Expense Control System for Commercial Bank

by
Ms. Chiraporn Chiraphan

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

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Computer Information Systems
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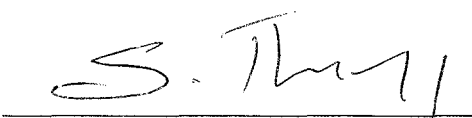|	
Project Title	Expense Control System for Commercial Bank
Name	Ms. Chiraporn Chiraphan
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Academic Year	November 2003

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

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ABSTRACT

This system development project aims to develop an application program to support an Expense Control System of construction projects to increase the efficiency and effectiveness of the company.

The current existing Expense Control System is based on a partly manual and partly computerized system. Most data are stored on paper, while some parts are kept in Microsoft Excel, and stored in a Personal Computer (PC). It requires many administrative staff to maintain the system, performing repetitive jobs manually and it has a high paper cost.

The new proposed system is developed to replace the manual system. The new system is designed to run on Local Area Network (LAN). The new system is implemented with a computerized database to be shared among users with certain level of security. All data are kept in the database server, Lotus Domino Server, and are accessed through the Lotus Notes. The user interfaces, moreover, are implemented on Lotus Notes R5. The new system helps to reduce redundant work and the amount of paper work, solve the problem of manual system and decrease the high maintenance cost.

ACKNOWLEDGEMENTS

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

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1.1 Background of the Project

There are many businesses that have high daily expense transaction. The high volume causes difficulty in processing large amounts of information, preparing all the necessary records and being unable to provide the management with a wide range of useful reports for making decision within the required time and budget control of each department.

Computer-Based Information System is an easy way to produce accurate information at the right time for the right job. Expense Control System is suggested to solve the problems. The new computerized system will enhance business functions in terms of capability and efficiency. All related information of the expense of each department for budget control, prepared for the auditor to audit and expenses can be accessed easily to check through the database system.

For this project, the officer will take responsibility for studying, monitoring and controlling over the Expense Control System of the existing system which has numerous detailed records which is a time-consuming task. Also, there is duplication of work in departments requesting for budget and officer of the Budgeting Department in manually keying in the same data. So, the new system is designed and implemented to increase effectiveness of job. It will also enable faster access time and quick response of the expense that may occur for the purpose of easy control over expenses. The system is also designed for preparing documents and reports for controlling the records of Expense Control System of Adam Bank Company Limited.

1.2 Objectives of the Project

The objectives of the project are as follows :

(1) To develop and implement the proposed computerized Expense Control System to replace the manual system.

(2) To reduce redundancy in the existing system.

(3) To design the new system utilizing the available computer resources effectively and efficiently.

(4) To provide meaningful information to support the decision making of the Management. To reduce high operating and maintenance cost.

1.3 Scope of Project

The scope of the project are as follows :

(1) To create and maintain costs/time into database file.

(2) To create and maintain Work-in-Process information into database file.

(3) To create and maintain allocating processing budget into database file.

(4) To create and maintain allocating expenses of all departments into database file.

(5) To generate reports (such as summary expense report, Budget, etc.) for day/month/year-end closing

1.4 Deliverables

The deliverables for the project of the Expense Control System are as follows :

(1) User Interface Design

(2) Process Specification

(3) Document Forms and Flows

    (a) Normal Expense Form

      (b)   Cancelled Expense Form

      (c)   Expense Pending Payment Form

      (d)   Completed Normal Expense

      (e)   Rejected Normal Expense

      (f)   Withholding Tax Form

(4)   Generate Report such as :

      (a)   Summary Expense Report

      (b)   Daily Expense Report

      (c)   Budget Allocation Report

      (d)   Payment Report

      (e)   Withholding Report

1.5 Project Plan

The project plan in as shown in the following Gantt Chart of Figure 1.1.

(1)   Existing System

(2)   Analysis of the Proposed System

(3)   Design of the Proposed System

(4)   Implementation of the Proposed System

No.	Task Name	September				October				November				December			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	I. Analysis of the Existing System																
1	Define the Objective and Scope																
2	Study the Existing System																
3	Identify the Existing Problems																
4	Study the Existing Computer System																
	II. Analysis of the Proposed System																
5	Develop Context Diagram																
6	Develop Data Flow Diagram																
7	Cost and Benefit Analysis																
	III. Design of the Proposed System																
8	User Interface Design																
9	Report Design																
10	Database Design																
11	Network Design																
12	Program Design																
	III. Implementation of the Proposed System																
13	Programming																
14	Testing																
15	Hardware Installation																
16	Software Installation																
17	Data Conversion																

Figure 1.1.   Project Plan of Expense Control System.

II. THE EXISTING SYSTEM

2.1 Organization Background

Adam Bank Public Company Limited was listed on the Stock Exchange of Thailand in 1978 and registered as a public company limited in 1992.

Adam Bank has built a reputation as a leading provider of a comprehensive range of financial banking products and services. Adam Bank has affiliates in general insurance, fund management, debut and equity underwriting and leasing.

As of March 2002, Adam Bank headquarter is located on South Sathon Road, Bangkok. Adam Bank has 119 branches and 273 ATM machines throughout Thailand.

Adam Bank's long standing strength is in serving Thailand's middle-market of commercial and industrial firms. Since 1995, additional emphasis has been placed on building a strong market position in Retail Banking. A comprehensive line of consumer banking products was developed. Improvement was made to the branches to make them more modern, efficient, and customer-friendly.

ABN AMRO, a Dutch financial service group, became the major shareholder of Adam Bank in 1998. In 2001, ABN AMRO ranks eight in Europe and 17th in the world based on Tier 1 capital and has over 3,400 branches in more than 60 countries. With ABN AMRO support, Adam Bank can offer financial products and services that meet international standards to our customers.

VISION: "To become the best Thai Financial Service Center with a record of innovation, a reputation for professionalism and a practice found upon the philosophy of doing right for our customers".

2.2 Background of the Existing System

The existing system uses a manual system in business operations, which involves expense requisition and payment. All documents and transactions are created and organized in department files. The operations are time consuming and cause redundancy of record keeping. The company uses centralized management; therefore the budgeting department controls all information centrally.

The document flow of all processes is as follows.

(1) Expense requisition

Having purchased from the merchants, the internal department requester will send the expense requisition document to sign authentication on expense form submitted to payment unit.

At the internal department, not only the vice president has to authenticate for own department but also allocate appropriate budget. Therefore, every requisition transaction has to be approved by the vice president.

(2) Verify expense requisition

After receiving expense requisition documents with transaction process submitted by the internal department, the senior officer checks for information correctness. If the information is not correct it is sent back to the original department.

(3) Payment

If the information is correct the officer can pay via systematic transfer account number that is informed in the requisition document or issue a cheque to the requesting department.

After payment transaction is completed, the officer must issue withholding tax invoice to the supplier and pay withholding tax to revenue department.

2.3 Current Problems and Areas for Improvement

Due to the use of manual system, all participating parties at Adam Bank face problems which are identified as follows:

(1) Inefficiency of work causes excessive effort requirement in each department:

(a) Budgeting department faces much time consuming in checking hard written expense requisition documents and budgeting record keeping like expense summary, vat and tax invoice, and closing account at the end of each month. The requesting department faces difficulty in controlling the budget for debit expenses. Management also faces task load in checking.

(b) There is redundancy of work as each department that creates and maintains its own data.

(c) At the peak period, the company has to pay much overtime for staff e.g. every 6 month and end of the month.

(2) In record keeping on expense transaction the problems are :

(a) There is no appropriate format for record keeping.

(b) Data is not accessible.

(c) The information is not accurate. The same information, which comes from different sources may not be the same.

(d) There is no statistical record about any transactions. Therefore, it is difficult for decision making, analysis and planning.

(3) Too little control and is not well organized:

    (a) As there is no supporting data in checking the budget, the internal department has to make sure that budget is available.

    (b) Time consuming and expensive in generating ad hoc report.

    (c) Unpredictable cost from delayed response time in order processing causes longer company business cycle. The effect may cause rechecking document, which comes from longer terms of payment.

(4) Lack of accuracy and security

    (a) Manual system may have human errors in processing.

    (b) There is no security procedure to protect data access by unauthorized person.

Areas for improvements

(1) To increase the efficiency of overall workflow

The system helps the organization to accelerate expensing and payment for goods and services while reducing operating cost so as to efficiently allocate the budget. Moreover the organization can reduce task load and redundancy of work by centralized database, and decentralize authority to subordinates in normal order approval by giving supplier information to them.

(2) More accuracy and security

All related expense documents require accuracy and security. Any documents sent to the supplier should not have any mistakes and should be kept secret because it will effect the supplier's and organization's image. The system can help serve this objective by allowing only authorized person

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to access the information and also reduce manual work, which has more chance to create human error.

(3)   To increase ability to control expense

The system can reduce the workload on checking handwritten documents by generating automatic calculation of expenses. Moreover, budget can be reduced from the estimation of expense requirement for each season, by using historical information, and receiving alert when reaching budget limit. Therefore the organization can easily reduce cost from over budgeting.

(4)   To be able to monitor and control daily operations

A record will be kept for all daily transaction in the organization system for transaction of processing management of daily operations such as issuing cheque and accounting record keeping which are used to monitor the status of internal operations and the organization's relation with the external environment.

(5)   To be able to plan and focus the future

By using daily information, the organization can generate quick and inexpensive statistical records as management information system for the management level to serve functional planning, controlling and decision making such as expense analysis, and budgeting with routine summary and expectation reports.
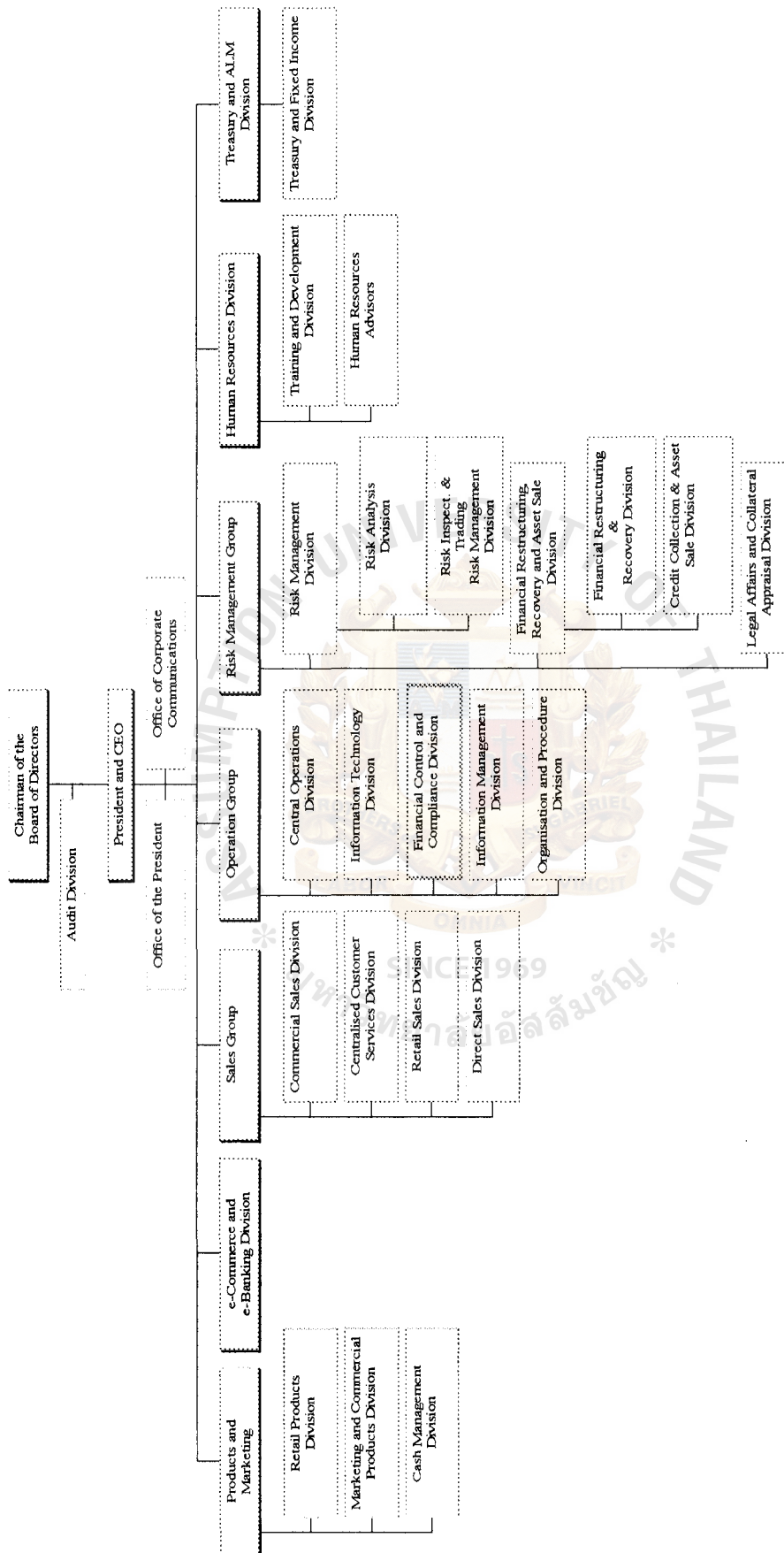
Figures 2.1. Organization Chart of Adam Bank PLC.

III. THE PROPOSED SYSTEM

3.1 User Requirements

The proposed system is developed to replace the existing manual system. The new computerized system will be implemented to solve the current problems of expense activities.

The new system should fulfill all the following requirements:

(1) To reduce the manual key-in processes that are duplicated between user and officer of financial control division. All departments will have access to the central database server, which gives them the same standard expense form. This will also reduce paper usage.

(2) To eliminate human errors from manual work.

(3) Multi-users should be able to retrieve information from on-line computer simultaneously.

(4) The new computerized system can reduce workload and errors of employees, such as data entry, and data categorization.

(5) Security is implemented into the system to protect all information from unauthorized persons. The system should be on-line with authorized access only.

(6) The new system should provide updated and reliable information that is provided to the budget department.

(7) Employees need to be trained for the new system.

(8) Client/Server should provide an efficient and effective system for the company.

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3.2 System Design

With the current number of users and the amount of data, it is more economical to have them on the same machine.

Microsoft has provided a lot of software, which can transform a normal Intel-based PC server into Application Server and Database Server. The software is designed to integrate with Windows 2000 Server, and is also packed together as Microsoft Back Office suite.

It is decided to use the Microsoft Back Office suite as the major software for the proposed Intranet system; therefore, the server must have the hardware specifications which can run both Microsoft Windows NT, 2000, XP and the other software in the suite. The hardware & software specifications for the proposed Intranet Server are shown in Tables 3.1 and 3.2 respectively.

Data Flow Diagram (DFD) is used as a tool to depict the logical flow of data through the proposed system. DFD is a technique for organizing and documenting the structure and flow of data through a system's process and logic, policies, and procedure to be implemented. DFD begins with a context diagram, which indicates initial project scope showing the relationship between the external entities and the system.
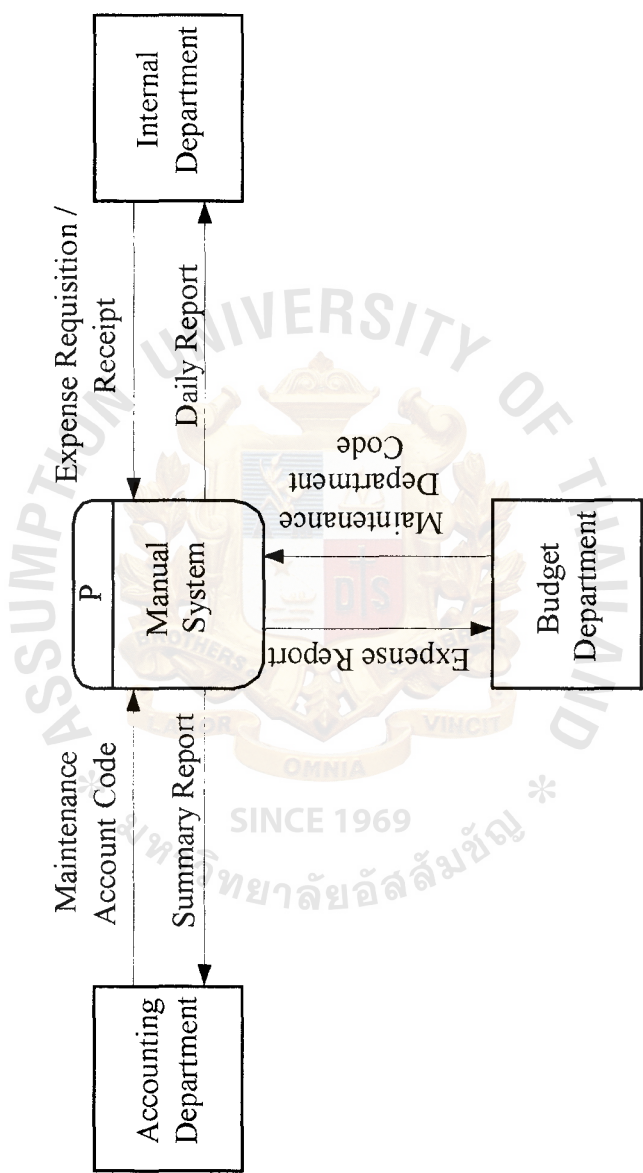
Figure 3.1.   Context Diagram of Existing System.

