Online URL Forwarding Service

by

Mr. Pakdee Pakdeejitti

A Final Report of the Three-Credit Course
IC 6997 E-Commerce Practicum

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
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The Graduate School of Assumption University has approved this final report of the Three-credit course, IC 6997, E-Commerce Practicum submitted in partial fulfillment of the requirements for the degree of Master of Science in Internet and E-Commerce Technology.

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ABSTRACT

Nowadays there are a lot of book rental stores. Most of them still use manual system for managing all processes. It seems to be simple but has a lot of problems. To have the competitive advantages, a company has to improve its operation by using computerized system as a tool to manage all data and information.

The capabilities of computerized system are faster and of higher quality service. The customers will be satisfied with this system. This new system also makes higher revenue and profit for a company for a long time.

This project, Book Rental System, involves developing computerized system to replace manual operations. The project focuses on the existing system and identifies user's requirements. Then it designs the new system with complete hardware and software to meet user's requirements. Cost and benefit analysis, security and control and design of input and output screen are also included in this project. This system has been successfully tested and implemented on Microsoft Access.

ACKNOWLEDGEMENTS

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I. INTRODUCTION

1.1 Background of the Project

The business of book rental service nowadays is Booming as many new book rental shops are being opened. People are interested in renting books instead of buying books because of the increase in the cost of living.

Book rental services is an interesting business that has opportunities for growing in the future so there are many new comers to this business. The company has to create competitive edges for a long-term business.

Most of the book rental shops still use manual system for managing all aspects of business operation because in the past the computers were so expensive and the owner had no knowledge of information management technology. This results in a lot of weaknesses for the business such as wrong data recording, slow and low quality of service. The manual system needs a lot of paper work that is difficult to handle and process. For example, it is very difficult to find who borrows or returns books. It takes a lot of time to check for any information (e.g., which books or magazines are available in the shop). The customers may choose other book rental stores that can serve them better.

An automated book rental system will increase the efficiency and effectiveness of a company. The capabilities of the book rental system are faster and of higher quality service. This new system can manage rental transactions, calculate rental fees and update inventory. It is more convenient for staff to file or find any information. Whenever the customer requests for information, staff can find the answer immediately. The customers will be satisfied with a better service from the new system. The company

will gain more loyalty from a lot of customers. As a result, our company with the computerized book rental system will make higher revenue and long-term profit.

1.2 Objectives of the Project

The main objectives of this project are to understand more of the existing system in order to design the new system to improve its performance.

The objectives of the project are as follows:

1. To retain the current customers and create new customers.
2. To save cost and time to complete all business processes.
3. To provide a better service.
4. To collect and analyze customer behavior.
5. To provide up-to-date, effective and accurate information.
6. To collect customer information.
7. To reduce human errors in business operation, data redundancy and incorrect and inconsistent record.

1.3 Scope of the Project

The project will analyze the existing manual system to identify current problems and areas for improvements. The proposed computer system will cover major part of the book rental system, which includes:

1. Customer requisition
2. New customer registration
3. Borrowed transaction
4. Returned transaction
5. New book registration
6. Report generation

1.4 Project Plan

The project plan is shown in a Gantt chart of Figure 1.1. The Gantt chart is a simple horizontal bar chart that depicts project tasks along with a calendar. Each bar represents a named project task. The tasks are listed vertically in the left-hand column. The horizontal axis is a calendar timeline.

No.	Task Name	January				February				March				April			
		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																
3	Identify the Existing Problems																
4	Study the Existing Computer System																
5	Develop Context Diagram																
6	Develop Data Flow Diagram																
7	Cost and Benefit Analysis																
	II. Analysis and Design of the Proposed System																
8	Interface Design																
9	Report Design																
10	Database Design																
11	Network Design																
12	Program Design																
	III. Implementation of the Proposed System																
13	Coding																
14	Testing																
15	Hardware Installation																
16	Software Installation																
17	Conversion																

The system development plan consists of three phases. The first phase is an analysis of the existing system. It takes six weeks to complete this phase. It defines the project's objectives and scope, identifies the existing problems, and then develops the context and data flow diagram of the existing system. Cost and benefit analysis is also performed in this first phase and at the same time as when the second phase starts. The second phase is an analysis and design of the proposed system. It consists of interface design, report design, database design, network design and program design. Three weeks are suitably allocated for this phase. The Final stage is an implementation of the proposed system. It involves coding, testing, hardware and software installation, and conversion. Eight weeks are provided for this last stage. Hardware installation is the first activity for the implementation. Hardware installation does not have to be finished for coding to be performed. Then testing and software installation are prepared before conversion starts.

II. THE EXISTING SYSTEM

2.1 Background of the Organization

Ton-Son bookshop provides a book rental service, that was established in 1990. The shop is located at Sirirach pier, a business area with a lot of students and working people, opening everyday between 7 am. - 9 pm.

There are three departments that operate all processes of the business. Managing director is an owner of the company who manages and controls all departments. There are Three persons in the company; one person for each department. The organization chart of Ton-Son Company is shown in Figure 2.1.

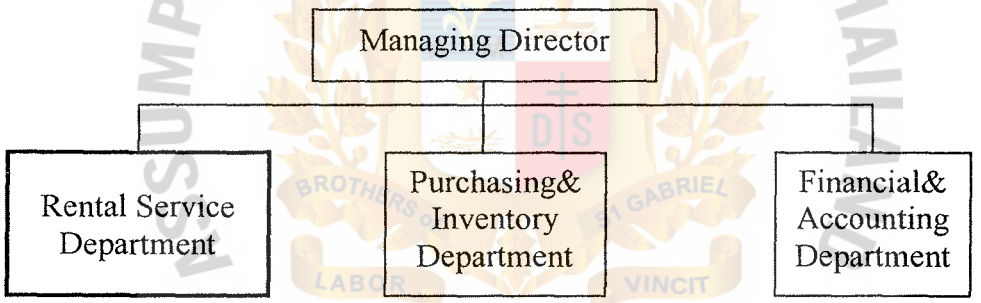

Figure 2.1 Organization Chart of Ton-Son Bookshop.

