7,000	7,700	8,470	9,317	10,248
Paper		6,000	6,600	7,260	7,986	8,784
Printer Toner		8,000	8,800	9,680	10,648	11,712
Utilities		10,000	11,000	12,100	13,310	14,641
Miscellaneous		31,000	34,100	37,510	41,261	45,387
Total Annual Operating Cost		1,388,000	1,499,300	1,649,230	1,814,153	1,995,568
Total Computerized System Cost		2,457,500	1,728,800	1,878,7.30	2,075,653	2,259,068

Table I.5. The Benefit of the Proposed System, Baht.

Benefit Items		Amount
Personnel Reduction		
Helpdesk	3 persons @ 15,000	540,000
Staff	4 persons @ 7,000	336,000
Monthly Personnel Reduction Benefit	4 persons @ 3,000	144,000
Inventory Cost:		
Inventory Officer	1 person @ Day	5,000
Messenger		3,000
Inventory Staff	3 persons @ Day	5,000
Stock	1 person @ Day	3,000
Customer Center:		
Customer Service Representative	5 person @ 2 Hour / Day	5,000
Operating Time Saving:		
Solution Manager	1 person @ 1 Hour / Day	5,625
System Administrator	2 person @ 1 Hour / Day	5,500
Helpdesk	2 person @ 1 Hour / Day	4,500
Total Annual Time Saving		1,387,500
Office Supplies & Miscellaneous Cost:		
Stationary		3,000
Paper		6,000
Printer Toner		4,000
Utilities		40,000
Total Annual Operating Cost		53,000
Maintenance:		
Maintenance for Fax		24,000
Maintenance for Printer		20,000
Facsimile Expense Saving		
Facsimile Charge	10% of 150 Calls / Staff / Day @ 5 Baht	530,000
Facsimile Toner	10,000 Baht / Annum	20,000
Total Benefits from Implementing Computerized System Cost		1,990,500

Table I.6. Payback Period for Candidate 1, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost:	-1,021,100					
Annual operating cost		-1,388,000	-1,720,400	-1,870,330	-2,065,253	-2,248,668
Discount factor for 13%	1	0.893	0.797	0.712	0.636	0.567
Time Adjust Cost (Adjusted To Present Value)	-1,021,100	-1,239,484	-1,371,159	-1,331,675	-1,313,501	-1,274,995
Cumulative Time-Adjusted costs over life time	-1,021,100	-2,260,584	-3,631,743	-4,963,418	-6,276,919	-7,551,913
Benefit derived form operation of the new system	0	1,990,500	2,189,550	2,408,505	2,649,356	2,914,291
Discount factor for 13%	1,000	0.893	0.797	0.712	0.636	0.567
Time Adjusted benefit (Adjusted to Present Value)	0	1,777,517	1,745,071	1,714,856	1,684,990	1,652,403
Cumulative time-adjusted benefit over life time	0	1,777,517	3,522,588	5,237,443	6,922,434	8,574,837
Cumulative Life Time Time-Adjusted Costs+Benefit	-1,021,100	-483,068	-109,155	274,026	645,515	1,022,923

Table I.7. Payback Period for Candidate 2, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost:	-771,100					
Annual operating cost		-1,363,000	-1,710,400	-1,860,330	-2,053,253	-2,236,668
Discount factor for 13%	1	0.893	0.797	0.712	0.636	0.567
Time Adjust Cost (Adjusted To Present Value)	-771,100	-1,217,159	-1,363,189	-1,324,555	-1,305,869	-1,268,191
Cumulative Time-Adjusted costs over life time	-771,100	-1,988,259	-3,351,448	-4,676,003	-5,981,872	-7,250,062
Benefit derived form operation of the new system	0	1,990,500	2,189,550	2,408,505	2,649,356	2,914,291
Discount factor for 13%	1,000	0.893	0.797	0.712	0.636	0.567
Time Adjusted benefit (Adjusted to Present Value)	0	1,777,517	1,745,071	1,714,856	1,684,990	1,652,403
Cumulative time-adjusted benefit over life time	0	1,777,517	3,522,588	5,237,443	6,922,434	8,574,837
Cumulative Life Time Time-Adjusted Costs+Benefit	-771,100	-210,743	171,140	561,441	940,562	1,324,774

Table I.8. Payback Period for Candidate 3, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost:	-1,069,500					
Annual operating cost		-1,388,000	-1,728,800	-1,878,730	-2,075,653	-2,259,068
Discount factor for 13%	1	0.893	0.797	0.712	0.636	0.567
Time Adjust Cost (Adjusted To Present Value)	-1,069,500	-1,239,484	-1,377,854	-1,337,656	-1,320,115	-1,280,892
Cumulative Time-Adjusted costs over life time	-1,069,500	-2,308,984	-3,686,838	-5,024,493	-6,344,609	-7,625,500
Benefit derived form operation of the new system	0	2,990,500	2,189,550	2,408,505	2,649,356	3,125,121
Discount factor for 13%	1,000	0.893	0.797	0.712	0.636	0.567
Time Adjusted benefit (Adjusted to Present Value)	0	1,777,517	1,745,071	1,714,856	1,684,990	1,652,403
Cumulative time-adjusted benefit over life time	0	1,777,517	3,522,588	5,237,443	6,922,434	8,574,837
Cumulative Life Time Time-Adjusted Costs+Benefit	-1,069,500	-531,468	-164,250	212,950	577,825	949,336