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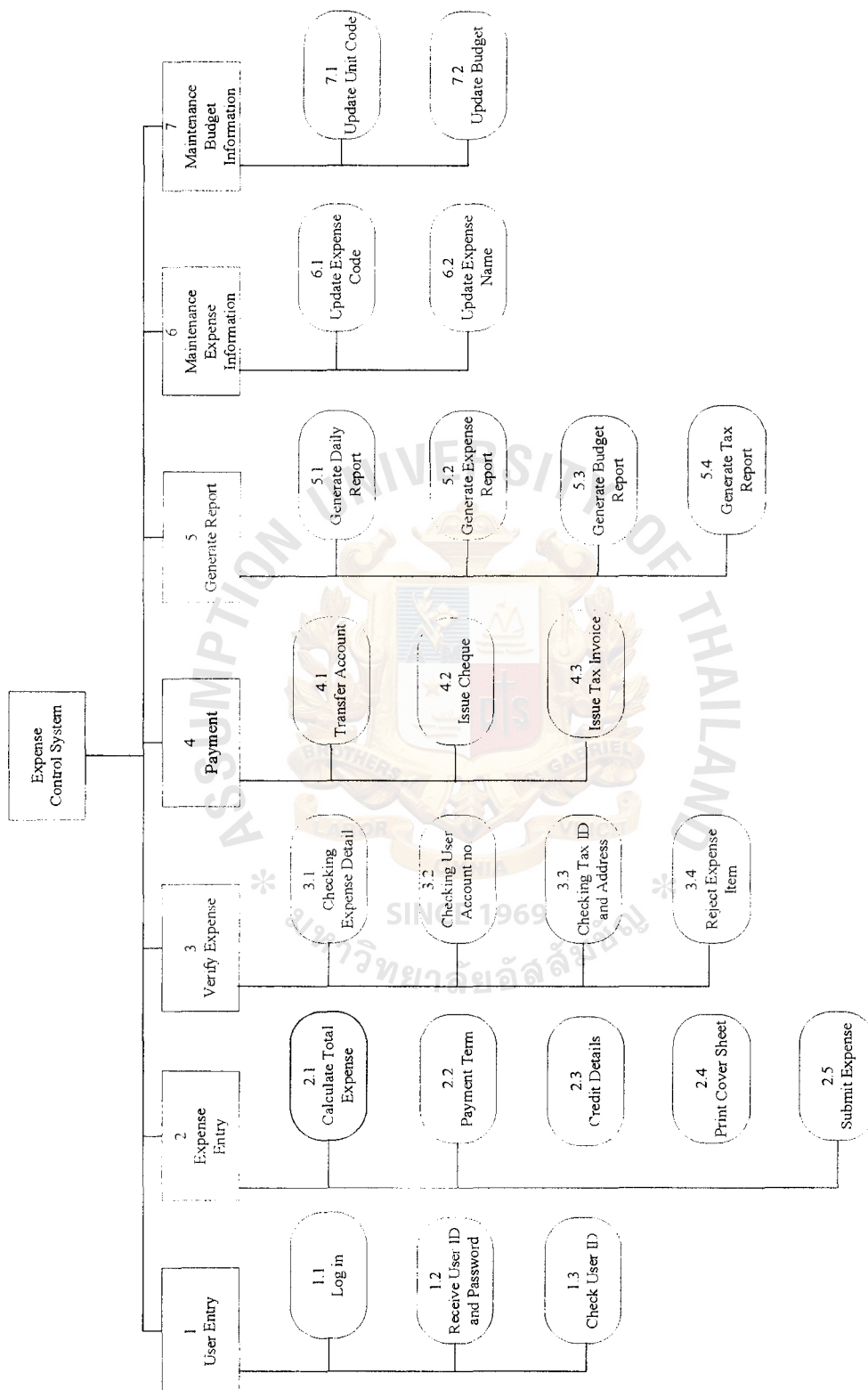
Figure 3.2. Functional Decomposition Diagram.
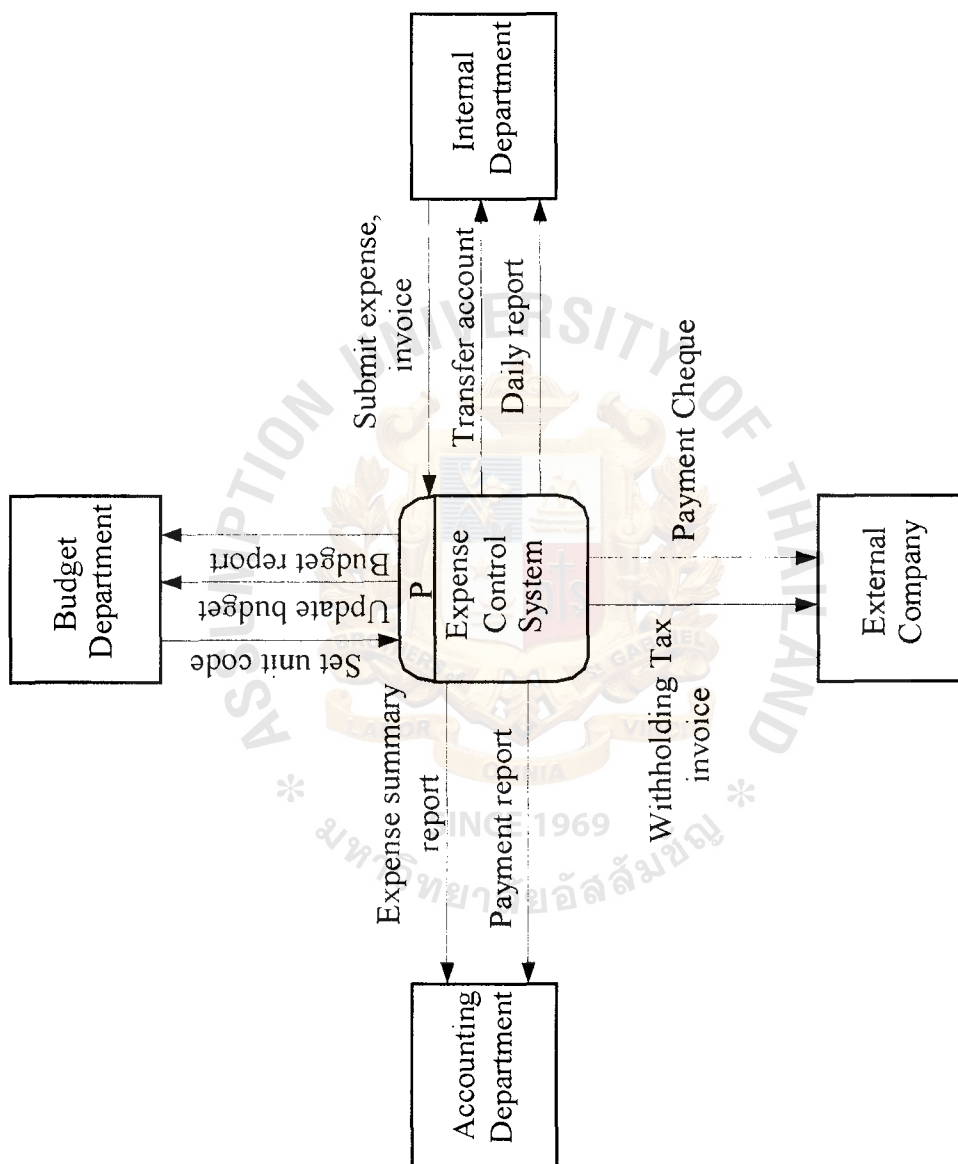
Figure 3.3.   Context Diagram of Proposed System.

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3.2.1 DFD Level-0

The context diagram of proposed system shown in Figure 3.3 can be expanded to DFD level 0 in Figure 3.4, which consists of the following seven processes.

Process 1: User Entry

An officer must have a user id and password for entering the proposed system.

Process 2 : Expense Requisition Entry

Each department has its own expense. A user must enter the proposed system and input the expense requisition into the system. If each department has budget for debit expense, the department can request the expense and submit it to the budgeting department and vice versa. The system deducts the budget of the department.

Process 3 : Verify Expense

Both the system and expense documents are reconciled information. If there is any incorrect information, the system sends it back to the original department.

Process 4 : Payment

There are 2 alternative payments, transfer account number for each department and issue cheque for the supplier.

Process 5 : Generate Reports

There are 2 types of reports, daily and monthly, and they are automatically generated by the system. IT Administration will retrieve the report from the database by the specific format. Daily expense is mostly used for day-to-day operations. Monthly report, as a summary report, will be provided for the management level to make further decision, and controlling and planning.

Process 6 : Maintenance Expense Information

Expense Request Form must have update expense code to match expense name for user to choose information and record it in the database.

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Process 7 : Maintenance Budget Information

       Every department has to submit the updated budget in the system to the Budgeting Department. The new system will update the data user use to provide accuracy and data integrity.
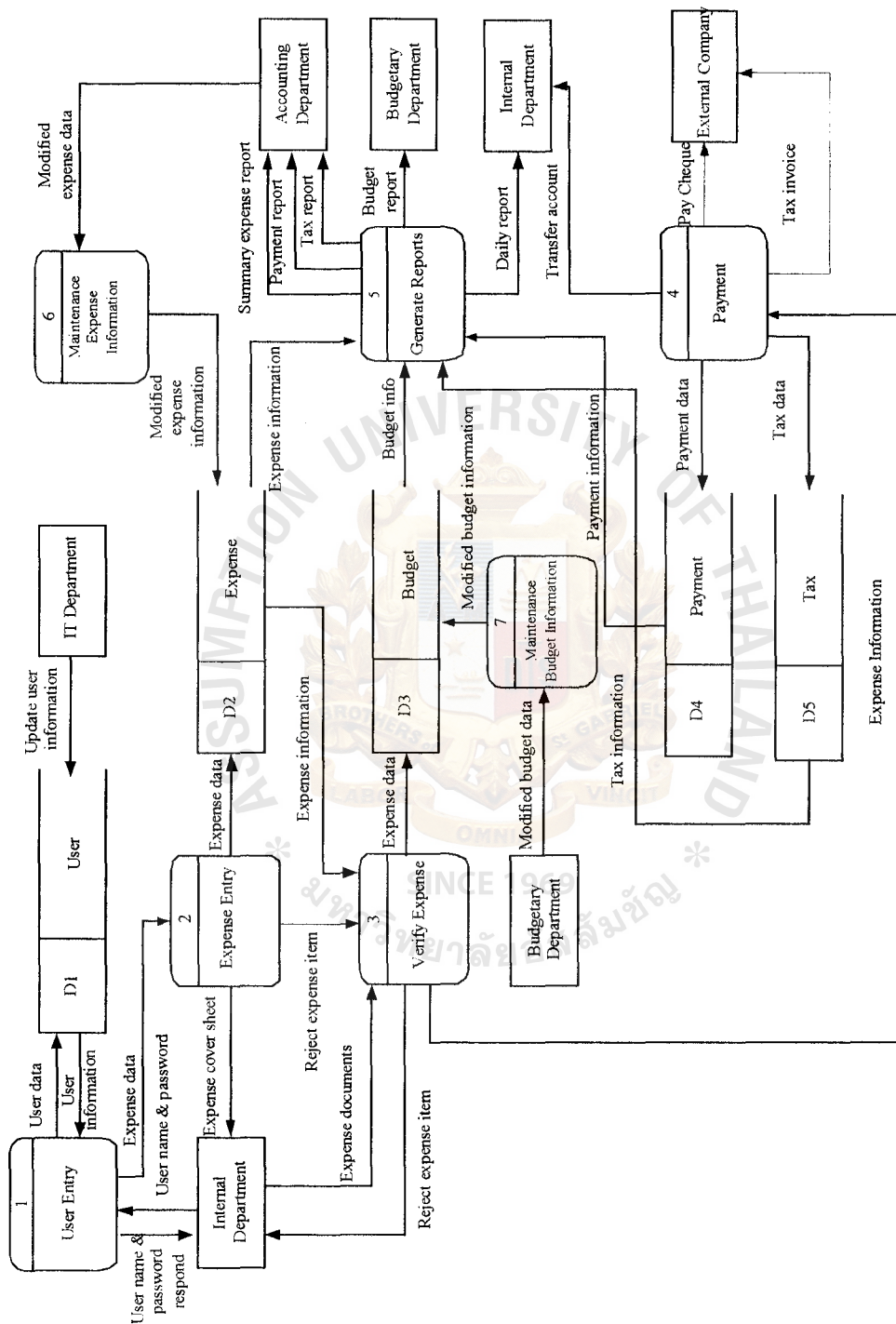
Figure 3.4. Level 0 Logical Data Flow Diagram of Proposed System.

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3.2.2 DFD Level-1

Some processes can be divided into sub-processes, which are shown in the following DFD level-1:

(1)   DFD level-1 of process 1:   User Entry (Figure 3.5)

Process 1.1   Log in

The user is selected for entering the new system.

Process 1.2   Receive User ID and Password

The user enters user name and password in the system.

Process 1.3   Checking User ID

User name and password is checked. if invalid, that user can not enter the new system.

(2)   DFD level-1 of process 2:   Expense Entry (Figure 3.6)

Process 2.1   Calculate Total Expense

Expense data is filled in the blank. The system will calculate the expense amount and withholding tax.

Process 2.2   Payment Term

The requester selects payment method. Internal department must be payee only but payment for supplier is by cheque.

Process 2.3   Credit Details

In this field requester must make sure to change to department for debit budget.

Process 2.4   Print Cover Sheet

The requester must print out cover sheet before requester concurs to the management system. Cover sheet is necessary for reconciling with the requisition document for verifying process.

Process 2.5 Submit Expense

The system must prepare budget remaining for debit expense. Management approves the expense and submit via the system to budgeting department.

(3) DFD level-1 of process 3: Verify Expense (Figure 3.7)

Process 3.1 Checking Expense Details

The officer receives cover sheet and requisition documents from the requester department and opens expense reference number for checking requisition system with requisition document.

Process 3.2 Checking Unit Code

Management approves expense of the department and checks unit information.

Process 3.3 Checking Tax Details

Check the kind of withholding tax and calculate withholding tax amount to pay.

Process 3.4 Rejected Expense Item

Expense requisition documents and information in the system do not match, so the officer must be send them back and the system will change the status to rejected.

(4) DFD level-1 of process 4: Payment (Figure 3.8)

Process 4.1 Transfer Account

Pay the amount via systematic system by savings account of the department, after payment complete and status is changed in the new system.

Process 4.2 Issue Cheque

Supplier receives cheque with approval of budgeting department.

Process 4.3   Issue Tax Invoice

Supplier receives withholding tax invoice with approval of budgeting department.

(5)   DFD level-1 of process 5:   Generate Reports (Figure 3.9)

Process 5.1 Generate Daily Reports

Requester can generate last updated expense report in the system at any time they want.

Process 5.2   Generate Expense Report

At the end of month/day the system provides expense report from server to each department.

Process 5.3   Generate Budget Report

At the end of month the system will provide summary budget report to budgeting department.

Process 5.4   Generate Tax Report

At the end of month the system will provide withholding tax report to budgeting department which sends it to the revenue department.

(6)   DFD level-1 of process 6:   Maintenance Expense Information (Figure 3.10)

Process 6.1   Update Expense Code

Expense Code needed for requester chooses the correct expense and record it in the proposed system.

Process 6.2   Update Expense Name

Expense name must match expense code, which the requester selected and recorded in the proposed system.

(7)   DFD level-1 of process 7:   Maintenance Budget Information (Figure 3.11)

Process 7.1   Update Unit Code

Every department must have a unit code (Identification) for setting the budget in the system. When the department has an expense, it is deducted from the budget. For a new department it must be setup in the system before using the budget.