1. Rental Service department is responsible for member registration and rental service.
2. Purchasing and inventory department is responsible for finding new books for the bookshop.
3. Financial and accounting department is responsible for receiving all incomes and the expenses of the bookshop.

Ton-Son is a large bookshop that has about 5,000 books. There are many kinds of books such as cartoons, magazines, novels, short stories, and pocket books. A customer has to apply for membership and get a member I.D by showing identity card and paying 100 baht for membership fees. The procedure is explained below.

A member is able to rent a maximum of five books each time. The rental fee depends on type and price of the book. The customers will pay rental fee when they return the books. In case books are damaged (e.g., scratched or torn), the customers must pay full price of the books.

2.2 Existing System

The existing system of Ton-Son Bookshop is not computerized so that staffs have to manually manage all business processes. The context diagram of the existing system is shown in Figure 2.2.

There are four main functions in the existing system.

1. Member Registration
2. Book Registration
3. Book rental service
4. Collect Payment

1. Member Registration

The member registration has to be completed before the member can start using the book rental service in order to control all the transactions. The non-members must fill out the application form for registration and show their ID card, driving license or student card and pay 100 Baht for membership fee. The staff verifies and approves the application form, assigns a member ID to member and keeps the record in the member book. After the application process, the staff will give the member ID to a new member.

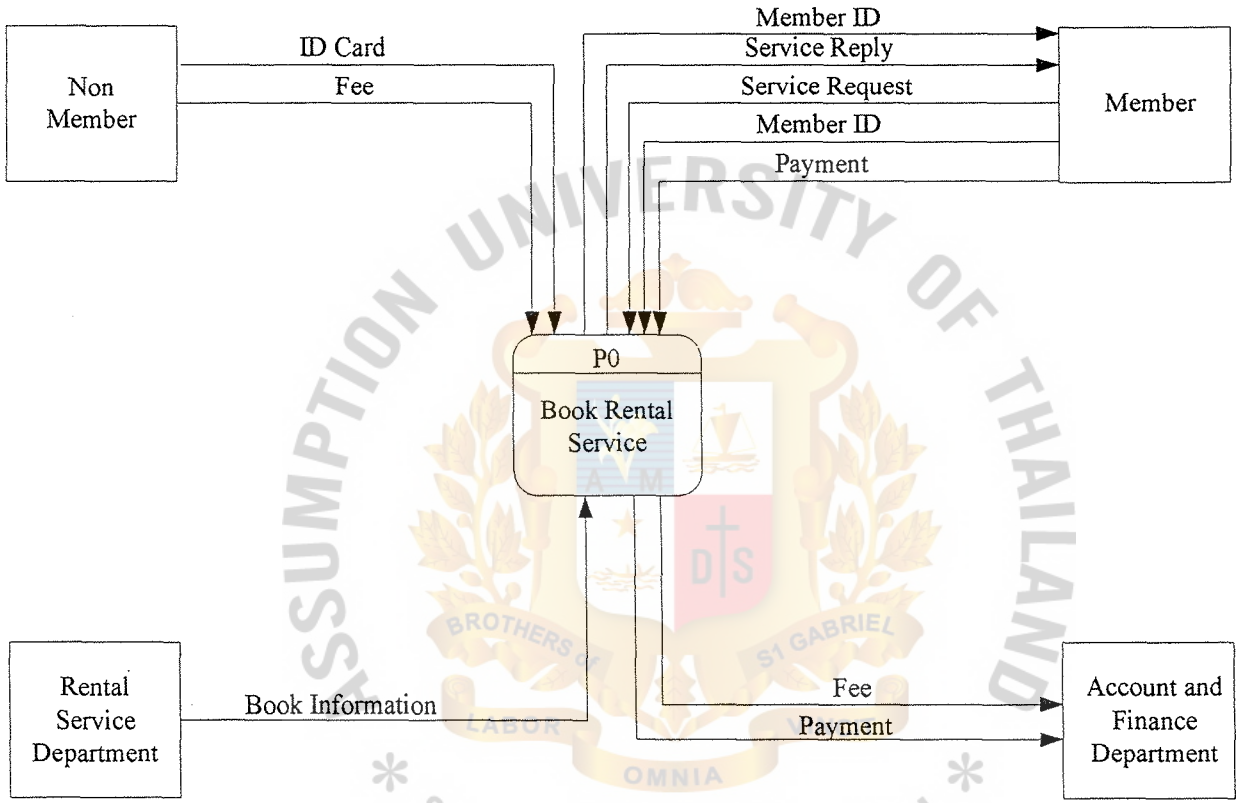

Figure 2.2 Context Diagram of the Existing System

2. Book Registration

When new books arrive, they must be registered as to record the books into the file. The staff classifies the books, assigns book number and records into the book list. We divide the books into many types such as cartoons, magazine, novels, etc. Each book record consists of received date, book number, book name, price and number of copy.

3. Book Rental Service

The rental policies of Ton-Son Bookshop are:

- It is forbidden to use someone else's ID to rent the book.
- The member can rent a maximum of five books each time
- The member must pay the full price of books if the returned books are severely damaged.

After customers select books and give them to staff, the staff will verify the member ID. The staff will record the rent date and book name and member ID into the rental record book. When the books are returned to the shop, the staff will find the rental record from the rental record book. The name of the returned book has to match the name of the book shown in the rental record book. Finally the staff calculates the rental fee.

4. Collect Payment

The rental fee is calculated after customers return their books. The staff will collect all payments from the customers and then send the payment information to the accounting and financial department at the end of each day. The rental rate depends on type and price of a book. It is in term of percentage of the full price of a book for each day that customers rent. Ten percent is the rate for magazines and cartoon books. Eight percent is for pocket books, novels and short stories. For example, the price of ELLE

magazine is 80 Baht. If a customer rents ELLE magazine for two days, the rental fee would be 16 Baht.

2.3 Current Problems and Areas for Improvement

2.3.1 Current Problems

At present, the company does not have any information system to support our business. After studying the existing system of the book rental service, the problems are identified as follow:

1. Time consuming in the following processes:
   - Answering the questions of the customers.
   - Finding the book for the customers.
   - Providing rent and return services.
   - Finding rental record from rental record book.
   - Calculating rental fees.