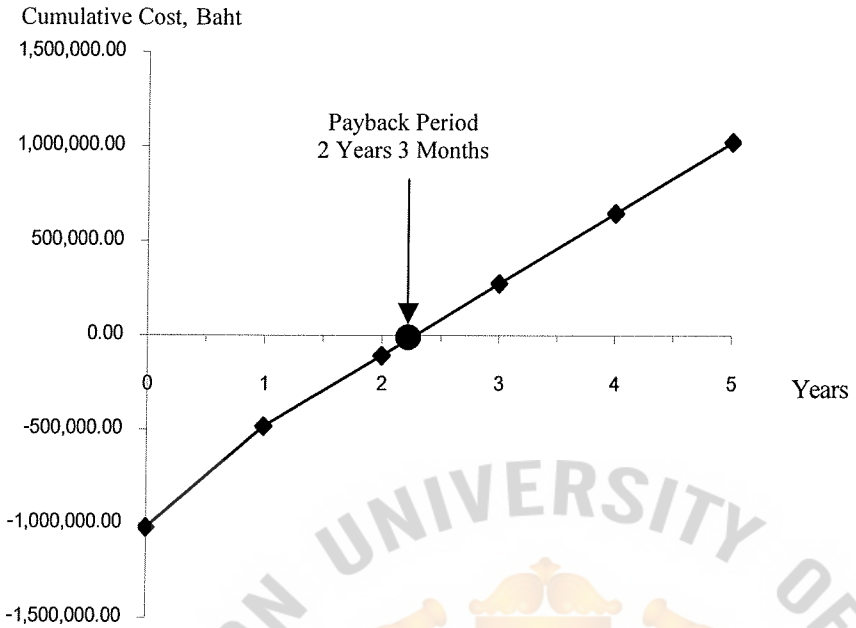

Figure I.1. Payback Period for Candidate 1.

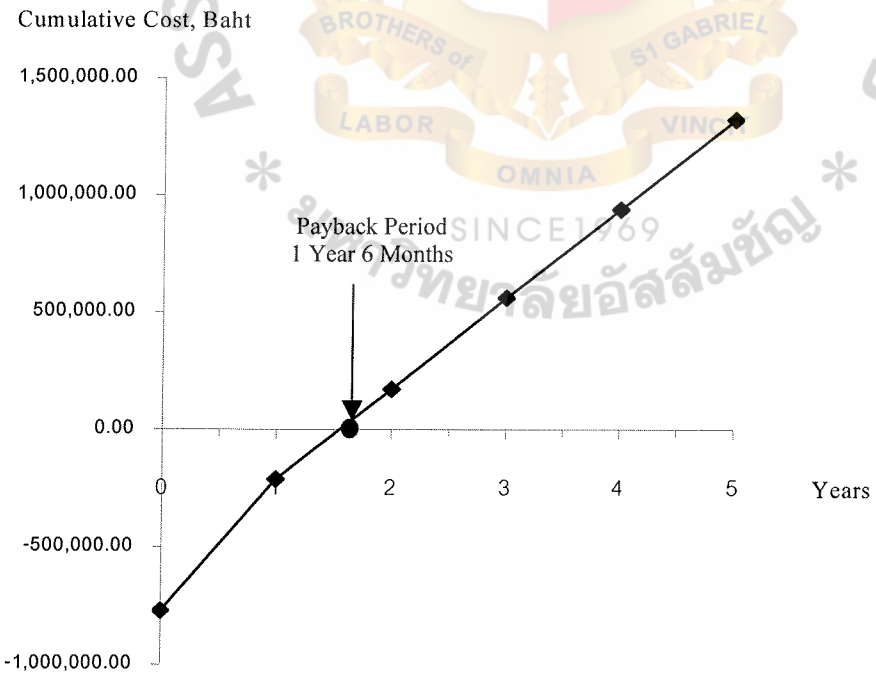

Figure I.2. Payback Period for Candidate 2.