Process 7.2   Update Budget

Every department has a period to set up the allocation of budget every year to the Budgeting Department which on getting the information will update (increase/decrease) the budget of the department as soon as possible.
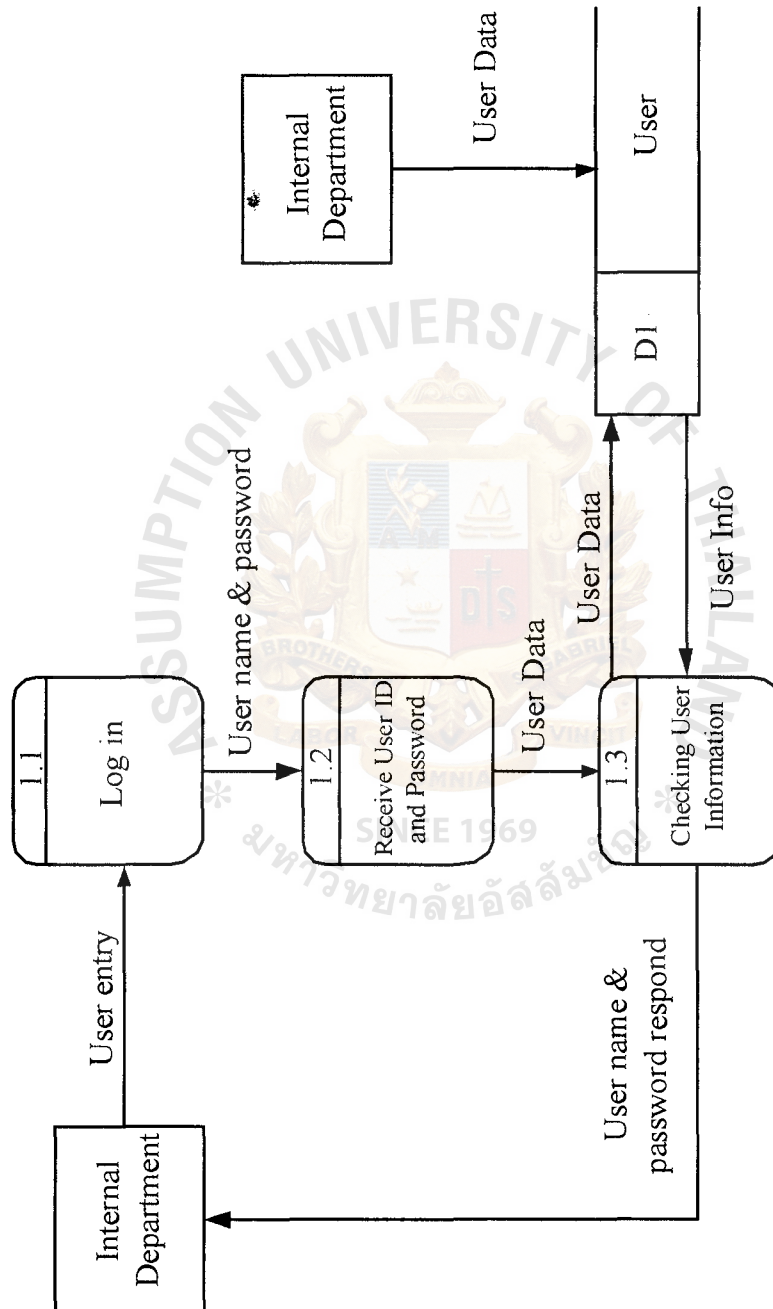
Figure 3.5. Level 1 Logical Data Flow Diagram of User Entry Process.
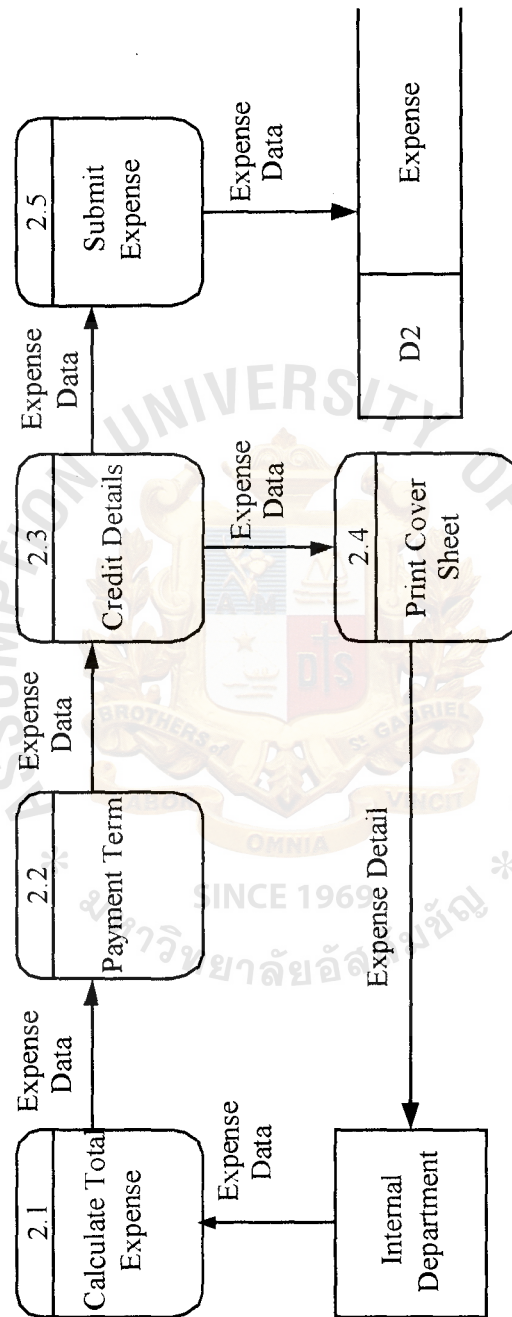
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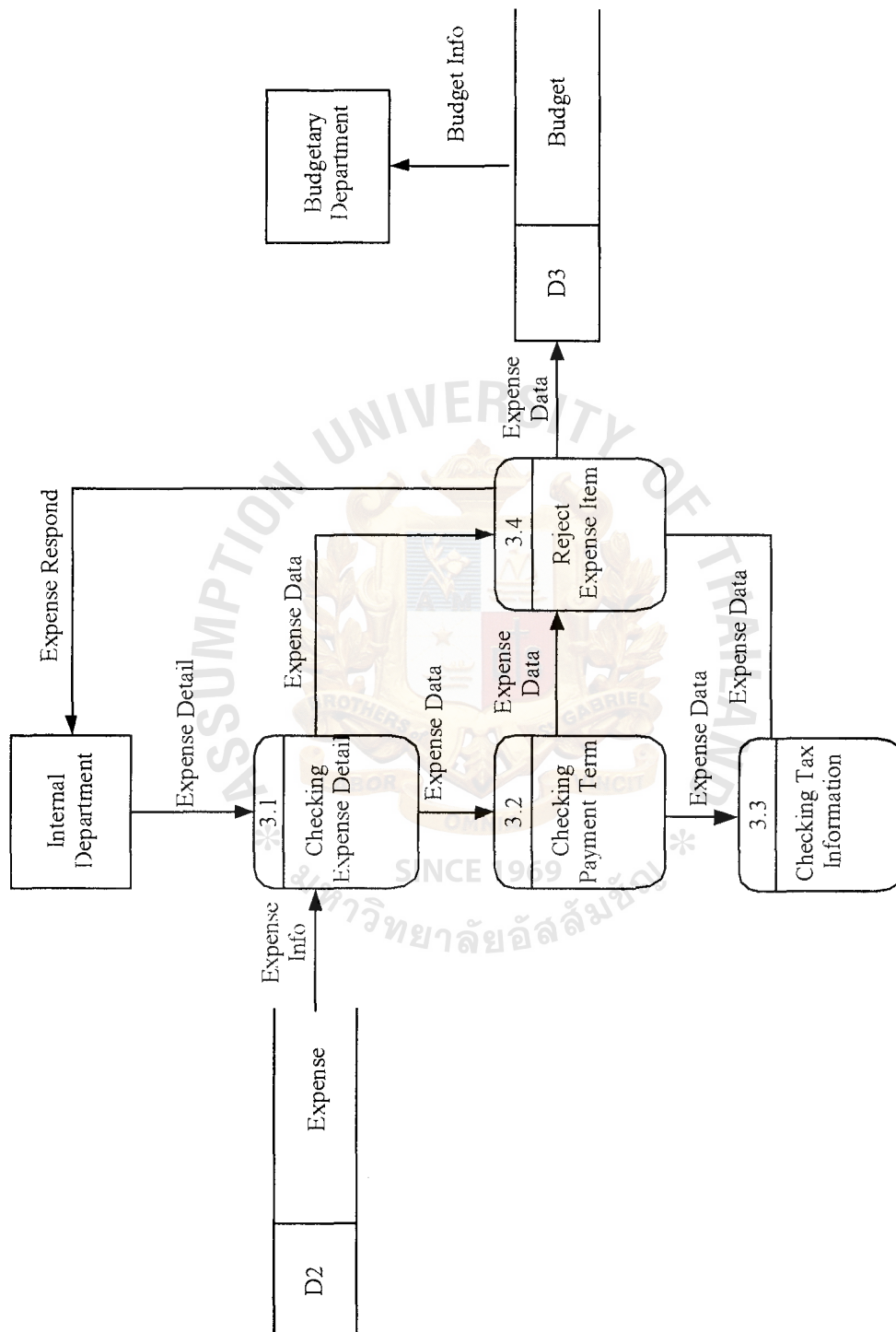
Figure 3.7. Level 1 Logical Data Flow Diagram of Verify Expense Process.
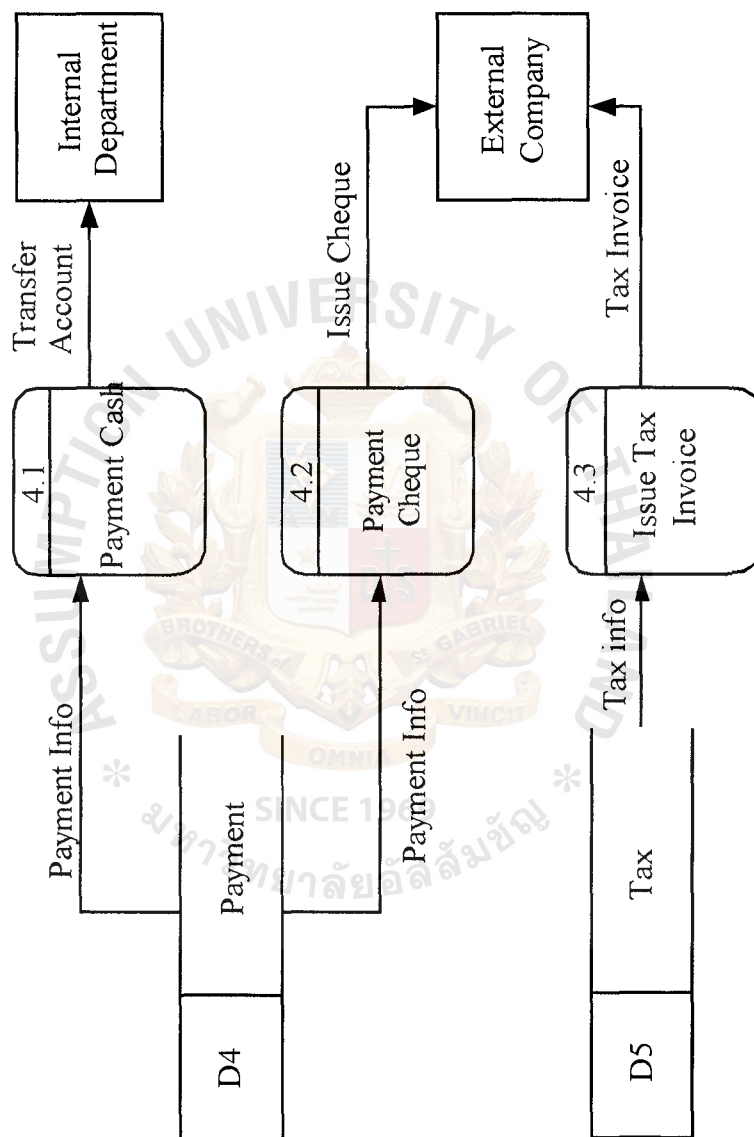
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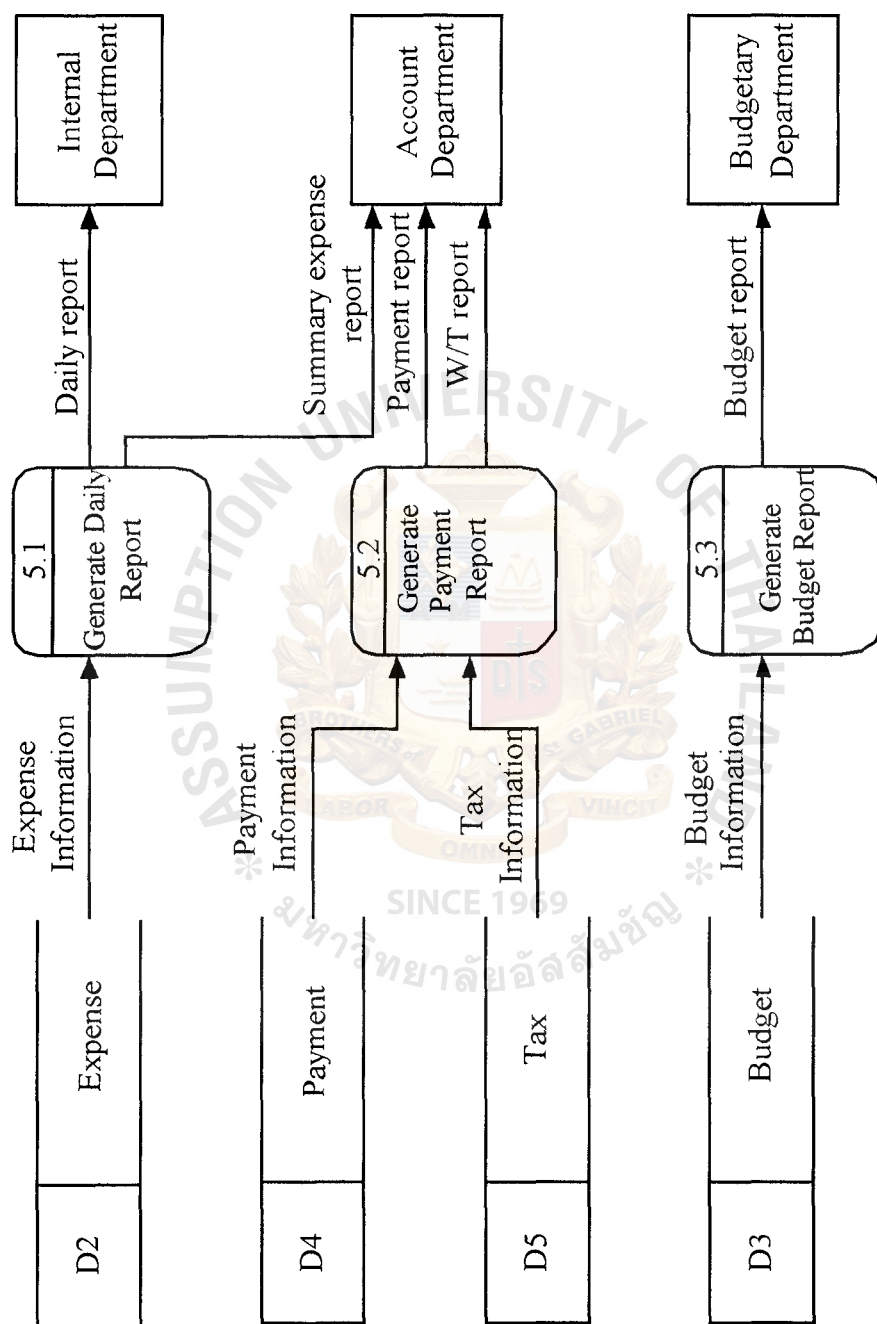
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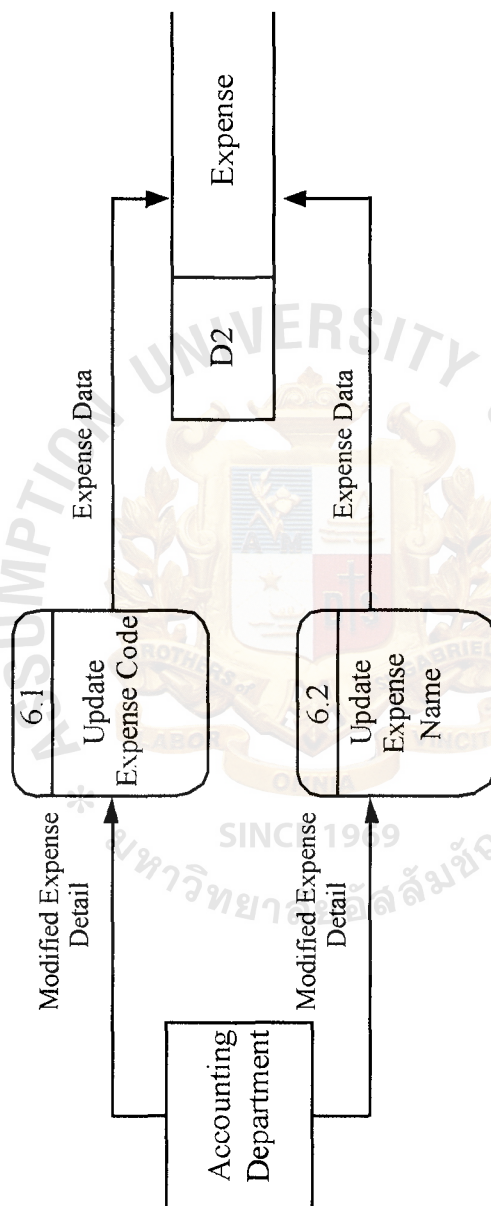
Figure 3.10.   Level 1 Logical Data Flow Diagram of Maintenance Expense Process.

Candidate Solutions

Given the business requirement established in the previous section, the alternative candidate solutions can be identified from the idea and opinion of the development team and user. Along with reviewing the system specification, the three candidate solutions can be defined for the proposed system.

(1)   Candidate 1: Resources Sharing LAN – File Server

MS Visual Basic 6.0 is a very popular development tool. The existing programmer can use it without any technical assistance. As a visual style of MS product, it facilitates the programmer to develop the new application quickly. For network architecture, the file server is used in this candidate to store the database, and the Client PC executes all database instructions. This means that the entire database and tables may have to be transported to and from the client across the network. The database software, MS Access 2000, is used to manage data in the system.

This candidate is easy to implement because MS Visual Basic 6 is available for the programmer to use, and the current network architecture, Local Area Network (LAN), also supports this kind of configuration. Thus, this candidate takes less time to design and implement in the current environment.