The staff frequently spends a lot of time for finding a rental record in the rental record book. Therefore the customer has to wait for a long time for the book returning process. In addition, the customer usually wants to know whether the needed book is still in the book store or not.

2. Low quality of record
   - Data are redundant and not updated.
   - There is no statistic report to support the decision making process.
   - There are too many incorrect data records.
   - There is no back up of all records.

The staff often forgets to record books returned. So when other customers rent the already returned book, the rental records show that two customers rent the same book. There are too many incorrect records. The staff has to record a lot of rental books

in each day. It is difficult to find the rental record when the customer wants to return the books. If the rental record book is lost, staff does not have any information because there is no back up record.

3. Human errors can occur from:

- Calculating incorrect rental fee.
- Writing incorrect data.
- Providing incorrect information to the customer.

A number of mistakes come from our staff. The more they manually record the data, the more mistakes they are likely to make. Incorrect data recording results in incorrect information.

4. Difficulty in using information for planning and decision making process. Books, members and rental records are kept and maintained in separate books so it is extremely difficult to find the necessary data to generate any kind of reports.

2.3.2 Areas for Improvement

For book rental system, there are many possibilities for improvement, which include:

1. Providing faster service.
2. Keeping the statistic data to make the report to support planning and decision making process.
3. Eliminating redundancy of records.
4. Eliminating error of information.
5. Reducing staff workload with computer system.
6. Preventing loss of data by keeping a back up system of the records.

III. THE PROPOSED SYSTEM

3.1 System Specification

The requirements for changing the existing book rental system from a manual operation to a computerized system have been developed to support the company needs. These user requirements or system specifications of a proposed system are specified after interviewing the relevant users and analyzing the existing system. They contain a narrative description of the new system that users require.

1. The proposed system should be easy to use and learn.
2. The proposed system should provide faster transaction to members and staffs.
3. The proposed system should allow multiple users to access the database at the same time.
4. The proposed system should generate reports that show the statistical data for a better decision making.
5. The input and output screens are designed in a user-friendly format.
6. All records are permanently maintained in files, backed up and secured in a secondary storage.

3.2 System Design

System Design is the specification or construction of a technical, computer based solution to the business requirements identified in systems analyses. The system design categories are divided into the following parts:

3.2.1 Design of input screen

The input screen provides the convenience for the staff to key in the data to the form. The design should keep the screens simple and create attractive screens. It should

ensure that the forms designed meet their purposes with accurate information completion. The details of input screens are shown in Figure G.1-G.6 of Appendix G.

3.2.2 Design of output screen

The output screen should be easy to view and understand. We have to ensure that the format of output screens meet the proposed requirements and display the processing results in a timely manner. The details of output screens are shown in Figure H.1-H.3 of Appendix H.

3.2.3 Design of Context Diagram and Data Flow Diagram

The context diagram of the proposed system represents an overview of the automated book rental system. It depicts the relationship between the book rental system and six external entities. Because the system must keep track of all the books that a member has rented, the external entity Member has the most data flowing in and out of it. The context diagram should be kept relatively simple to understand easily. The data flow diagram at level 0 represents the major activities of the book rental system. Each process is analyzed to determine the data required and the output produced. The proposed system's context diagram and data flow diagram of level 0 are shown in Figure 3.1 and 3.2 and for more details see Appendix A.