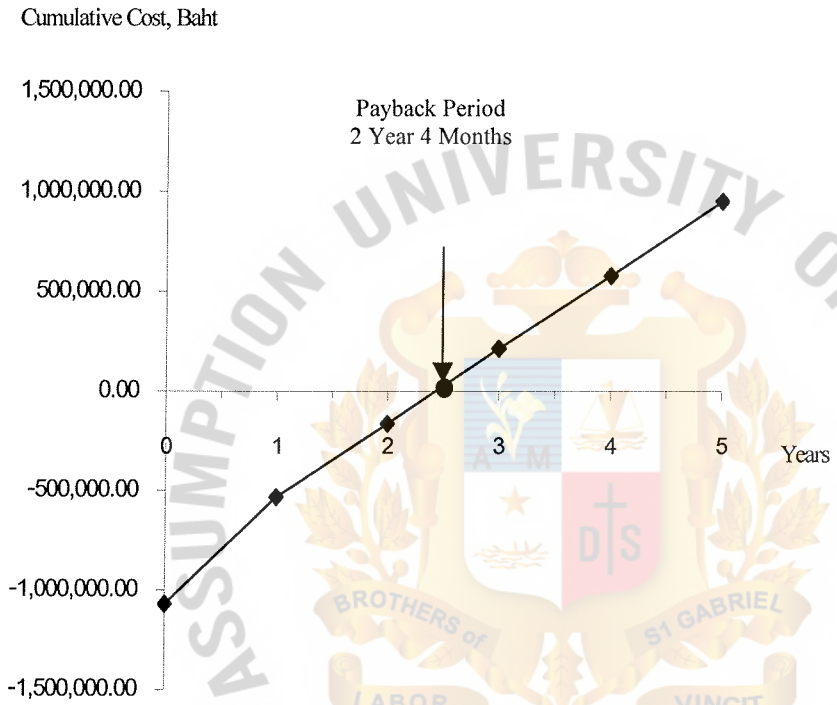

Figure I.3. Payback Period for Candidate 3.

Table I.9. Net Present Value for Candidate 1, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost:	-1,021,100					
Annual operating cost		-1,388,000	-1,720,400	-1,870,330	-2,065,253	-2,248,668
Discount factor for 13%	1	0.893	0.797	0.712	0.636	0.567
Time Adjust Cost (Adjusted To Present Value)	-1,021,100	-1,239,484	-1,371,159	-1,331,675	-1,313,501	-1,274,995
Cumulative Time-Adjusted costs over life time	-1,021,100	-2,260,584	-3,631,743	-4,963,418	-6,276,919	-7,551,913
Benefit derived form operation of the new system	0	1,990,500	2,189,550	2,408,505	2,649,356	2,914,291
Discount factor for 13%	1,000	0.893	0.797	0.712	0.636	0.567
Time Adjusted benefit (Adjusted to Present Value)	0	1,777,517	1,745,071	1,714,856	1,684,990	1,652,403
Cumulative time-adjusted benefit over life time	0	1,777,517	3,522,588	5,237,443	6,922,434	8,574,837
Cumulative Life Time Time-Adjusted Costs+Benefit	-1,021,100	-483,068	-109,155	274,026	645,515	1,022,923

Table I.10. Net Present Value for Candidate 2, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost:	-771,100					
Annual operating cost		-1,363,000	-1,710,400	-1,860,330	-2,053,253	-2,236,668
Discount factor for 13%	1	0.893	0.797	0.712	0.636	0.567
Time Adjust Cost (Adjusted To Present Value)	-771,100	-1,217,159	-1,363,189	-1,324,555	-1,305,869	-1,268,191
Cumulative Time-Adjusted costs over life time	-771,100	-1,988,259	-3,351,448	-4,676,003	-5,981,872	-7,250,062
Benefit derived form operation of the new system	0	1,990,500	2,189,550	2,408,505	2,649,356	2,914,291
Discount factor for 13%	1,000	0.893	0.797	0.712	0.636	0.567
Time Adjusted benefit (Adjusted to Present Value)	0	1,777,517	1,745,071	1,714,856	1,684,990	1,652,403
Cumulative time-adjusted benefit over life time	0	1,777,517	3,522,588	5,237,443	6,922,434	8,574,837
Cumulative Life Time Time-Adjusted Costs+Benefit	-771,100	-210,743	171,140	561,441	940,562	1,324,774

Table I.11. Net Present Value for Candidate 3, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
System Development Cost:	-1,069,500					
Annual operating cost		-1,388,000	-1,728,800	-1,878,730	-2,075,653	-2,259,068
Discount factor for 13%	1	0.893	0.797	0.712	0.636	0.567
Time Adjust Cost (Adjusted To Present Value)	-1,069,500	-1,239,484	-1,377,854	-1,337,656	-1,320,115	-1,280,892
Cumulative Time-Adjusted costs over life time	-1,069,500	-2,308,984	-3,686,838	-5,024,493	-6,344,609	-7,625,500
Benefit derived form operation of the new system	0	2,990,500	2,189,550	2,408,505	2,649,356	3,125,121
Discount factor for 13%	1,000	0.893	0.797	0.712	0.636	0.567
Time Adjusted benefit (Adjusted to Present Value)	0	1,777,517	1,745,071	1,714,856	1,684,990	1,652,403
Cumulative time-adjusted benefit over life time	0	1,777,517	3,522,588	5,237,443	6,922,434	8,574,837
Cumulative Life Time Time-Adjusted Costs+Benefit	-1,069,500	-531,468	-164,250	212,950	577,825	949,336

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