(2)   Candidate 2: Two Tier Client/Server Computing – Database Server

Developer 2000 and Oracle 10 are used as Development Tool and Database Software respectively. This solution supports the multi-user environment and relational database technology. Database Server is used to follow the concept of two-tier Client/Server Computing.

Table 3.1   Candidate Systems 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.	Fully supported all relevant departments involved in expense process.	Same as candidate 1	Same as candidate 1
Benefits Brief description of the business benefits that would be realized for this candidate.	Easy to develop with the existing tools.	Powerful DBMS and application enable user performing their tasks more efficiently and effectively.	Quickly implemented on client PC and easy application development.
Servers and Workstations A description of the servers and workstations needed to support this candidate.	Pentium 4, MS Windows 2000 Server, and MS Windows XP.	Same as candidate 1	Same as candidate 1
Software Tools Needed Software tools needed to design and build the candidate (e.g., database management system, emulators, operating system, emulators, operating systems, languages, etc.). Not generally applicable if applications software packages are to be purchased.	Microsoft Visual Basic 6.0 Microsoft Access 2000	Developer 2000 Oracle 10	Lotus Notes R5 Lotus Domino Server
Application Software A description of the software to be purchased, built, accessed, or some combination of these techniques.	Custom Solution	Same as candidate 1	Same as candidate 1
Method of Data Processing Generally some combination of: on-line, batch, deferred batch, remote batch, and real-time.	Database stored on server and processed on workstation.	Oracle uses a two tier Client/Server architecture with a powerful database server.	Lotus Notes uses a two tier Client/Server architecture with a powerful database server.
Output Devices and Implications A description of output devices that would be used, special output requirements (e.g., network, preprinted forms, etc.), and output considerations (e.g., timing constraints).	Display Monitor HP laser printer Dot Matrix	Same as candidate 1	Same as candidate 1
Input Devices and Implications A description of input methods to be used, input devices (e.g., keyboard, mouse, etc.), special input requirements (e.g., new or revised forms from which data would be input), and input considerations (e.g., timing of actual inputs).	Keyboard & Mouse	Same as candidate 1	Same as candidate 1
Storage Devices and Implications Brief description of what data would be stored, what data would be accessed from existing stores, what storage media would be used, how much storage capacity would be needed, and how data would be organized.	File Server with 20 GB storage capacity	Oracle Server DBMS with 50 GB storage capacity.	Lotus Domino Server DBMS with 50 GB storage capacity.

Feasibility Analysis

After the candidate solutions are identified, the feasibility analysis can be done for each candidate. The following feasibility criteria should be taken into consideration when the development team wants to select the best solution to implement in the production environment.

(1) Operation feasibility

It is a measure of how well the solution of problems or a specific solution will work in the organization. It is also a measure of how people feel about the system/project. All candidates are fully feasible because it can be implemented very quickly without additional software installation and hardware upgrades.

(2) Technical feasibility

It is a measure of the practicality of a specific technical solution and the availability of technical resources and expertise. Candidate 2 is the most difficult to implement because the current staffs have a little experience about its development too, whereas Candidate 1 and 3 are easy to design and implement because the current programmers are fully experienced with MS Visual Basic 6.0 and Lotus Notes.

(3) Economic feasibility

It is a measure of the cost-effectiveness of a project or solution. Candidate 2 is the most expensive solution because it requires a database specialist and a powerful hardware to implement and maintain it. In contrast, Candidate 1 and 3 require only a medium hardware and a system analyst to implement and operate the developed system.

(4)   Schedule feasibility

It is a measure of how reasonable the project timetable is. Candidate 1 takes the least time to implement because the development tool, Lotus Notes R5, is the company standard and a rapid application development solution. Candidate 3 spends slightly more time than Candidate 1 but it is also a quickly implemented solution. Conversely, Candidate 2 consumes the most time to design and implement the proposed system because the oracle product is very complicated and difficult to learn without any technical assistance from Oracle Company.

Up to this point, all four feasibility criteria assessments are provided for each candidate solutions. The score is then assigned to each feasibility criteria for each candidate, and multiplied by the weight, which is expressed in percentage, distributed from the total 100% to all four-feasibility criteria according to their degree of importance. The weight scores of each feasibility criteria are summed up for each candidate to rank the candidate solution of the proposed system.

The feasibility analysis result reveals that Candidate 3 has the highest scores in Operational, Technical and Economic Feasibility except in Schedule Feasibility, which is topped by Candidate 1. Thus, Candidate 3 has the highest total score, and ranks the best solution for the proposed system.

Table 3.2 shows the completed feasibility analysis matrix for each candidate. In addition, the full details of cost-benefit calculation (Economic Feasibility) are shown in Appendix H, which are all Candidate Cost tables, Payback table and graph, and Net Present Value (NPV) table.

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Table 3.2 Feasibility Analysis Matrix

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility **Functionality**. A description of to what degree the candidate would benefit the organization and how well the system would work. **Political**. A description of how well received this solution would be from both user management, user, and organization perspective.	30%	Fully supports user required functionality. Score: 80	Same as candidate 1 Score: 80	Fully supports the user requirements with quick implementation because it does not require the additional software installation on client PC Score: 90
Technical Feasibility **Technology**. An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate. **Expertise**. An assessment of the technical expertise needed to develop, operate, and maintain the candidate system.	20%	Current technical staff has full experience with Microsoft product, therefore the development process can be done easily and smoothly. Microsoft Visual Basic 6.0 is a company standard and mature technology based on version number. Score: 95	Although current technical staff has a little experience with oracle product, the management fully supports training and using oracle product. Oracle is a company standard and requires the continuous training course for operating course for operating and maintaining the system because it has no guarantee of its future version. Score: 75	Lotus Domino Server is the simplest way to develop database, and Lotus Notes is available in all company's PC. It can be proved that it is suitable for a system with a large number of users. Score: 100
Economic Feasibility **Cost to develop:** **Payback period (discounted):** **Net present value:** **Detailed calculations:**	30%	Approximately 562,400 Baht. Approximately 2.34 Years. Approximately 699.011.26 Baht. See Appendix H: Score: 80	Approximately 948,400 Baht. Approximately 3.85 Years. Approximately 313,011.26 Baht. See Appendix H: Score: 80	Approximately 624,400 Baht. Approximately 2.59 Years. Approximately 637,011.26 Baht. See Appendix H: Score: 80
Schedule Feasibility An assessment of how long the solution will take to design and implement.	20%	Approximately 4 months Score: 90	Approximately 10 months Score: 60	Approximately 6 months Score: 80
Ranking	100%	85	66	90

3.3 Hardware and Software Requirements

3.3.1 Architecture solutions

The proposed system is designed to use Microsoft NT Server 4.2 and Microsoft Windows 2000 specification for software server. For each client workstation, system specification is Microsoft Windows NT up for software. For application software, Lotus Notes R5 and Lotus Domino Server can support entire user requirements and business processes. A network environment is set as a client/server computing. For the output from the system, it is generated by new work printers as Hewlett-Package LaserJet 2100 and EPSON LQ300 generating documents and withholding tax invoice that need carbon copies. The input of this solution uses a keyboard and mouse. In the part of data storage, Lotus Domino server DBMS is used to manage the database, with hard disk 40 gigabytes capacity for storage of data and backup tape device for data backup.

A network environment is set as a client/server computing. The information system's database, software and interface are distributed across a network of clients and servers that communicate and coorporate to accomplish the objectives. The proposed system adopts client/server computing (Two-Tier Client/Server) connected by the Local Area Network (LAN) using star topology with many switching hubs. This architecture places the information system's stored data on server and the business logic and user interfaces on a client. Since the data is stored at the server side, other departments of the organization can access and use the information across the network.

In the part of data storage, Lotus Domino Server as Distributed Relational Database Management System is used that can control access to and maintenance
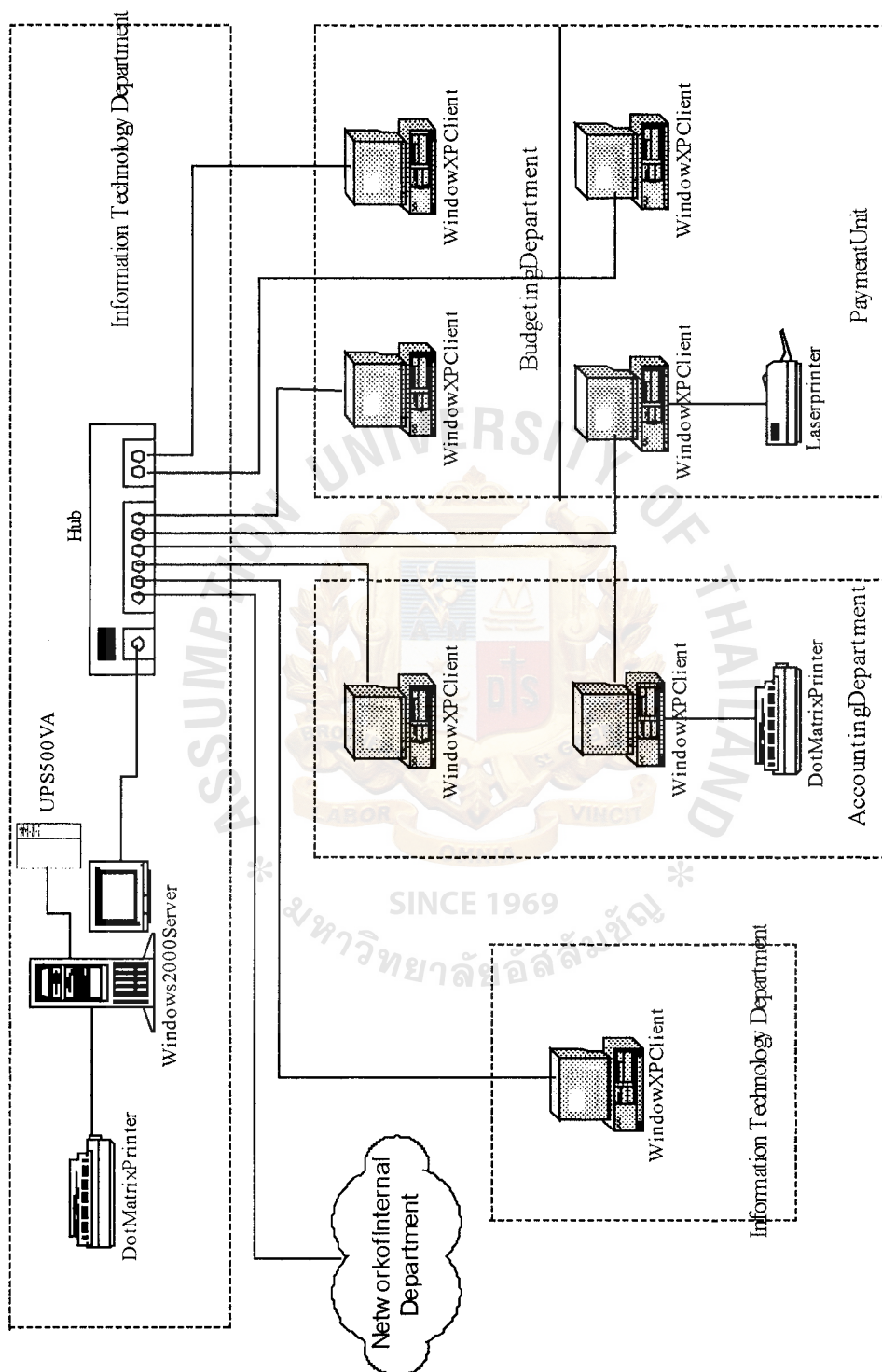
Figure 3.12.   Hardware Configuration of Expense Control System for Commercial Bank.

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of the data stored. It also provides more sophisticated backup, recovery, security, integrity and processing.

3.3.2 Hardware and Software Specifications

Table 3.3. Hardware Specifications for Server.

Hardware	Specification
CPU	Intel Pentium 4 Processor
Memory	512 MB
Hard Disk	40 GB
Floppy Drive	1.44 MB
CD-Rom Drive	52X
Monitor	15 inches
Input Device	Keyboard and Mouse
Network Adapter	Ethernet 10/100 Mbps
Display Adapter	SVGA card
Backup	Back Tape Device
UPS	500 VA
Modem	56 Kbps
Printer	Dot Matrix

Table 3.4. Software Specification for Server.

Software	Specification
Operating System	Microsoft NT Server 4.2 (Service Pack 4)
Database Server	Lotus Domino Server

Table 3.5.   Hardware Specification for Each Client Machine.

Hardware	Specification
CPU	Intel Celeron Processor 1.8GHz
Memory	128 MB or higher
Hard Disk	20 GB
Floppy Drive	1.44 MB
CD-Rom Drive	52X
Monitor	15 inches
Input Device	Keyboard and Mouse
Network Adapter	Ethernet 10/100 Mbps
Display Adapter	SVGA card
Printer	Dot Matrix, Laser Jet

Table 3.6.   Software Specification for Each Client Machine.

Software	Specification
Operating System	Microsoft Windows XP Professional
Application Software	Lotus Notes R5

3.4 Security and Control

The proposed system security serves all confidentiality, integrity and availability. Authority to access the system serves confidentiality. The Manager can access approved transactions and all the reports but do not have authority to input data. Each department has authorized access only in the part which concerns their work. Integrity can be served by centralized database, which provides correct and up-to-date data. Server backup and recovery means are provided to meet availability requirement. The procedure involves keeping records of daily transactions on backup tape, which has 5 copies for 5 days' operation and the tape will be reused for the following week's transactions. Such a backup tape is called History file. Moreover, once a week Master File will be kept as a backup. If the system goes down, the old master file and history file will be used to recover the transactions.

Controlling is concerned with the way to make the system work correctly and properly to serve the company's objectives. The procedure involves input control, process control, output control and administrative control.

Input control : input data must be validated and input by authorized person

Process control : backup tape device and UPS can be used to recover and restore the system operation

Output control : the system provides information to authorized persons only

Administrative control : Segregation between operation level and management level is required to ensure that only appropriate verification and approved transactions are done by the operation level, such as adding a new customer has to be approved by the management.

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3.5 Cost and Benefit Analysis

3.5.1 Breakeven Analysis

It is essential to analyze the cost between the existing system and the proposed system before starting to develop the new system. The description of system operation and maintenance cost of the existing system and the proposed system are shown as follows.

(1) Costs of Manual System

Table 3.7. Manual System Cost Analysis, (in Baht).

Cost items		Years				
		1	2	3	4	5
Fixed Cost:						
Calculator	10 units @ 2,050	20,500.00	–	–	–	–
Operating Cost :						
Officer	4 perrsons @12,000	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Senior Officer	2 persons @ 15,000	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
Accounting Officer	2 persons @ 15,000	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
Budgeting officer	2 persons @ 16,000	32,000.00	35,200.00	38,720.00	42,592.00	46,851.20
Total Monthly salary Cost		140,000.00	154,000.00	169,400.00	186,340.00	204,974.00
Overtime Annual for 4 persons		72,000.00	79,200.00	87,120.00	95,832.00	105,415.20
Total Annual Salary Cost		1,752,000.00	1,927,200.00	2,119,920.00	2,331,912.00	2,565,103.20
Office Supplies & Miscellaneous Cost:						
Paper	Per Annual	22,176.00	22,841.28	23,526.52	24,232.31	24,959.28
Utility	Per Annual	16,200.00	16,686.00	17,186.58	17,702.18	18,233.24
Stationary	Per Annual	1,500.00	1,545.00	1,591.35	1,639.09	1,688.26
Miscellaneous	Per Annual	2,000.00	2,060.00	2,121.80	2,185.45	2,251.01
Total Annual Office Supplies, Utility and Miscellaneous Cost		41,876.00	43,132.28	44,426.25	45,759.04	47,131.81
Total annual operating Cost		1,793,986.00	1,970,332.28	2,164,346.25	2,377,671.04	2,612,235.01
Total Manual System Cost		1,814,486.00	1,970,332.28	2,164,346.25	2,377,671.04	2,612,235.01

Table 3.8. Five Years Accumulated Manual System Cost, (in Baht).

Year	Total Manual Cost	Accumulated Cost
1	1,814,486.00	1,814,486.00
2	1,970,332.28	3,784,818.28
3	2,164,346.25	5,949,164.53
4	2,377,671.04	8,326,835.57
5	2,612,235.01	10,939,070.58
Total	10,939,070.58	-

(2)   Costs of Computerized System

Table 3.9.   Computerized System Cost Analysis, (in Baht).