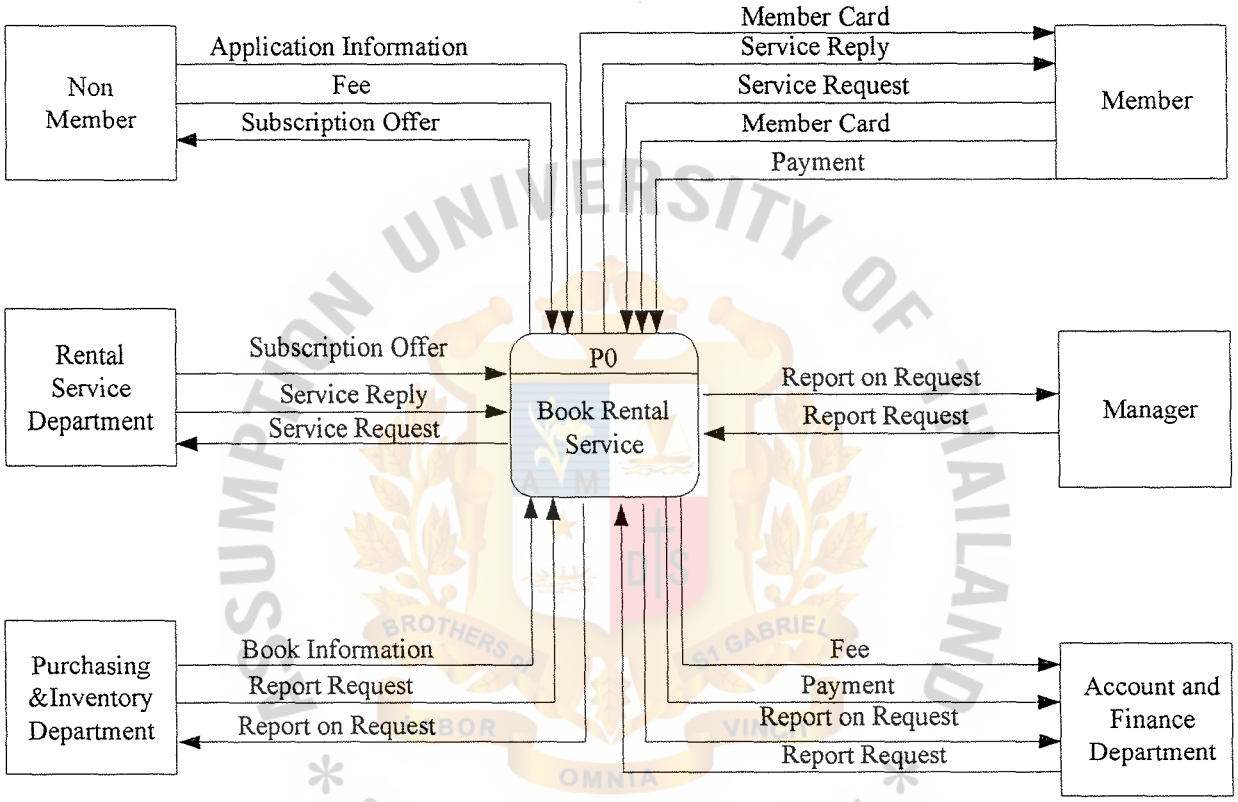

Figure 3.1 Context Diagram of the Proposed System

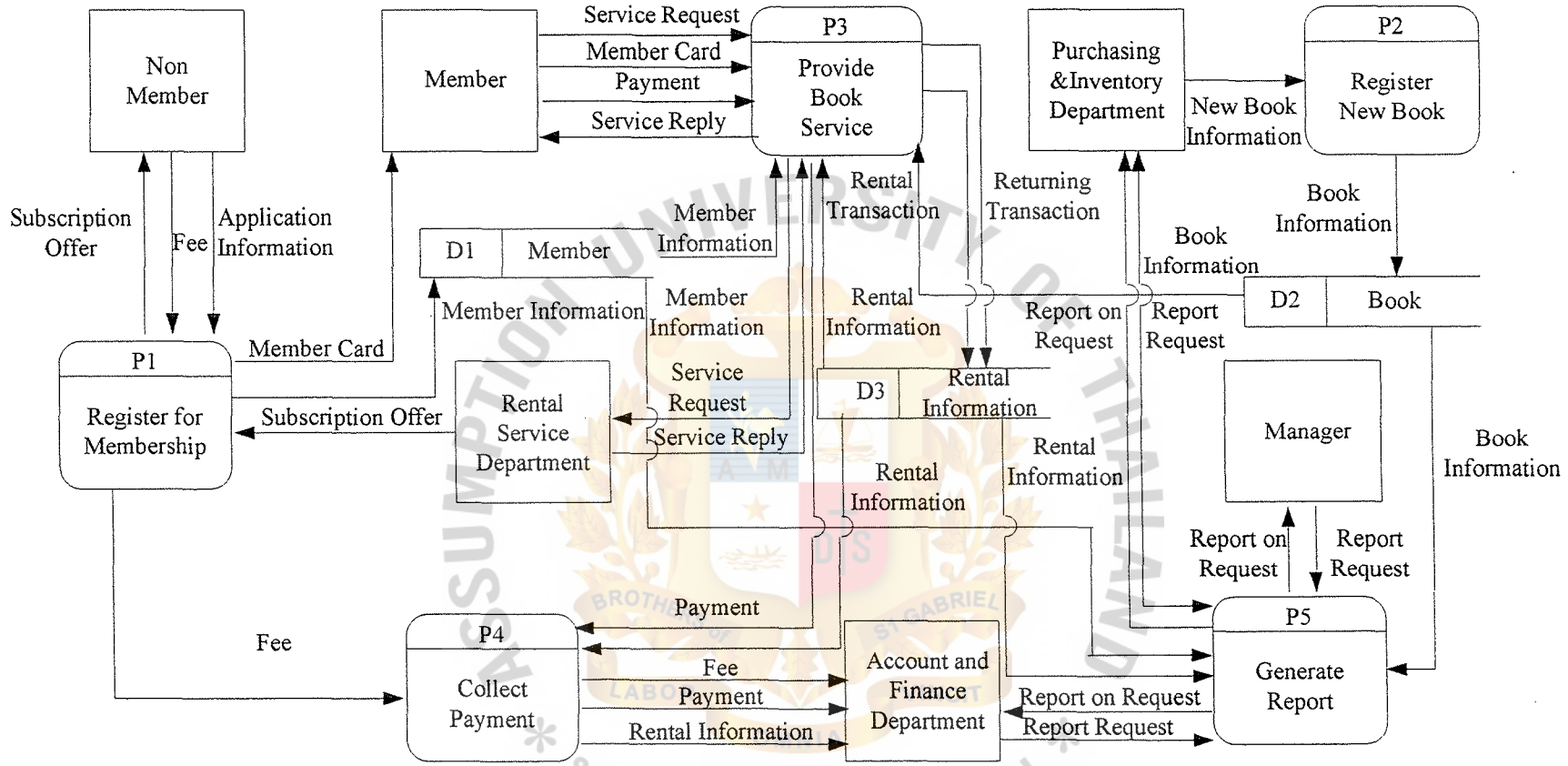

Figure 3.2 Data Flow Diagram of the Proposed System

The processes of the proposed system can be summarized as follows:

Process 1: Registration for Membership

A customer who would like to rent books from the bookshop should register to the bookshop first. He or she should fill out an application form and pay 100 Baht for the membership fees to the bookshop. After that, the staff will keep information provided by the customer in the member file for further transactions and keep a record of the new member. The staff will print a member card that has an ID number, member name, and date of issue. The member card will have to be shown everytime the member would like to borrow books.

Process 2: Registering a New Book

Once the bookshop receives a new book, it will keep information about the book. Information such as type of the book, I.D. for the book, name of the book, description, authors, publisher's name, price and rental fees is recorded for each book in the book file.

Process 3: Providing Book Rental Service

This process provides information the rental services including returning and borrowing of the book. Before the staff provide any service they have to check the status of the members to prevent unauthorized members.

Process 4: Collecting Payment

The collecting payment process deals with all the financial transactions in the bookshop. The process computes the amount of all payments by using book rental system. The rental rate depends on type and price of a book. It is calculated as a percentage of the full price of book for each day the customers rent. The system automatically calculates the rental fee for each member. The rental rate is shown in Table 3.1.

Table 3.1 Rental Rate

Type of book	Rental Rate
Magazine	10%
Cartoon Book	10%
Pocket Book	8%
Novel	8%
Short Story	8%

Process 5: Generating Report

The process will retrieve all necessary transactions in the bookshop to create the required reports. It can generate reports such as member information report, book information report, monthly rental service report , revenue report or any reports requested by the manager using all types of record files (e.g., member record, book record, rental record) in the bookshop.