Cost items		Years				
		1	2	3	4	5
Maintenance Cost:						
Maintenance Cost		30,900.00	30,900.00	30,900.00	30,900.00	30,900.00
(10% of Hardware cost)						
Total Maintenance Cost		30,900.00	30,900.00	30,900.00	30,900.00	30,900.00
Operating Cost People-Ware Cost:						
Officer	2 persons @ 12,000	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Senior Officer	2 persons @ 15,000	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
Accounting Officer	2 persons @ 15,000	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
Budgeting officer	1 person @ 16,000	16,000.00	17,600.00	19,360.00	21,296.00	23,425.60
System Administrator	1 person @ 15,000	15,000.00	16,500.00	18,150.00	19,965.00	21,961.50
Total Monthly Salary Cost		115,000.00	126,500.00	139,150.00	153,065.00	168,370.90
Total Annual Salary Cost		1,380,000.00	1,518,000.00	1,669,800.00	1,836,780.00	2,020,450.80
Office Supplies & Miscellaneous Cost:						
Preprinted Form 1 sheet @ 1.20		75,000.00	77,250.00	79,567.50	81,954.53	84,413.16
Stationary	1,500 per month	18,000.000	18,540.00	19,096.20	19,669.09	20,259.16
Paper	Per Annual	16,632.00	17,130.96	17,644.89	18,174.24	18,719.46
Ribbon for Printer	Per Annual	12,150.00	12,514.50	12,889.94	13,276.63	13,674.93
Utility	Per Annual	5,000.00	5,150.00	5,304.50	5,463.64	5,627.54
Miscellaneous	Per Annual	15,000.00	15,450.00	15,913.50	16,390.91	16,882.63
Total annual Office Supplies, Utility and Miscellaneous Cost		141,782.00	146,035.46	150,416.52	154,929.02	159,576.89
Total Operating Cost		1,521,782.00	1,664,035.46	1,820,216.52	1,991,709.02	2,180,027.69
Total Computerized System Cost		1,552,682.00	1,694,935.46	1,851,116.00	2,022,609.02	2,210,927.69

Table 3.10. Five Years Accumulated Computerized Cost, (in Baht).

Year	Total Computerized Cost	Accumulated Cost
0	624,400.00	624,400.00
1	1,552,782.00	2,177,182.00
2	1,694,935.46	3,872,117.46
3	1,851,116.00	5,723,233.46
4	2,022,609.02	7,745,842.48
5	2,210,927.69	9,956,770.17
Total	9,956,770.17	-

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Table 3.11. The Comparison of the System Costs between Manual System and Computerized System, (in Baht).

Year	Accumulated Manual Cost	Accumulated Computerized Cost
0	-	624,400.00
1	1,814,486.00	2,177,182.00
2	3,784,818.28	3,872,117.46
3	5,949,164.53	5,723,233.46
4	8,326,835.57	7,745,842.48
5	10,939,070.58	9,956,770.17
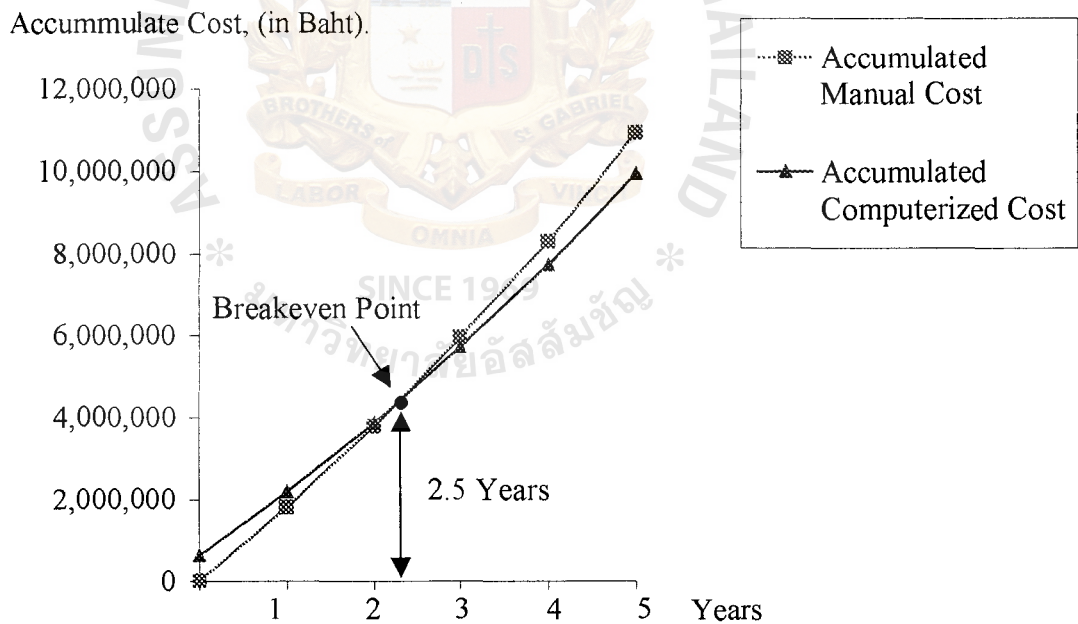
Figure 3.13. Cost Comparison between Manual and Proposed System.

3.5.2 Payback Period Analysis

The decision criterion: If payback period is less than or equal to the system's useful life, the project is accepted. If payback period is greater than the system's useful life, the project is rejected.

Figure 3.14. shows the payback period of the proposed system that has already been calculated to evaluate the candidate solution (See the full details of payback calculation in Table H.6. on appendix H). The lifetime costs are gradually increasing over the five-year period because operating costs are being incurred. But it also can be noticed that the lifetime benefits are occurring at a much faster pace. The result of payback period is 2.59 years, which is less than the predefined maximum desired payback period (3 years). Thus, this project is acceptable to implement with the return on investment to recover the initial investment.

Payback Period = Last year of negative + $\frac{\text{Cumulative difference last negative year}}{\text{Absolute value of cumulative difference}}$

$$= 2 + \frac{145,954.42}{145,954.42 + 102,750.40}$$
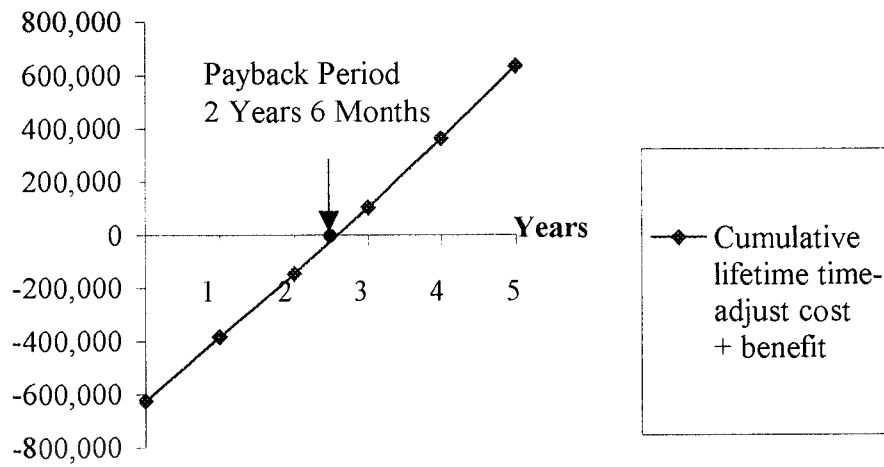
$$= 2.59 \text{ Years}$$

Accumulated Cost, (in Baht).

Figure 3.14.   Payback Period.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

Implementation is a process of assuring that the information system is operational. The actual implementation will follow the project schedule as a guideline. However, additional factors that arise in the normal course of the project evolution should be considered. The team must establish plans according to the phase in deliverables in a reasonable manner.

The implementation process starts after management has accepted the proposed system. Implementation consists of the installation of the new system that shows the current system. It mainly involves software development program, training the system user, and also implementation into the existing computer hardware environment.

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

Before the software application is designed for the new system, software development fundamental should have good quality with user friendliness and responding user functions.

4.2 Test Plan

Testing is the process of executing all or some parts of the system in order to discover any errors. Testing of specific programs, subsystems and the total system is essential for quality assurance of software. It is done to display up any existing problems with programs and their interface before the system is actually used. Typically, testing is carried out by means of bottom-up fashion, which is described as follows :

(1)   Program Testing

The programmers need to test the program to make sure that every module can work correctly by creating test data. Test data must be both position test (valid data) and negative test (invalid data) in order to test that the program can perform its function correctly.

(2)   User Acceptance Testing (UAT)

Users have to test whether the system can serve all users' requirement and work properly by using their own test data, which may be the daily transactional data under normal operating conditions. If the system does not get user acceptance, the programmer has to review the program until it meets user's satisfaction.

(3)   System Testing

This is to ensure that the entire system can be run together and verify that the program can meet the original programming specifications. Furthermore the system needs to perform all functions properly.

(4)   Security Test

The programmer must test whether or not the system can serve security requirements such as authorized access to the system, etc.

4.3   Conversion

Since there are some historical data kept in the legacy system and the hard copies, some of these data will need to be converted in Microsoft Excel by using expense function and some of these data will be keyed in by manual operation. The next step required is to investigate the correctness of the imported data, edit and complete the missing points.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Expense Control System for Commercial Bank is designed and implemented to support user intercommunication, expense requisition, information providing, expense, budget and payment control, record keeping and report generating. The cost and benefit analysis of the project can serve the objectives in all operational work. The cost of computerized system implementation starts at 624,400.00 Baht. The comparison of the system cost between computerized system and manual system reveals 2.5 years of breakeven point and 2.59 years of payback period. This analysis result ensures that the proposed system is worth the investment. Table 5.1 shows the capability of the proposed system compared with the existing system as follows :

Table 5.1. Degree of Achievement.

Tasks	Processing Time	
	Manual System	Proposed System
User Entry	5 minutes	1 minute
Expense Requisition Entry	15 minutes	5 minutes
Verify Expense	20 minutes	10 minutes
Payment	10 minutes	5 minutes
Issue Withholding Tax	10 minutes	5 minutes

Table 5.1. Degree of Achievement (Continued).

Tasks	Processing Time	
	Manual System	Proposed System
Maintenance Expense Information	60 minutes	10 minutes
Maintenance Budget Information	30 minutes	5 minutes
Generate Daily Report	60 minutes	10 minutes
Generate Monthly Report	5 hours	30 minutes

The developed system provides an efficient workflow with lower cost of operation, which has the following descriptions.

(1) User Entry

The user easily connects to the system by intranet which is the current technology used to enhance capability to gain more volume and compete with competitors. This tool will reduce the cost of intercommunication between the internal users and the officer of budgeting department.

(2) Expense Requisition Entry

The expense information is automatically updated by the system when there is expense and total expense is calculated by expense category and withholding tax.

(3) Verify Expense

The officer verifies the expense requisition document together with the data in the system which is a current technology used to enhance

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capability to gain more volume. This tool will reduce redundancy of work between the internal user and the officer of the budgeting department.

(4) Payment

The payment is done via systematic way to transfer payment method who selected by General Ledger or issuing cheque transfer to savings account for inter department only and issue cheque to supplier.

(5) Generate Reports

Daily and monthly reports are easily generated by the system without error from redundancy of work. In the existing system, all departments have their own database to keep record of the transactions related to their department, there is more chance to generate errors in information and difficult for reconciliation between departments.

(6) Maintenance Expense Information

The system can updated and generate user expense information report within 5 minutes but in the manual system it is slow and difficult to do it.

(7) Maintenance Budget Information

The system can update and generate user, budget information report within 5 minutes.

5.2 Recommendations

Since the proposed system is expected to reduce problems of the existing system, the proposed system will be computerized, hence some functions are new for users. So, in the training, technical staff should pay more attention in order to understand all details and functions of the system properly, especially how to use the proposed system.

Expansion and upgrading are required when the organization expands its expense and operations in the future. The plan is expected to expand the system in the future for

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expense and payment transaction. The next development plan is datamining, which is software tools for the organization to analyze large pools of data to find the pattern and rules that can be used to guide decision making and to predict future behavior. Datamining enables organization to analyze volume requiting patterns, tastes and preferences in order to provide efficiency launch budget control.

APPENDIX   A

USER INTERFACE DESIGN

Figure A.1. System Login.

Figure A.2. Main Menu Form.

Figure A.3. Menu View Status.

Figure A.4.   Expense Draft Form.

Figure A.5.   Expense Cancelled Form.

Figure A.6.   Expense Pending Payment Form.

Figure A.7. Expense Completed Form.

Figure A.8. Alert message to reconfirm Payment Transaction.

Figure A.9.   Alert message to reconfirm Expense Transaction.

Figure A.10.   View BA.

Figure A.11.   Update Budgeting Allocation.

Figure A.12. Withholding Tax Form.

APPENDIX B

REPORT DESIGN

Cover Sheet

Reference No   663-99-01-00001

Department   663 Direct Sale Force

Requester   Kingkaew Saiklai

Telephone_Number   1612

Date   9/2/2003

Net Amount   6,220.00

Figure B.1.   Cover Sheet.
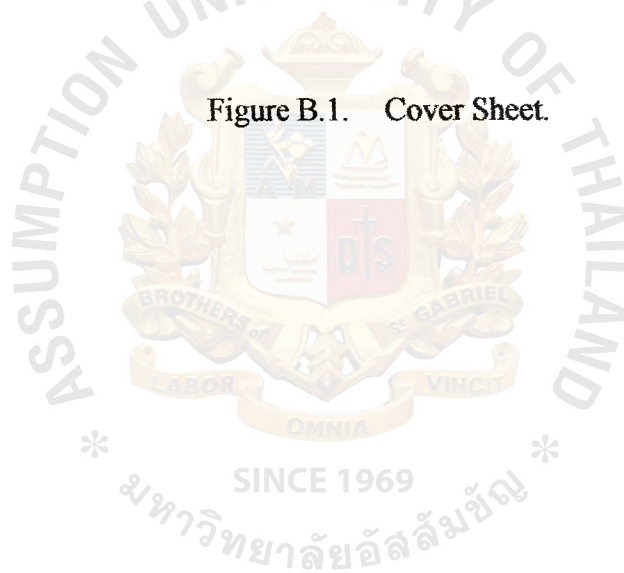
Adam Bank Public Company Limited
Summary Expense Report

Department	Date	Reference No	A/C No Name	Amount	Vat	W/T	Net Amount
683 Direct Sale Force	9/2/2003	663-98-01-00001	59595005 คชจ. ยืมค่าทางด่วนและค่าผ่านทางในประเทศ	6,220.00	0.00	0.00	6,220.00
					Total		6,220.00
674 Operational Risk Management	2/9/2003	681-03-01-00998	59505005 คชจ.ยืมค่าจับรถ	2,300.00	0.00	0.00	2,300.00
					Total		2,300.00
681 Purchasing Unit	1/3/2003	682-03-01-00023	55095010 คชจ. บริหารทนะค่าน้ำมัน	2,000.00	0.00	0.00	2,000.00
					Total		2,000.00
918 Domestic Banking Services Department	5/4/2003	918-22-01-12231	55095010 คชจ. บริหารทนะค่าน้ำมัน	2,000.00	0.00	0.00	2,000.00
					Total		2,000.00
918 Domestic Banking Services Department	5/5/2003	918-03-05-00333	55095010 คชจ. บริหารทนะค่าน้ำมัน	2,000.00	0.00	0.00	2,000.00
					Total		2,000.00
918 Domestic Banking Services Department	5/6/2003	918-03-05-00983	55095010 คชจ. บริหารทนะค่าน้ำมัน	2,000.00	0.00	0.00	2,000.00
					Total		2,000.00
920 Compensation and Benefit	4/6/2003	920-03-01-00897	55095010 คชจ. บริหารทนะค่าน้ำมัน	2,000.00	0.00	0.00	2,000.00
					Total		2,000.00

Figure B.2.   Summary Expense Report.

Adam Bank Public Company Limited
Expense Report by Department

March 2003

987 Card Processing Department

Date	A/C No and Name	Amount	Vat	W/T	Net Amount
02/03/2003	59595045 ศฬจ. อื่น-ค่าวารสาร สิ่งพิมพ์	210.00			210.00
06/03/2003	59595045 ศฬจ. อื่น-ค่าเครื่องเขียน	180.00			180.00
21/03/2003	59595045 ศฬจ. อื่น-ค่างานบริการพิมพ์เอกสาร	2,800.00			2,800.00
24/03/2003	59595045 ศฬจ. อื่น-ค่ารักษาพยาบาล	1,250.00			1,250.00
Grand Total		4,440.00			4,440.00

Figure B.3.   Expense Report by Department.

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Adam Bank Public Company Limited
Budget Allocation by Department

987 Card Processing Department

March 2003
Budget Balance : 350,000 Baht

Date	A/C No and Name	Expense	Available
02/03/2003	59595045 คปจ.อืน-ค่าวสาร สิ่งพิมพ์	210.00	349,790.00
06/03/2003	59595045 คปจ.อืน-ค่าเครื่องเขียนฯ	180.00	349,610.00
21/03/2003	59595045 คปจ.อืน-ค่าแบบพิมพ์และกระดาษ	2,800.00	346,810.00
24/03/2003	59595045 คปจ.อืน-ค่ารักษาพยาบาล	1,250.00	345,560.00
Budget Allocation		4,440.00	345,560.00

Figure B.4.   Budget Allocation by Department.

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Adam Bank Public Company Limited
Payment Report for March, 2003

Date	Company Name	Amount	Vat	Total	W/T	Net Amount
03/03/2003	Index Company Limited	25,000.00	1,750.00	26,750.00	750.00	26,000.00
08/03/2003	Index Company Limited	30,000.00	2,100.00	32,100.00	900.00	31,200.00
13/03/2003	Verasu Company Limited	3,500.00	245.00	3,745.00	105.00	3,640.00
16/03/2003	Index Company Limited	5,500.00	385.00	5,885.00	165.00	5,720.00
20/03/2003	Index Company Limited	55,000.00	3,850.00	58,850.00	1,650.00	49,500.00
23/03/2003	Naratana Construction Co., Ltd.	150,000.00	10,500.00	160,500.00	4,500.00	156,000.00
29/03/2003	Bangkok Construction Co., Ltd.	100,000.00	7,000.00	107,000.00	3,000.00	104,000.00
Grand Total		369,000.00	25,830.00	394,830.00	11,070.00	357,930.00

Figure B.5.   Payment Monthly Report.

Adam Bank Public Company Limited
Payment Department Report for March, 2003

Date	Company Name	Amount	Vat	Total	W/T	Net Amount
01/03/2003	Purchasing Unit	2,000.00				2,000.00
10/03/2003	Card Processing Unit	2,000.00				2,000.00
Grand Total		4,000.00				4,000.00

Figure B.6. Payment Department Monthly Report.

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Adam Bank Public Company Limited
Withholding Tax Report for March, 2003

Ref. No.	Issue Date	Company Name	Tax ID	Withholding Tax
98703001234	03/03/2003	Index Company Limited	3030456544	750.00
98703001235	08/03/2003	Index Company Limited	3030456544	900.00
98703001236	13/03/2003	Verasu Company Limited	3030111232	105.00
98703001237	16/03/2003	Index Company Limited	3030456544	165.00
98703001238	20/03/2003	Index Company Limited	3030456544	1,650.00
98703001239	23/03/2003	Naratana Construction Co., Ltd.	3030234321	4,500.00
98703001240	29/03/2003	Bangkok Construction Co., Ltd.	3031234555	3,000.00
		Total		11,070.00

Figure B.7. Withholding Tax Report.

APPENDIX C

PROCESS SPECIFICATION

Table C.1.   Process Specification of Process 1.2.

Process Name :	Receive user ID and Password
Data In :	User ID and password
Data Out :	On screen shows user ID and password
Process :	1. Receive user ID and password on screen 2. Print out customer ID and password on screen
Attachment :	1. User data store 2. Internal department

Table C.2.   Process Specification of Process 1.3.

Process Name :	Check user information
Data In :	User information
Data Out :	Expense information log in
Process :	1. Read user information which match with the existing user 2. Verify the correctness of user information 3. Log in to expense control system
Attachment :	1. User data store 2. Internal department

Table C.3. Process Specification of Process 2.1.

Process Name :	Calculate total expense
Data In :	Account code information User information
Data Out :	Expense record
Process :	1. Read user information such as department name, department budget, which match with the user ID or name 2. Calculate total expense including withholding tax 3. Record expense data into expense database
Attachment :	1. Expense data store 2. Budget data store 3. Internal department

Table C.4. Process Specification of Process 2.5.

Process Name :	Submit expense details
Data In :	Receive expense requisition information
Data Out :	On screen shows expense information
Process :	1. Receive expense requisition information on screen 2. Print out expense request information on screen and change expense status
Attachment :	Expense data store

Table C.5. Process Specification of Process 3.

Process Name :	Verify expense
Data In :	Expense requisition documents
Data Out :	Print out total expense requisition on screen
Process :	1. Receive expense requisition via expense control system with expense requisition documents by internal department. 2. Verify the correctness of the expense requisition document and information in the system 3. Record expense into expense database
Attachment :	1. Expense data store 2. Accounting department

Table C.6. Process Specification of Process 4.

Process Name :	Payment
Data In :	Total amount expense requisition
Data Out :	Total amount expense
Process :	1. Payment account number and issue cheque 2. Verify the correctness of the requisition documents and change status in the system 3. Record payment into payment database
Attachment :	Payment data store

Table C.7. Process Specification of Process 5.1.

Process Name :	Generate payment report
Data In :	Payment information
Data Out :	Payment report
Process :	1. Read payment information 2. Generate formation of payment report 3. Print out expense report for accounting department
Attachment :	1. Payment data store 2. Accounting department

Table C.8. Process Specification of Process 5.2.

Process Name :	Generate expense report
Data In :	Expense information
Data Out :	Expense report
Process :	1. Read expense information 2. Generate formation of expense report 3. Print out expense report for Internal department 4. Print out expense report for Budgeting department
Attachment :	1. Expense data store 2. Internal department 3. Budgeting department

Table C.9.   Process Specification of Process 5.3.

Process Name :	Generate budget report
Data In :	Budget information
Data Out :	Budget report
Process :	1. Read budget information 2. Generate formation of budget report 3. Print out budget report for Budgeting department
Attachment :	1. Budget data store 2. Internal department 3. Budgeting department

Table C.10.   Process Specification of Process 6.

Process Name :	Update Expense information
Data In :	Expense information
Data Out :	Expense record
Process :	1. Receive Expense information from Accounting Department 2. Update modified expense information into expense database
Attachment :	1. Expense data store 2. Internal Department

Table C.11.   Process Specification of Process 7.

Process Name :	Update budget
Data In :	Budget information
Data Out :	Budget record
Process :	1. Read budget information 2. Verify the correctness of budget information 3. Update budget information into budget database
Attachment :	1. Budget data store 2. Internal department

APPENDIX   D

DATABASE DESIGN
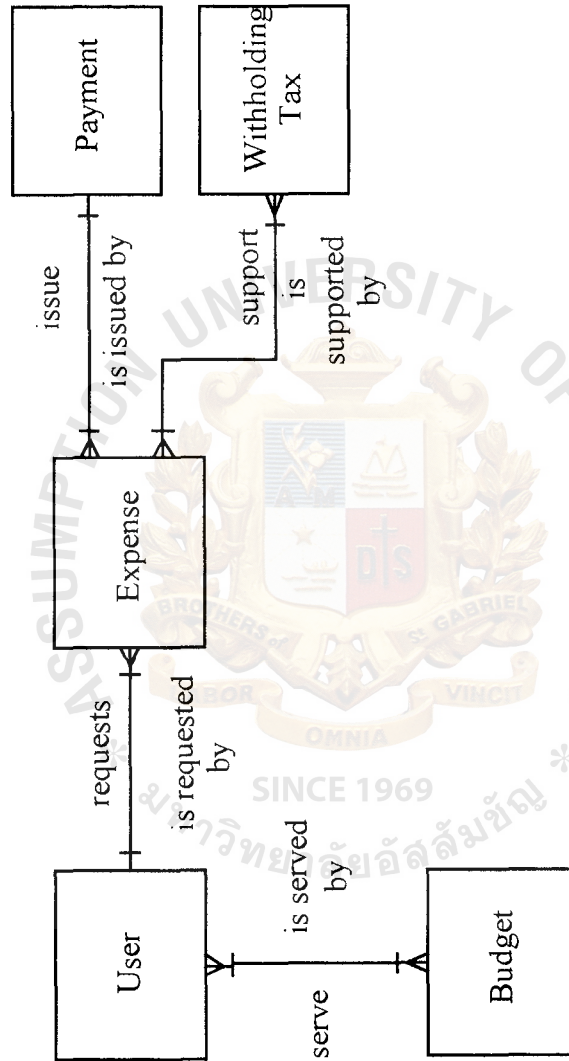
Figure D.1. Context Diagram Data Model.
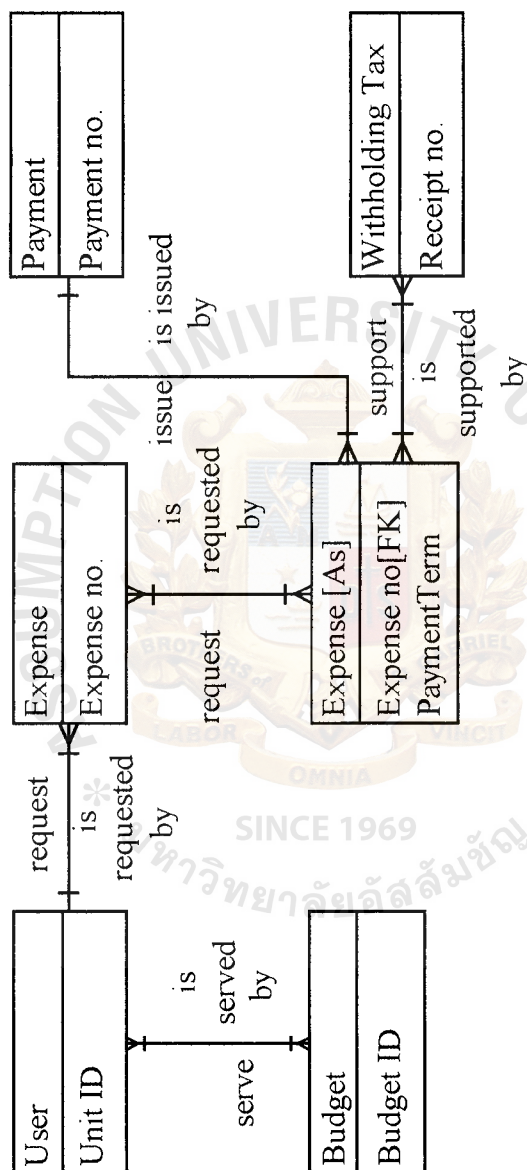
Figure D.2.   Key Based Data Model.
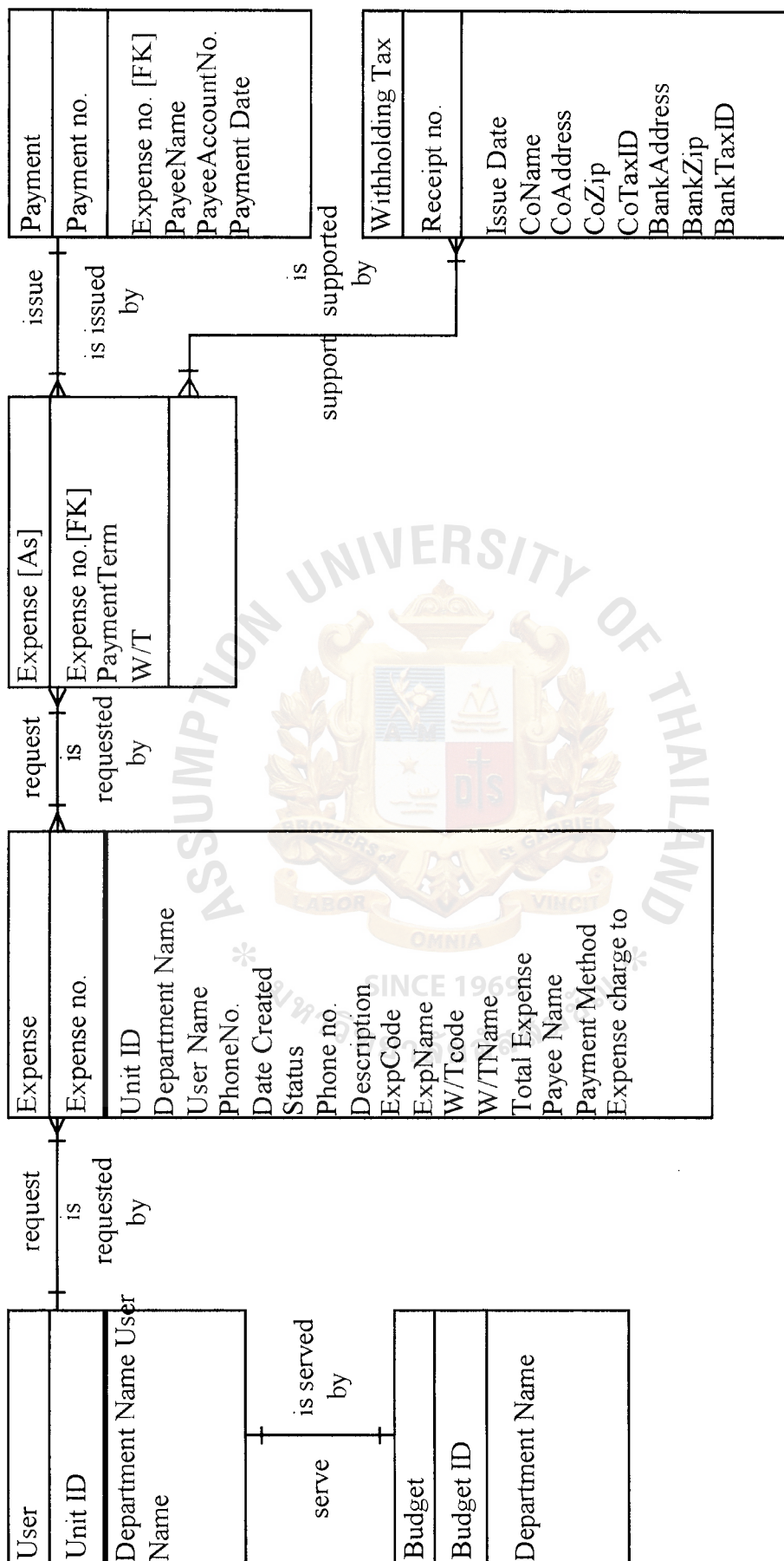
Figure D.3. Fully Attribute Data Model

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APPENDIX   E

DATA DICTIONARY

DATA DICTIONARY

Table E.1. Data Dictionary of Database.

Field Name	Field Type	Length	Meaning
CompanyAddr	Text	50	Company Address
CompanyName	Text	50	Company name
CompanyPhone	Integer	10	Company Phone number
Postal Code	Integer	10	Company Postal Code
City	Text	30	The city of customer address
SupplierAddr	Text	50	Supplier Address
SupplierName	Text	50	Supplier name
SupplierPhone	Integer	10	Supplier Phone number
SupplierZip	Integer		Supplier zip code
DateCreated	Date		Created expense date
Description	Text	100	Made to expense description
ExpAmount	Number		Expense amount
ExpCode	Integer		Expense identification
ExpName	Text	50	Expense Description
ExpNo	Integer	10	Made to expense reference
IssueDate	Date		Created Withholding Tax date
PayAmount	Number		Payment amount
PayDate	Date		Date of payment
PayeeAccNo.	Integer	12	Account Number
PayeeName	Text	20	Account Name

Table E.1. Data Dictionary of Database (Continued).

Field Name	Field Type	Length	Meaning
PayNo.	Integer		Made to payment reference
PhoneNo	Integer	10	Requester Phone no.
Pwd	Text	30	User password
Requester	Text	30	User who requests expense
Status	Text	15	Show status of expense
TaxCompanyID	Integer		Company Tax Identification
TaxSupplierID	Integer		Supplier Tax Identification
UnitCode	Integer	8	Unit code
UnitName	Text	30	Department name
UserName	Text		User identification
W/Tcode	Integer	8	Withholding tax category
W/TName	Text	30	Withholding tax document issued to user for collected payment
W/Tno	Integer		Withholding Tax reference
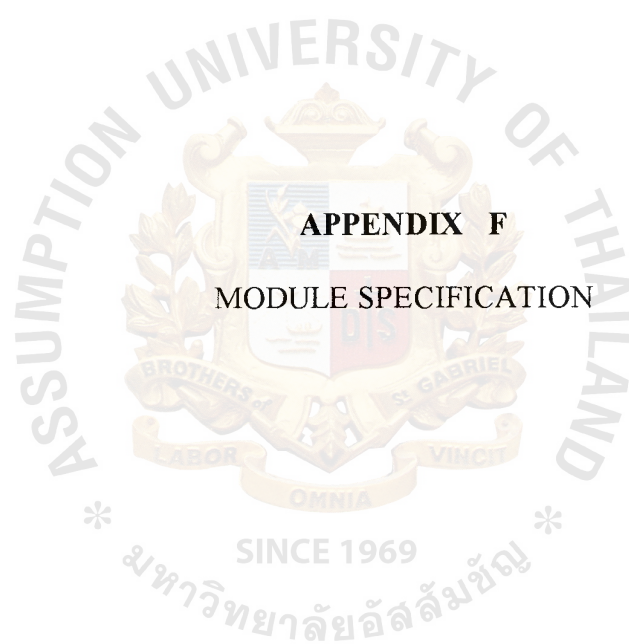
APPENDIX   F

MODULE SPECIFICATION

Module Number : 1

Module Name : User Entry Transaction Process

Propose/Objectives : 1. To get user information

2. To know who enters the system

Input : User ID and Password

Output : User records

Invoker : Module 1 invokes module 1.2.

Callee : It does not have called because this is the main module.

Constraint : This module depends on user details related in the process.

Begin

1. To get user details online

2. To check the correctness of details

3. To read user information from database

End

Module Number	:	1.1
Module Name	:	Log in
Propose/Objectives	:	To access expense processing
Input	:	User ID
		User Password
Output	:	Update user database
Invoker	:	The module is not invoked by other modules.
Callee	:	This module 1.1 is called by module 1.
Constraint	:	This module depends on the information from other modules.

Begin

1. To get user ID and password

2. To read user information from database

3. To access expense form

4. To update user database

End

Module Number   :   2

Module Name   :   Expense Entry

Propose/Objectives   :   1. To get requester

2. To get department code

3. To get expense detail

Input   :   1. Requester and department

2. Account no. and Account name

Output   :   Expense records

Invoker   :   This module is main module, so it is not invoked by other

modules

Callee   :   It does not have callee because this is the main module.

Constraint   :   This module depends on the information from more than

one module such as expense, user information and tax

information

Begin

1.   To get requester and department

2.   To get expense details

2.   To check the correctness of details

3.   To read expense information from database

End

Module Number   :   3

Module Name   :   Verify Expense

Propose/Objectives   :   1. To get document and cover sheet

                               2. To get expense process

Input   :   User ID and Password

Output   :   User records

Invoker   :   Module 1 invokes module 1.2.

Callee   :   It does not have callee because this is the main module.

Constraint   :   This module depends on user details related in the

                               process.