3.2.4 Designing Data Dictionary

The data dictionary of the proposed system contains information about the data maintained by the system including data flows, data structures, data elements, and data stores. It consists of data description and data type. Data dictionary is presented in Appendix B.

3.2.5 Designing Files

The design of files includes decisions about the nature and contents of the files. It shows the field name, types of field name and length of field name. There are member Information table, book information table, rent transaction table, return transaction table and login table. The file layouts are presented in Appendix E.

3.2.6 Designing of Program Specification

The program specification design describes the transformation of the system for input and output file and the processing of the computer software. In designing the computer software, it is important to ensure that the structure of the software is divided into modules to permit suitable testing and validation. The actual program must perform all tasks and in the manner intended for the system.

The process specification provides further descriptions of element-level processes as shown in Appendix C.

3.3 Hardware and Software Requirement

3.3.1 Hardware Requirement

To prepare for increasing workload in the near future, all hardware for Ton-Son bookshop are listed in Table3.2

Table 3.2 Hardware Requirement

Device	Specification
1. File server (1 unit)	- Intel Pentium 4 2.8 GHz - 512KB L2 cache, FSB 533 MHz. - 256 MB Registered DDR ECC PC3200 unbuffered - 80 GB,1" internal HDD SATA 7200 rpm - Acer CRT Monitor 17"
2. Workstations (Acer Aspire SA10 3 units)	- Intel Celeron D Processor 330 (2.8GHz, 256K L2 Cache, 533 MHz FSB) - Integrated Intel® Extreme Graphics - 256MB DDR-ram PC3200 - 80GB HDD (7200rpm) - CD-RW 52x32x52x16x Combo Drive , 1.44MB FDD - 56k ITU V.90 Fax Modem (internal) - Integrated 10/100 Base-T Network (Built-in) - Integrated 3D Sound(Built-in /Sound Blaster Compatibility) - 6 Hi-Speed USB ports (version 2.0) - Acer Keyboard & Scrolling Mouse with Speaker - Flat CRT 17"
3. Printer (2 units)	- HP Deskjet DJ 3940 - HP All in one PSC 2610
4. UPS	- UPS Leonic Green III 500 VA.
5. Network Peripherals	- D-Link 10/100 8 ports
6. Cabling	- UTP Cable, RJ-45 Connection

3.3.2 Software Requirement

The new system needs programs to support and facilitate the company's activities. It uses Microsoft Windows 2000 Server as operating system software on the server side and Microsoft Windows XP Professional as operating system in each work station. For application software, it uses Microsoft office for Windows XP Professional that contains Access, Word, Excel, and PowerPoint.

3.4 Data Communication and network

The existing system of Ton-Son Bookshop is a manual system. Now we try to design a computer-based system. So in the future, if the staff want some details or information of each book or member, they can search for that information from the computer at their place.

We decide to use the work group feature of Windows for the new system. It will provide a better means to access, share data and resources, and give no redundancy. Network Configuration of the Proposed System is shown in Figure 3.3.

3.5 Security and Control

Ton-Son's system will be more complex when changing from the manual system to the computer-based system. Security and control are very important when a computer-based information system is involved. It encompasses not only the day-to-day protection of the computer hardware and software but also the data integrity, data privacy, safeguarding of all physical facilities, and avoidance of disastrous losses. Many of the security controls attempt to prevent or detect unauthorized access to data, computer equipment, or other physical facilities. Other security controls are corrective in nature since they enable losses of data or facilities to be recovered or reconstructed. Some security controls are highly technical and sophisticated especially when providing security for centralized database and data communication networks.

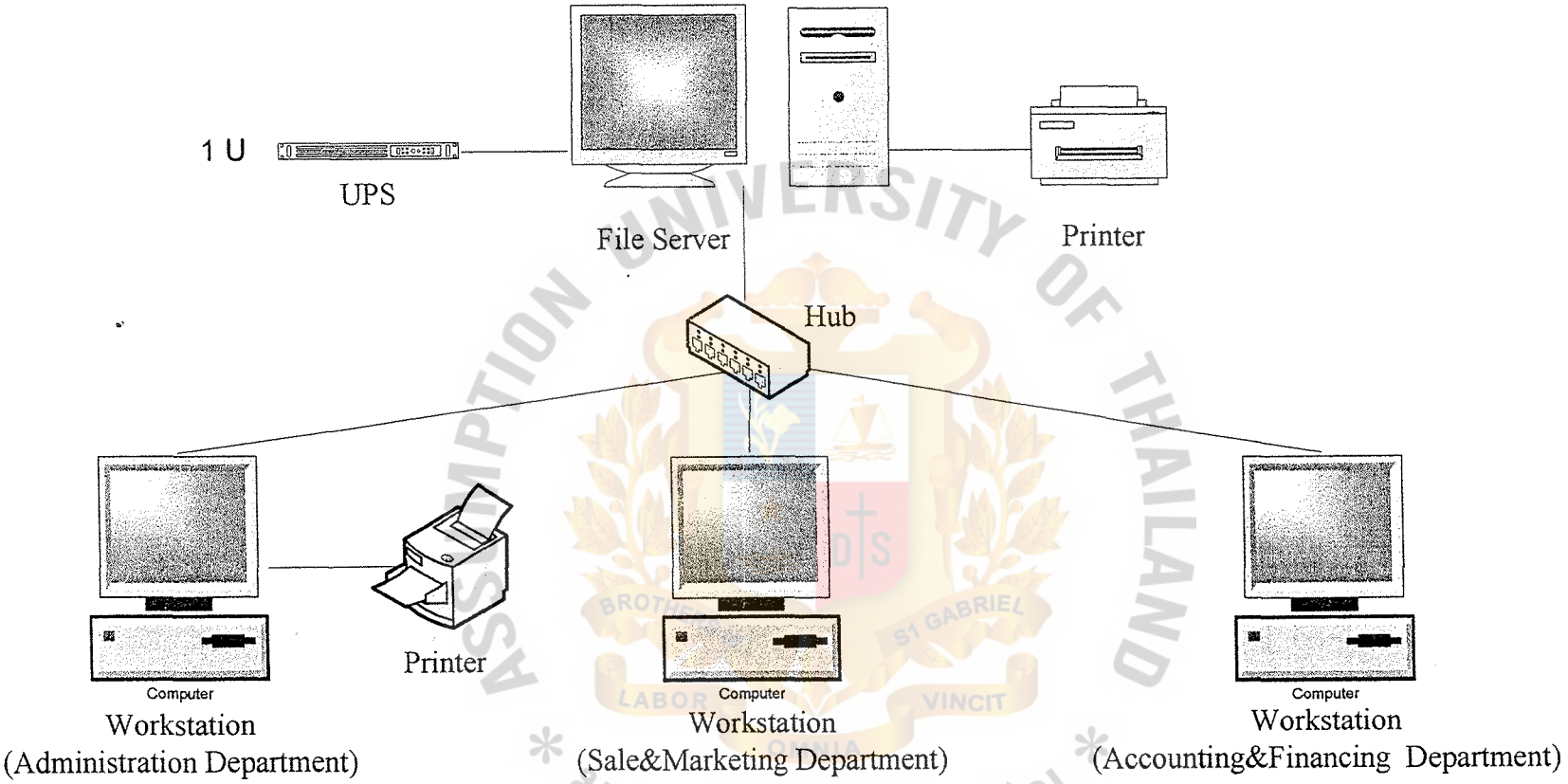

Figure 3.3 Network Configuration of the Proposed System

The risk and threat to the computer system are any advanced situation or unfortunate event that would interrupt the service operations of the bookshop. The security and controls may include:

1. Protecing data from unauthorized person's access.

   - Use log-in name and password before entering the system.

   - Force users to change password within a specific time.

2. Preventing the loss of data or errors from any accident that may destroy the file.

   - Staffs have to back up the important information to prevent file damaging in the hard disk.

   - Use UPS to supply power instead of the main electricity supply.

   - The source document will be stored in the secure cabinet that is located outside the bookshop in order to prevent unauthorized changes and to prevent loss of source document due to a natural disaster such as fire or flood.

3. To assure data completeness and accuracy starting from input to output.

   - Data entry must be double-checked and verified.

   - The historical and current data report must be kept in categorized files for managerial planning.

   - The formats of reports should include a proper heading for easy understanding.

4. To assure a correct function for each level of the users.

   - Create menu for each user to use the system depending on related function tasks.

5. A virus-checking program will be installed for scanning virus before running any program. Staff will need to update the virus check every three months.

3.6 Candidate Solution Analysis

(1) Candidate1: Purchasing rental service software

Media Rental is a Point of Sale system that manages sales and marketing operations of rental and retail business of video, book and game. It is developed by Fonlow company. General features of the software include integrated rental, sales, reservations, overdue loan monitoring, marketing schemes, operation and management reporting, comprehensive search functions, and much more. The software also provides comprehensive E-mail functionalities, and marketing schemes supports. A lot of book and video rental shops use this software to manage their rental service. This solution can be implemented quickly because it is a purchased solution. However, the disadvantages are that this software is so expensive and may not be customized to all user requirements of Ton-Son bookshop.

(2) Candidate2: In-house development

This Book Rental Service will be developed by in-house developers. This candidate can implement at the lowest cost and support all user required business processes. The disadvantage is that the company has inexperienced staff with little information on technology, especially in the area of system development.

(3) Candidate 3: Outsourcing of the company

The company will outsource software development to Freedomsoft company. It is the software development company that design specific software

for each customer. It has a lot of experience in developing this kind of solution using DBMS, MS Access. This candidate will fully support user requirement. In addition, we have heard that customers are extremely satisfied with the customized software product.

The comparison of all candidates is shown in Table 3.3.

Table 3.3 A 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.	Rental Software would be purchased.	System operations in relation to Book Rental Service.	Same as candidate2
Benefits Brief description of the business benefits that would be realized for this candidate.	This solution can be implemented quickly because it is a purchased solution.	Fully supports user required business processes.	Same as candidate2
Servers and Workstations A description of the servers and workstations needed to support this candidate.	Intel Pentium 4 3.2 GHz for server and Intel Pentium 4 3.06 GHz for workstations.	Intel Pentium 4 2.8GHz for server and Intel Celeron D Processor 330for workstations.	Same as candidate2
Software Tools Needed Software tools needed to design and build the candidate (e.g., database management system, emulators, operating system, languages, etc.) Not generally applicable if applications software packages are to be purchased.	Microsoft window 2000 server, Microsoft Windows XP Professional	Same as candidate1	Same as candidate1
Application Software A description of the software to be purchased, built, accessed, or some combination of these techniques.	Package Solution	Custom Solution	Same as candidate1
Method of Data Processing Generally some combination of: on-line, batch, deferred batch, remote batch, and real-time.	Client/Server	Same as candidate1	Same as candidate1
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).	HP LAN Laser Jet 3055 printer	Same as candidate1	- HP Deskjet DJ3940 - HP All in one PSC 2610
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 candidate1	Same as candidate1
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.	Microsoft Access with 80 GB capability.	Same as candidate1	Same as candidate1

3.7 Feasibility Analysis

Each candidate system solution must be analyzed for feasibility. This can occur after all candidates have been identified. There are four criteria as follows:

(1) Operational Feasibility

Operational Feasibility is a measurement of how the solution fulfills the user's requirements and how the solution changes the user's work environment. In conclusion, every alternative is now worth for solving the problem. But with usability analysis, it is most outstanding than any other alternative, which is candidate 3. It is easy to learn and use. Also it is a fashionable look of the operating system Window XP, yielding satisfaction to the user.

(2) Technical Feasibility

Technical Feasibility is a measurement of the practicality of a specific technical solution and the availability of technical resources expertise. Candidate 1 and 3 require training all users. Candidate 2 requires full training for system developers and users.

(3) Economic Feasibility

Economic Feasibility is a measurement of cost-effectiveness of a solution. Candidate 2 is reasonably priced and cost- effective in terms of return of investment. The software costs from other two candidates are quite high.

(4) Schedule Feasibility

Schedule Feasibility is a measurement of how reasonable the project timetable is. Candidate 1 definitely gives a satisfactory result as it purchase software.