Begin

1.   To get user details online

2.   To check the correctness of details

3.   To read user information from database

End

Module Number	:	5
Module Name	:	Generate Reports
Propose/Objectives	:	To generate format report
Input	:	Expense database
		Budget database
		Payment database, Tax database
Output	:	Summary expense report
		Budget report
		Payment report, Tax report
Invoker	:	This module is main module, so it is not invoked by other modules
Callee	:	It does not have callee
Constraint	:	This module depends on the information from other modules

Begin

1.   To read expense data from expense database

2.   To read budget data from budget database

3.   To read payment data from payment database

4.   To read tax data from tax database

5.   To print summary expense report

6.   To print budget report

7.   To print payment report

8.   To print tax report

End

Module Number	:	6
Module Name	:	Maintenance Expense Information
Propose/Objectives	:	1. To update account no. and name
		2. To update department code
Input	:	Modified expense information from Accounting department and Budgeting department
Output	:	Update expense information
Invoker	:	This module is main module, so it is not invoked by other modules
Callee	:	It does not have callee because this is the main module.
Constraint	:	This module depends on the information from other modules

Begin

1. To get account detail from Accounting department

2. To get department code from Budgeting department

3. To read expense information from expense database

4. To update modified expense data into expense database

End

APPENDIX   G
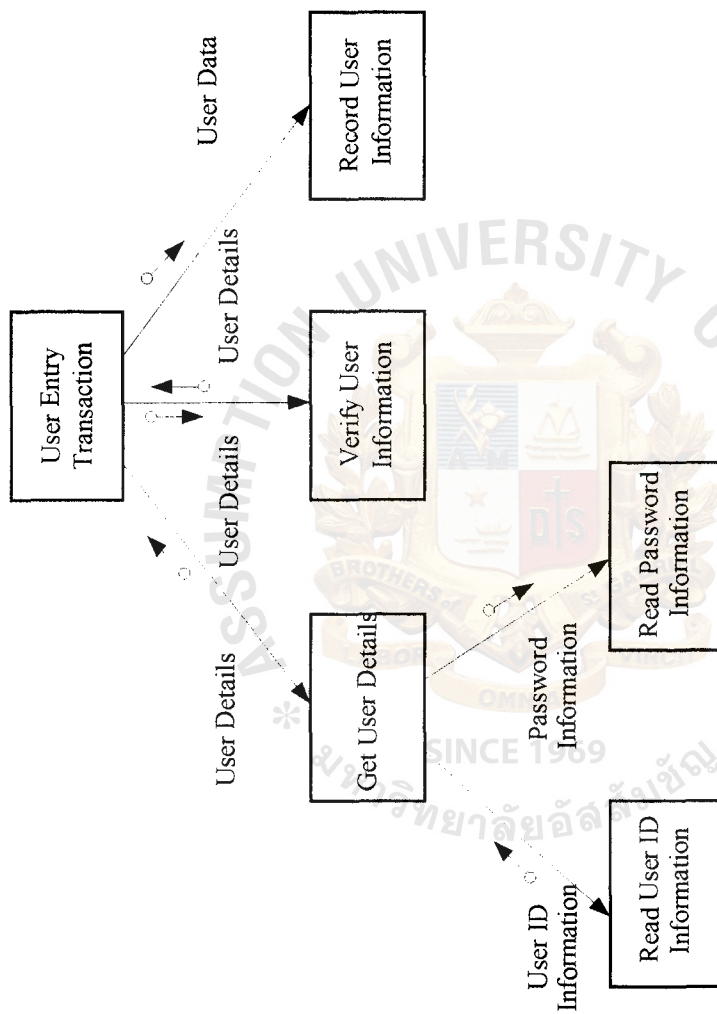
STRUCTURE CHART

Figure G.1. Structure Chart of User Entry Transaction.
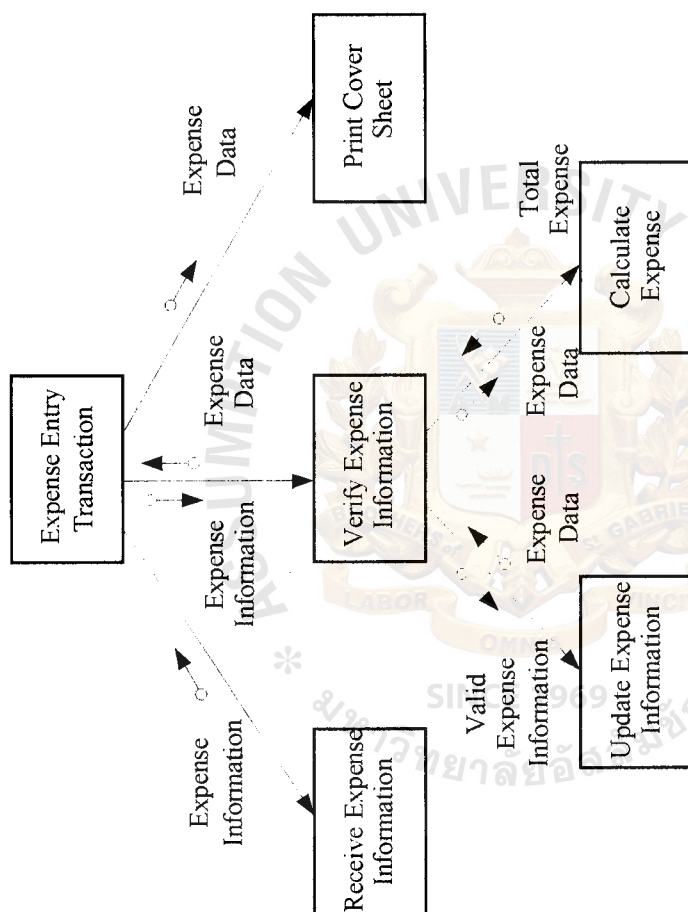
Figure G.2.   Structure Chart of Expense Entry Transaction.
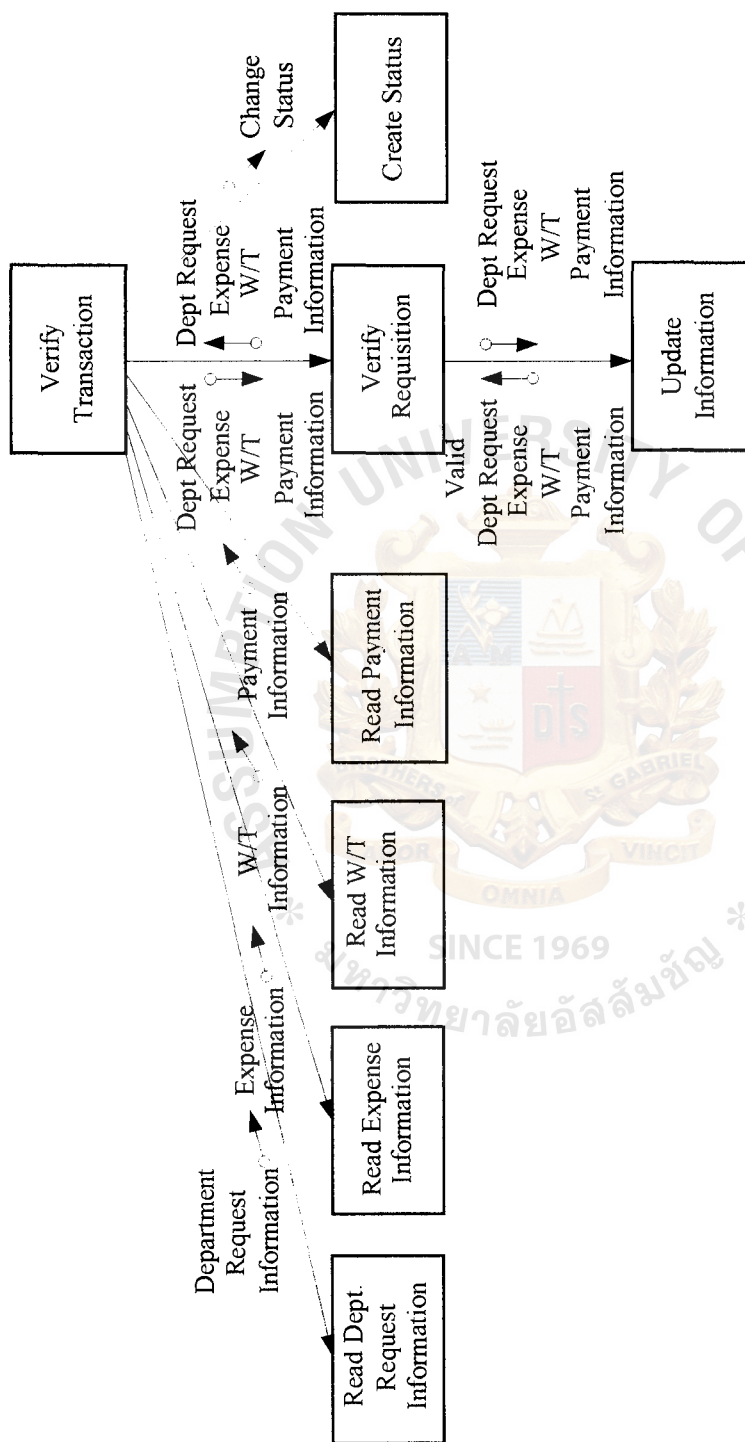
Figure G.3. Structure Chart of Verify Expense Transaction.
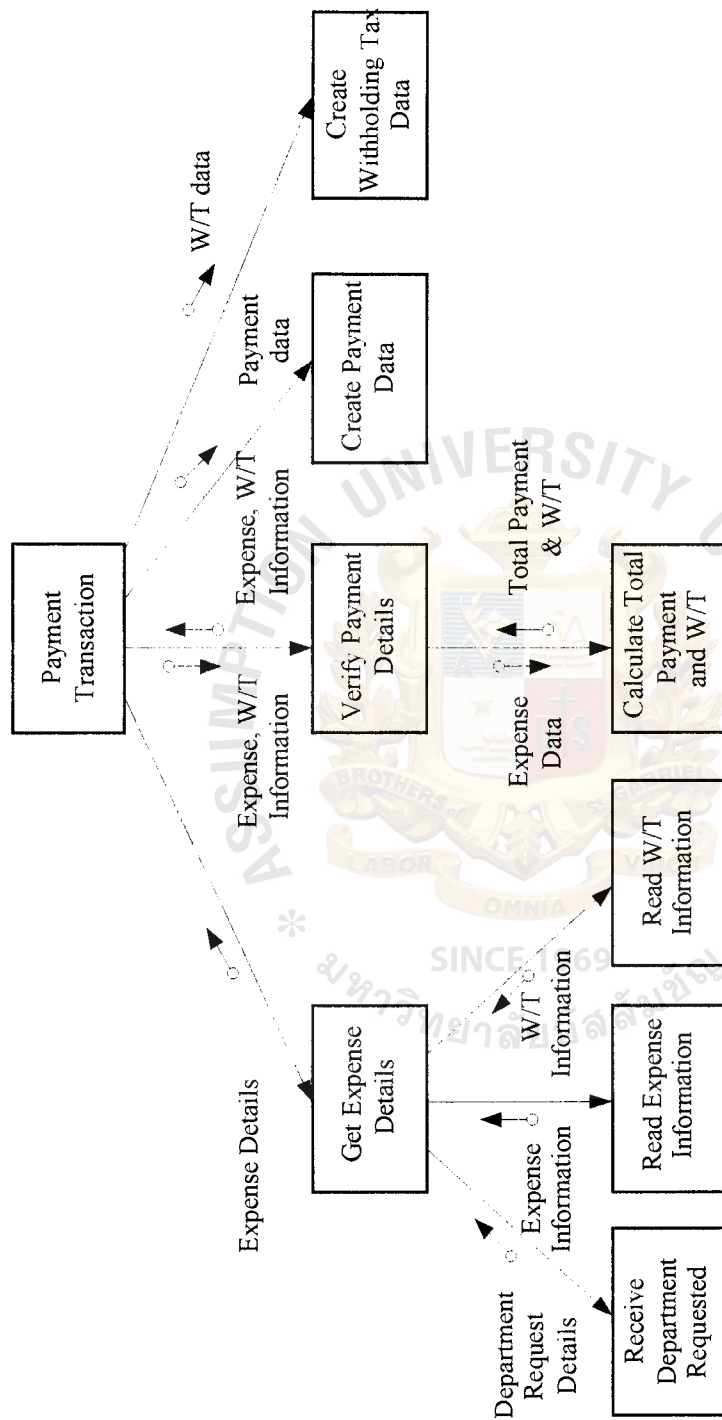
Figure G.4.   Structure Chart of Payment Transaction.
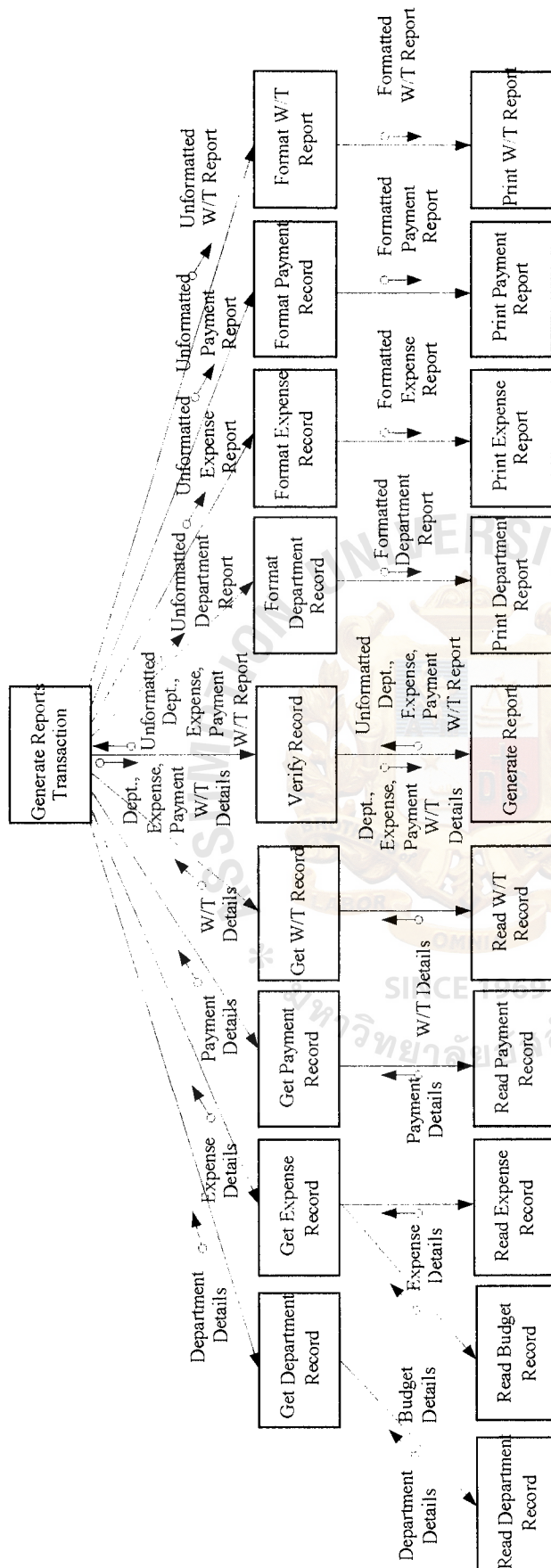
Figure G.5.   Structure Chart of Generate Reports Transaction.