The feasibility is performed on each individual candidate without regard to the feasibility of other candidates. It is show in Table 3.4.

Table 3.4 A Feasibility Analysis Matrix

Feasibility Criteria	**Weight**	**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, and organization perspective.	30%	Some function can not meet the user's requirement. Score:70	Fully supports user required functionality. Score:100	Same as candidate2. Score:100
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%	Require some training for all users. Score:85	Require fully training for system developers and users Score:50	Same as candidate1. Score:85
Economic Feasibility **Cost to develop:** **Payback period(discounted):** **Net present value:** **Detailed calculations:**	30%	Approximately 372,100 Baht Approximately 2Years 2.44 months Approximately 207,246 Baht See Attachment Score: 60	Approximately 191,100 Baht Approximately 1Years 8.15months Approximately 436,995 Baht See Attachment Score: 90	Approximately 236,400 Baht Approximately 1Year9.68months Approximately 420,225 Baht See Attachment Score: 85
Schedule Feasibility An assessment of how long the solution will take to design and implement.	20%	2 months Score:90	8 months Score:60	4 months Score:80
Ranking	**100%**	74	79	88.5

3.8 Cost and Benefit Analysis

3.8.1 Cost Analysis

To consider the financial aspects of the new system, cost comparison should be performed between the existing system and the proposed system. Cost analysis of the proposed system should include investment costs, implementation cost, and annual operation costs shown respectively in Table 3.5, Table 3.6 and Table 3.7.

Table 3.5 Investment cost of proposed system

Investment Costs	Price per unit	Total (Baht)
Hardware Specification:		
(1) File server : Acer 1 Unit	39,000	39,000
(2) Workstations : Acer Aspire SA10 3 Units	14,000	42,000
(3) Printer		
- HP Deskjet DJ 3940 1 Unit	2,400	2,400
- HP All in one PSC 2610 1 Unit	9,900	9,900
(4) UPS 3 Units	2,500	7,500
(5) Network Peripherals 1 Unit	1,100	1,100
(6) Cabling 1 Set	2,500	2,500
Total Hardware Costs		**104,400**
Software Specification:		
(1) Microsoft Windows 2000 Server 1 Unit	40,000	40,000
(2) Microsoft Windows XP Professional 3 Units	7,000	21,000
(3) Microsoft office for Windows XP Professional 3 Units	7,000	21,000
(4) Book Rental System 1 Unit	50,000	50,000
Total Software Costs		**132,000**
Total Investment Costs		**236,400**

Table 3.6 Implementation Costs of proposed system

Implementation Costs	**Price per unit**	**Total (Baht)**
- Software development and training cost	5,000	5,000
- Salary for 3 people	72,000	288,000
Total Implementation Costs		**293,000**

Table 3.7 Annual Operating Costs of proposed system

Annual Operating Costs	**Price per unit**	**Total (Baht)**
- Stationary	10,000	10,000
- Miscellaneous costs	5,000	5,000
Total Annual Operating Costs		**15,000**

(1) Costs of Computerized System

Table 3.8 Computerized System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
Hardware Cost:					
Server	39,000	0	0	0	0
PC 1 item @14,000	42,000	0	0	0	0
Network Peripherals	1,100	0	0	0	0
UPS 500 VA 1item@2,500	7,500	0	0	0	0
All in one printer	9,900	0	0	0	0
Deskjet printer	2,400	0	0	0	0
Cabling	2,500	0	0	0	0
Total Hardware Cost	104,400	0	0	0	0
Software Cost:					
MS Windows 2000 Server	40,000	0	0	0	0
MS Windows XP professional	21,000	0	0	0	0
MS office for Windows XP professional	21,000	0	0	0	0
Book Rental System	50,000	0	0	0	0
Total Software Cost	132,000	0	0	0	0
Implementation Cost:					
Software development and training cost	5,000	5,500	6,000	6,500	7,000
Salary for 3 people	288,000	292,800	297,600	302,400	307,200
Total Implementation Cost	293,000	298,300	303,600	308,900	314,200
Annual Operating Cost:					
Stationary cost	10,000	11,000	12,000	13,000	14,000
Miscellaneous cost	5,000	5,000	5,000	5,000	5,000
Total Annual Operating Cost	15,000	16,000	17,000	18,000	19,000
Total Computerized System Cost	**544,400**	**314,300**	**320,600**	**326,900**	**333,200**

Table 3.8 shows costs of computerized system for five years. It consists of hardware cost, software cost, implementation cost and annual operation cost.

Table 3.9 Five Years Accumulated Computerized Cost, Baht.

Year	Total Computerized Cost	Accumulated Cost
1	544,400	544,400
2	314,300	858,700
3	320,600	1,179,300
4	326,900	1,506,200
5	333,200	1,839,400

Table 3.9 shows total cost of each year and accumulated cost for five years for a computerized system.

(2) Costs of Manual System

Table 3.10 Manual System Cost Analysis, Baht.

Cost items	Year				
	1	2	3	4	5
Office Equipment	85,000	93,000	101,000	109,000	117,000
Salary	360,000	366,000	372,000	378,000	384,000
Total Manual System Cost	**445,000**	**459,000**	**473,000**	**487,000**	**501,000**

Table 3.10 shows costs of manual system for five years. It consists of office equipment and salary.

Table 3.11 Five Years Accumulated Manual System Cost, Baht.

Year	Total Manual Cost	Accumulated Cost
1	445,000	445,000
2	459,000	904,000
3	473,000	1,377,000
4	487,000	1,864,000
5	501,000	2,365,000

Table 3.11 shows total cost of each year and accumulated cost for five years for manual system.

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

Table 3.12 The Comparison of the System Costs, Baht.

Year	Accumulated Manual Cost	Accumulated Computerized Cost
1	445,000	544,400
2	904,000	858,700
3	1,377,000	1,179,300
4	1,864,000	1,506,200
5	2,365,000	1,839,400

Table 3.12 shows the comparison cost of the proposed and the existing system. Figure 3.4 shows the comparison cost of the proposed and the existing system in terms of graph. It shows that the cost of the proposed system is higher than the existing system at the beginning or early period. However, for just about two years, the cost of proposed system is declined to meet the cost of the existing system. The operation of the existing system requires more staff and the cost of hiring staff will be increased every year. For the proposed system, the company may appear to spend more money than the existing system. However, in the long term, the cost will come down year by year because only the operation staff are required to handle all the operations.