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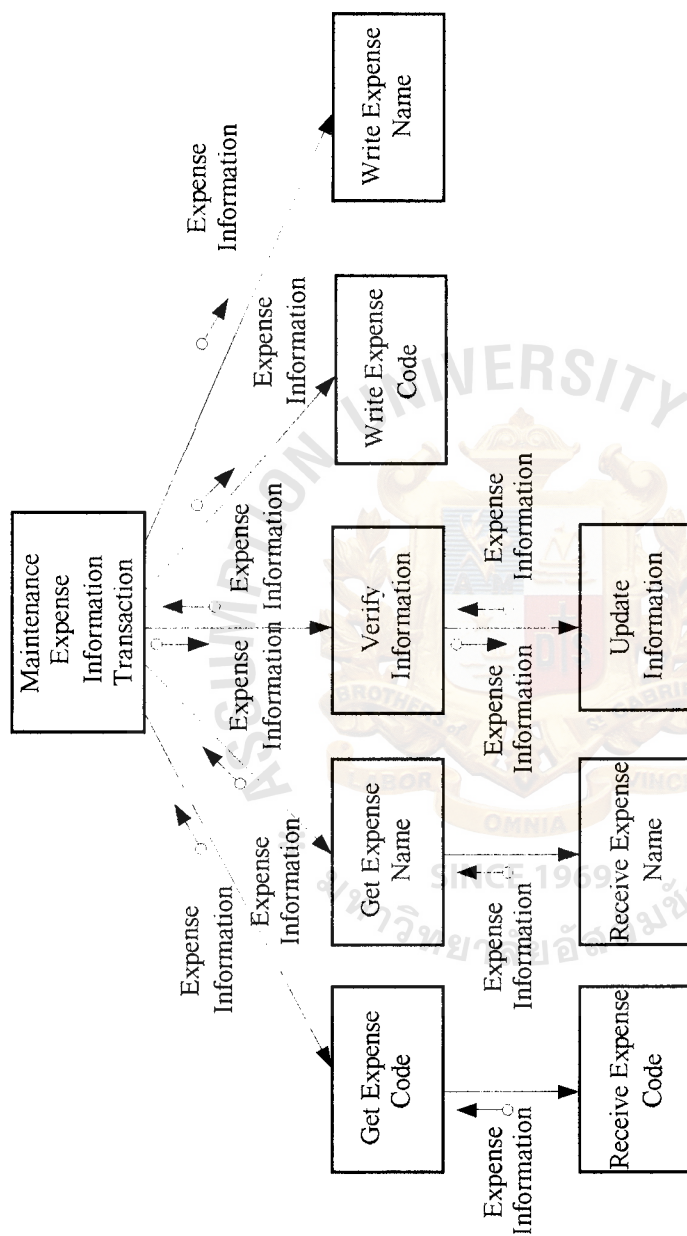
Figure G.6. Structure Chart of Maintenance Expense Information.
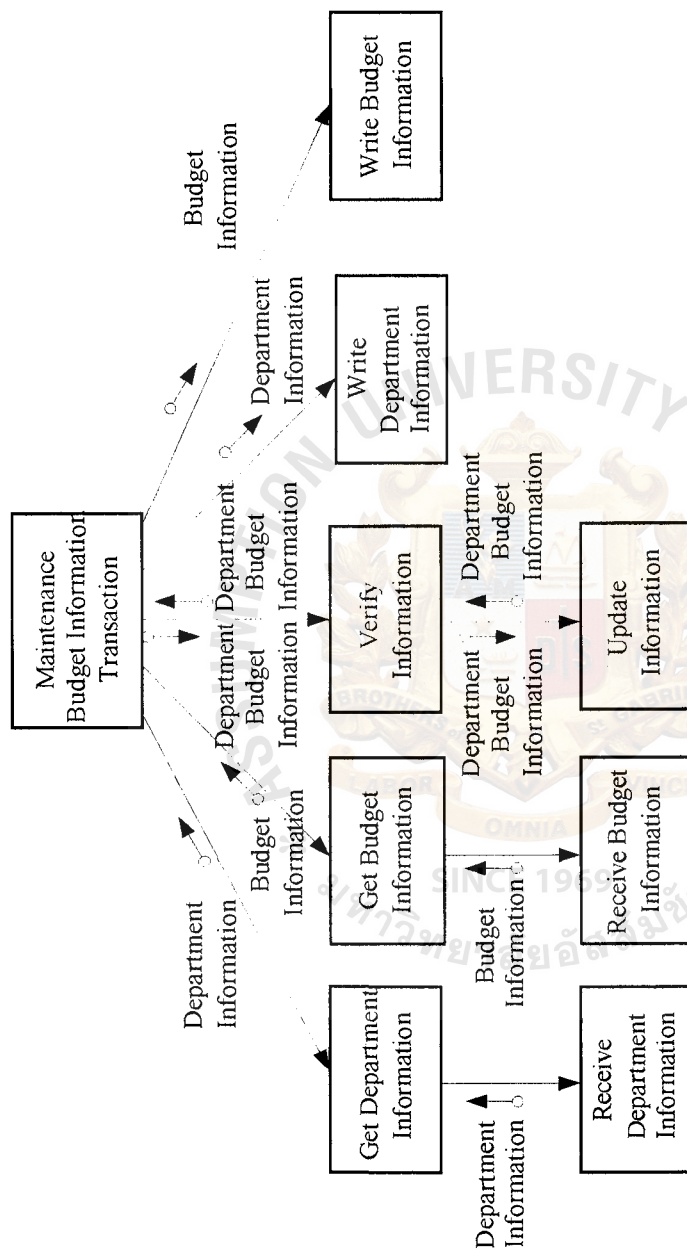
Figure G.7. Structure Chart of Maintenance Budget Information Transaction.

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APPENDIX   H

FEASIBILITY ANALYSIS

Table H.1. Estimated Cost of Candidate 1, (in Baht).

Cost items	Year 0
Hardware Cost:	
Computer Server Cost	90,000.00
Workstation Cost - 6 units@ 29,000	174,000.00
Backup tape device	20,000.00
HP LaserJet 2100 as remote printer	14,000.00
EPSON LQ300	11,000.00
Total Hardware Cost	309,000.00
Maintenance Cost:	
Maintenance Cost (10% of Hardware cost)	30,900.00
Total Maintenance Cost	30,900.00
Software Cost:	
Server Software (Windows 2000)	50,000.00
Windows XP Professional 6 units @ 2,000	12,000.00
Visual Basic 6.0 for workstation 6 units @ 3,000	18,000.00
Microsoft Access 2000 for workstation 6 units @ 5,000	30,000.00
Network Cost - Hub	4,000.00
- Installation cost	16,000.00
Total Software Cost	130,000.00
Implementation Training Cost:	
Training Cost 50 hrs @ 1,000	50,000.00
Set up Cost	25,000.00
Total Implementation Cost	75,000.00
Office Equipment Cost :	
Calculator 5 units @ 3,500	17,500.00
Total Office Equipment Cost	17,500.00
Total Initial Investment cost	562,400.00

Table H.2. Estimated Cost of Candidate 2, (in Baht).

Cost items	Year 0
Hardware Cost:	
Computer Server Cost	90,000.00
Workstation Cost - 6 units@ 29,000	174,000.00
Backup tape device	20,000.00
HP LaserJet 2100 as remote printer	14,000.00
EPSON LQ300	11,000.00
Total Hardware Cost	309,000.00
Maintenance Cost:	
Maintenance Cost (10% of Hardware cost)	30,900.00
Total Maintenance Cost	30,900.00
Software Cost:	
Server Software (Windows 2000)	50,000.00
Windows XP Professional 6 units @ 2,000	12,000.00
Oracle 10 for workstation 6 units @ 7,500	45,000.00
Oracle 10 Server	250,000.00
Developer 2000 Server	50,000.00
Network Cost - Hub	4,000.00
- Installation cost	30,000.00
Total Software Cost	441,000.00
Implementation Training Cost:	
Training Cost 50 hrs @ 2,000	100,000.00
Set up Cost	50,000.00
Total Implementation Cost	150,000.00
Office Equipment Cost :	
Calculator 5 units @ 3,500	17,500.00
Total Office Equipment Cost	17,500.00
Total Initial Investment cost	948,400.00

Table H.3. Estimated Cost of Candidate 3, (in Baht).

Cost items	Year 0
Hardware Cost:	
Computer Server Cost	90,000.00
Workstation Cost - 6 units@ 29,000	174,000.00
Backup tape device	20,000.00
HP LaserJet 2100 as remote printer	14,000.00
EPSON LQ300	11,000.00
Total Hardware Cost	309,000.00
Maintenance Cost:	
Maintenance Cost (10% of Hardware cost)	30,900.00
Total Maintenance Cost	30,900.00
Software Cost:	
Server Software (Windows 2000)	50,000.00
Windows XP Professional 6 units @ 2,000	12,000.00
Lotus Notes for workstation 6 units @ 5,000	30,000.00
Lotus Domino Server R5	65,000.00
Network Cost - Hub	4,000.00
- Installation cost	16,000.00
Total Software Cost	182,500.00
Implementation Training Cost:	
Training Cost 50 hrs @ 1,000	50,000.00
Set up Cost	40,000.00
Total Implementation Cost	90,000.00
Office Equipment Cost :	
Calculator 5 units @ 3,500	17,500.00
Total Office Equipment Cost	17,500.00
Total Initial Investment cost	624,400.00

Table H.4. Payback Period for Candidate 1, (in Baht).

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Initial Investment Cost	-562,400.00					
Total Computerized Cost		-1,552,682.00	-1,694,935.46	-1,851,116.00	-2,022,609.02	-2,210,927.69
Discount factor 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	-562,400.00	-1,437,783.53	-1,452,559.69	-1,469,786.10	-1,486,617.63	-1,505,641.76
Cumulative time-adjusted cost over life time	-562,400.00	-2,000,183.53	-3,452,743.22	-4,922,529.32	-6,409,146.95	-7,914,788.71

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cost of Manual System	0.00	1,814,486.00	1,970,332.28	2,164,346.25	2,377,671.04	2,612,235.01
Discount factor 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	0.00	1,680,214.04	1,688,574.76	1,718,490.92	1,747,588.21	1,778,932.04
Cumulative time-adjusted cost over life time	0.00	1,680,214.04	3,368,788.80	5,087,279.72	6,834,867.93	8,613,799.97

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cumulative lifetime time-adjust cost + benefit	-562,400.00	- 319,969.49	- 83,954.42	164,750.40	425,720.98	699,011.26

Table H.5. Payback Period for Candidate 2, (in Baht).

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Initial Investment Cost	-948,400.00					
Total Computerized Cost		-1,552,682.00	-1,694,935.46	-1,851,116.00	-2,022,609.02	-2,210,927.69
Discount factor 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	-948,400.00	-1,437,783.53	-1,452,559.69	-1,469,786.10	-1,486,617.63	-1,505,641.7C
Cumulative time-adjusted cost over life time	-948,400.00	-2,386,183.53	-3,838,743.22	-5,308,529.32	-6,795,146.95	-8,300,788.71

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cost of Manual System	0.00	1,814,486.00	1,970,332.28	2,164,346.25	2,377,671.04	2,612,235.01
Discount factor 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	0.00	1,680,214.04	1,688,574.76	1,718,490.92	1,747,588.21	1,778,932.04
Cumulative time-adjusted cost over life time	0.00	1,680,214.04	3,368,788.80	5,087,279.72	6,834,867.93	8,613,799.97

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cumulative lifetime time-adjust cost + benefit	- 948,400.00	- 705,969.49	- 469,954.42	- 221,249.60	39,720.98	313,011.26

Table H.6. Payback Period for Candidate 3, (in Baht).

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Initial Investment Cost	-624,400.00					
Total Computerized Cost		-1,552,682.00	-1,694,935.46	-1,851,116.00	-2,022,609.02	-2,210,927.69
Discount factor 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	-624,400.00	-1,437,783.53	-1,452,559.69	-1,469,786.10	-1,486,617.63	-1,505,641.76
Cumulative time-adjusted cost over life time	-624,400.00	-2,062,183.53	-3,514,743.22	-4,984,529.32	-6,471,146.95	-7,976,788.71

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cost of Manual System	0.00	1,814,486.00	1,970,332.28	2,164,346.25	2,377,671.04	2,612,235.01
Discount factor 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	0.00	1,680,214.04	1,688,574.76	1,718,490.92	1,747,588.21	1,778,932.04
Cumulative time-adjusted cost over life time	0.00	1,680,214.04	3,368,788.80	5,087,279.72	6,834,867.93	8,613,799.97

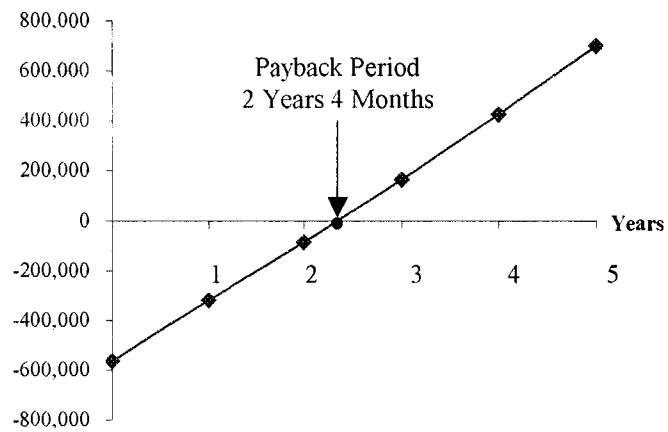|	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cumulative lifetime time-adjust cost + benefit	- 624,400.00	- 381,969.49	- 145,954.42	102,750.40	363,720.98	637,011.26

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Accumulative Cost, (in Baht).

Figure H.1. Payback Period for Candidate 1.

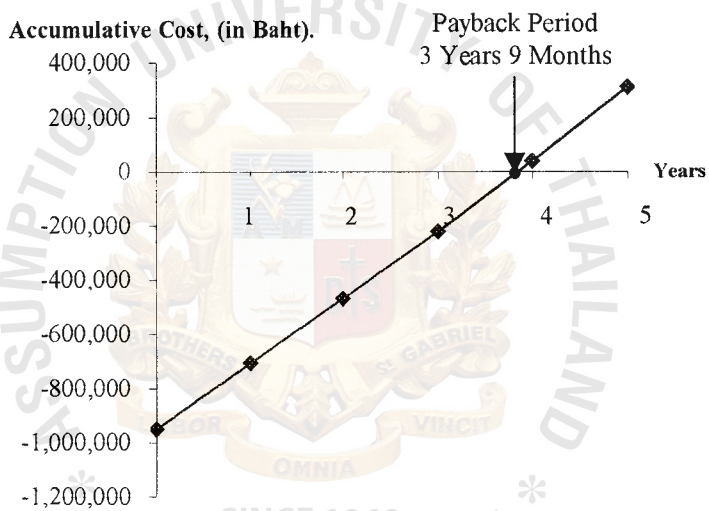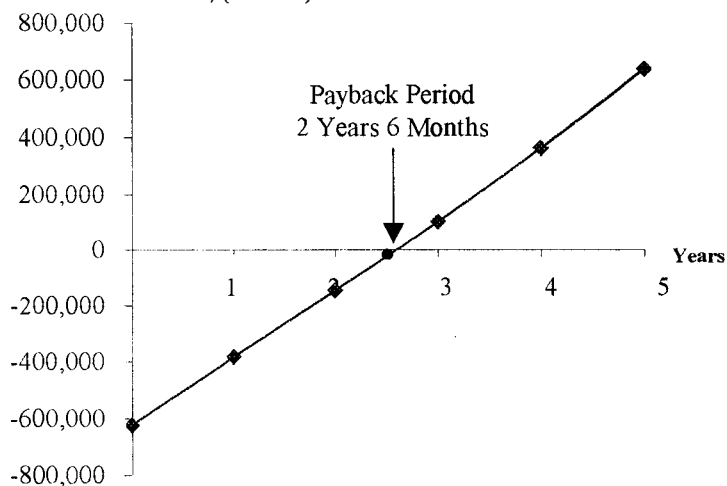

Figure H.2. Payback Period for Candidate 2.

Figure H.3. Payback Period for Candidate 3.

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Table H.7. Net Present Value for Candidate 1, (in Baht).

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Initial Investment Cost	-562,400.00					
Total Computerized Cost		-1,552,682.00	-1,694,935.46	-1,851,116.00	-2,022,609.02	-2,210,927.69
Discount factor 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	-562,400.00	-1,437,783.53	-1,452,559.69	-1,469,786.10	-1,486,617.63	-1,505,641.76
Cumulative time-adjusted cost over life time	-562,400.00	-2,000,183.53	-3,452,743.22	-4,922,529.32	-6,409,146.95	-7,914,788.71

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cost of Manual System	0.00	1,814,486.00	1,970,332.28	2,164,346.25	2,377,671.04	2,612,235.01
Discount factor 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	0.00	1,680,214.04	1,688,574.76	1,718,490.92	1,747,588.21	1,778,932.04
Cumulative time-adjusted cost over life time	0.00	1,680,214.04	3,368,788.80	5,087,279.72	6,834,867.93	8,613,799.97

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cumulative lifetime time-adjust cost + benefit						699,011.26

Table H.8. Net Present Value for Candidate 2, (in Baht).

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Initial Investment Cost	-948,400.00					
Total Computerized Cost		-1,552,682.00	-1,694,935.46	-1,851,116.00	-2,022,609.02	-2,210,927.69
Discount factor 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	-948,400.00	-1,437,783.53	-1,452,559.69	-1,469,786.10	-1,486,617.63	-1,505,641.76
Cumulative time-adjusted cost over life time	-948,400.00	-2,386,183.53	-3,838,743.22	-5,308,529.32	-6,795,146.95	-8,300,788.71

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cost of Manual System	0.00	1,814,486.00	1,970,332.28	2,164,346.25	2,377,671.04	2,612,235.01
Discount factor 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	0.00	1,680,214.04	1,688,574.76	1,718,490.92	1,747,588.21	1,778,932.04
Cumulative time-adjusted cost over life time	0.00	1,680,214.04	3,368,788.80	5,087,279.72	6,834,867.93	8,613,799.97

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cumulative lifetime time-adjust cost + benefit						313,011.26

Table H.9. Net Present Value for Candidate 3, (in Baht).

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Initial Investment Cost	-624,400.00					
Total Computerized Cost		-1,552,682.00	-1,694,935.46	-1,851,116.00	-2,022,609.02	-2,210,927.69
Discount factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	-624,400.00	-1,437,783.53	-1,452,559.69	-1,469,786.10	-1,486,617.63	-1,505,641.76
Cumulative time-adjusted cost over life time	-624,400.00	-2,062,183.53	-3,514,743.22	-4,984,529.32	-6,471,146.95	-7,976,788.71

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cost of Manual System	0.00	1,814,486.00	1,970,332.28	2,164,346.25	2,377,671.04	2,612,235.01
Discount factors for 8%	1.000	0.926	0.857	0.794	0.735	0.681
Time adjusted cost (adjusted to present value)	0.00	1,680,214.04	1,688,574.76	1,718,490.92	1,747,588.21	1,778,932.04
Cumulative time-adjusted cost over life time	0.00	1,680,214.04	3,368,788.80	5,087,279.72	6,834,867.93	8,613,799.97

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cumulative lifetime time-adjust cost + benefit						637,011.26

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