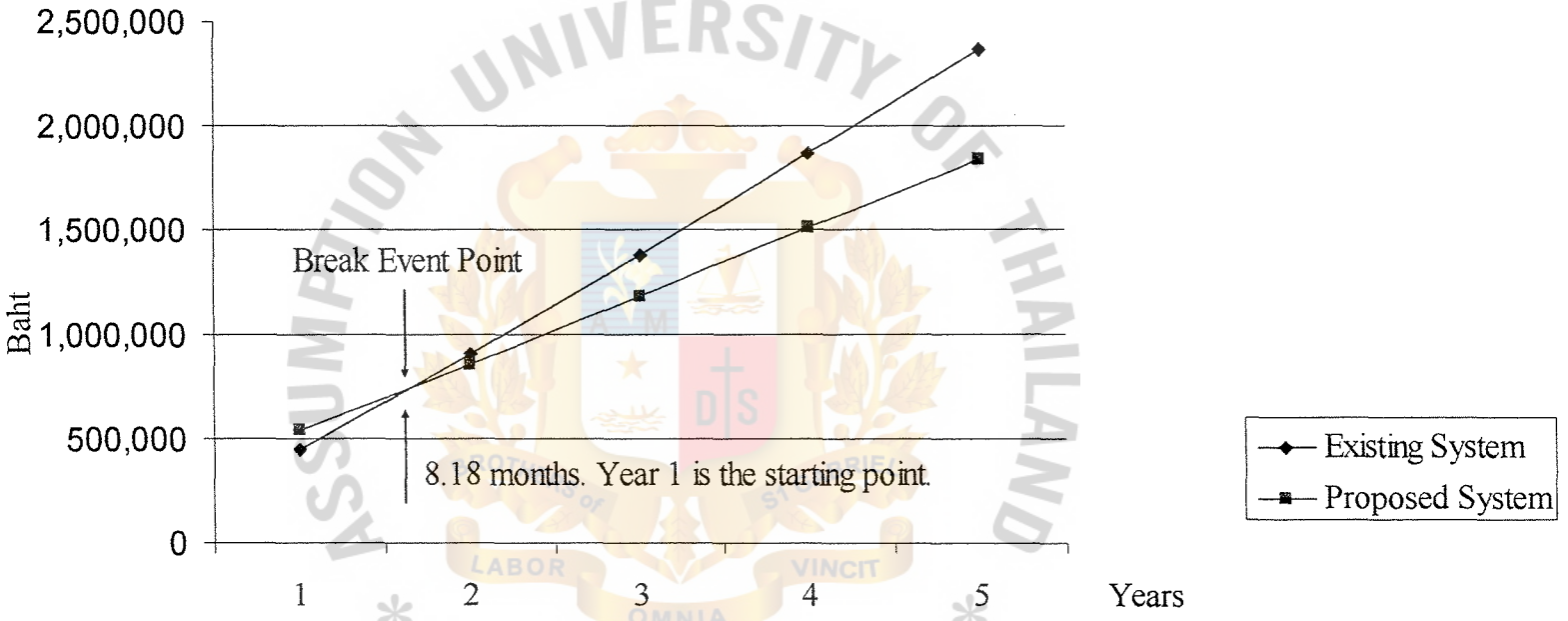

Figure 3.4 Cost comparison between the Existing System and the Proposed System

3.8.2 Benefit Analysis

Benefit analysis is the method for evaluating the proposed computer information system. The benefit of book rental system is not only that it increases the efficiency of the service but also many more things such as maintaining customers for long terms that can be achieved from the proposed system. The benefits can be projected as both tangible and intangible as follows:

(1) Tangible benefits

(a) Fewer processing error.

(b) Reduce staff: We do not need to hire extra employees to handle the paper document.

(c) Reduce office supply expenses (e.g., stationary, paper, and etc.).

(d) Decrease response time.

(2) Intangible benefits

(a) Improve employees' goodwill because they have a system to support their tasks and to reduce their workload.

(b) Better decision making.

(c) Identify and retain profitable customers.

(d) Solve the problem immediately and improve working process.

(e) In the proposed system, data will be kept in permanent storage, which prevents loss of information and damage of documents while providing more security than the existing system.

3.8.3 Payback Analysis

There are many techniques for comparing the costs and the benefits of the proposed system. For this project, payback analysis is suitable and thus used.

System development costs are incurred long before benefit begins to accrue so it will take time for the benefits to overtake the costs. The payback period is the number of years required to accumulate earnings sufficient to cover the investment cost.

Lifetime benefits will overtake the lifetime costs between year 1 and 2. By charting the cumulative lifetime costs and benefits, it can be estimated that benefits will cover the cost in approximately 1 year and 9.68 months after the proposed system is in operation as shown in Table 3.13 and Figure 3.5.

Table 3.13 Payback Analysis of the Proposed System

Cash Flow description	Years					
	0	1	2	3	4	5
Development cost:	-236,400					
Operation & Maintenance cost:	0	-20,000	-21,500	-23,000	-24,500	-26,000
Discount factor for 5%:	1	0.952	0.907	0.864	0.823	0.784
Time-adjusted costs(adjusted to present value):	-236,400	-19,040	-19,501	-19,872	-20,164	-20,384
Cumulative time-adjusted costs over lifetime:	-236,400	-255,440	-274,941	-294,813	-314,977	-335,361
Benefits derived from operation of new system:	0	157,000	166,200	175,400	184,600	193,800
Discount factor for 5%:	1	0.952	0.907	0.864	0.823	0.784
Time-adjusted benefits (current of present value):	0	149,464	150,743	151,545	151,925	151,939
Cumulative time-adjusted benefit over lifetime:	0	149,464	300,207	451,752	603,677	755,616
Cumulative lifetime time-adjusted costs + benefits:	**-236,400**	**-105,976**	**25,266**	**156,939**	**288,700**	**420,255**

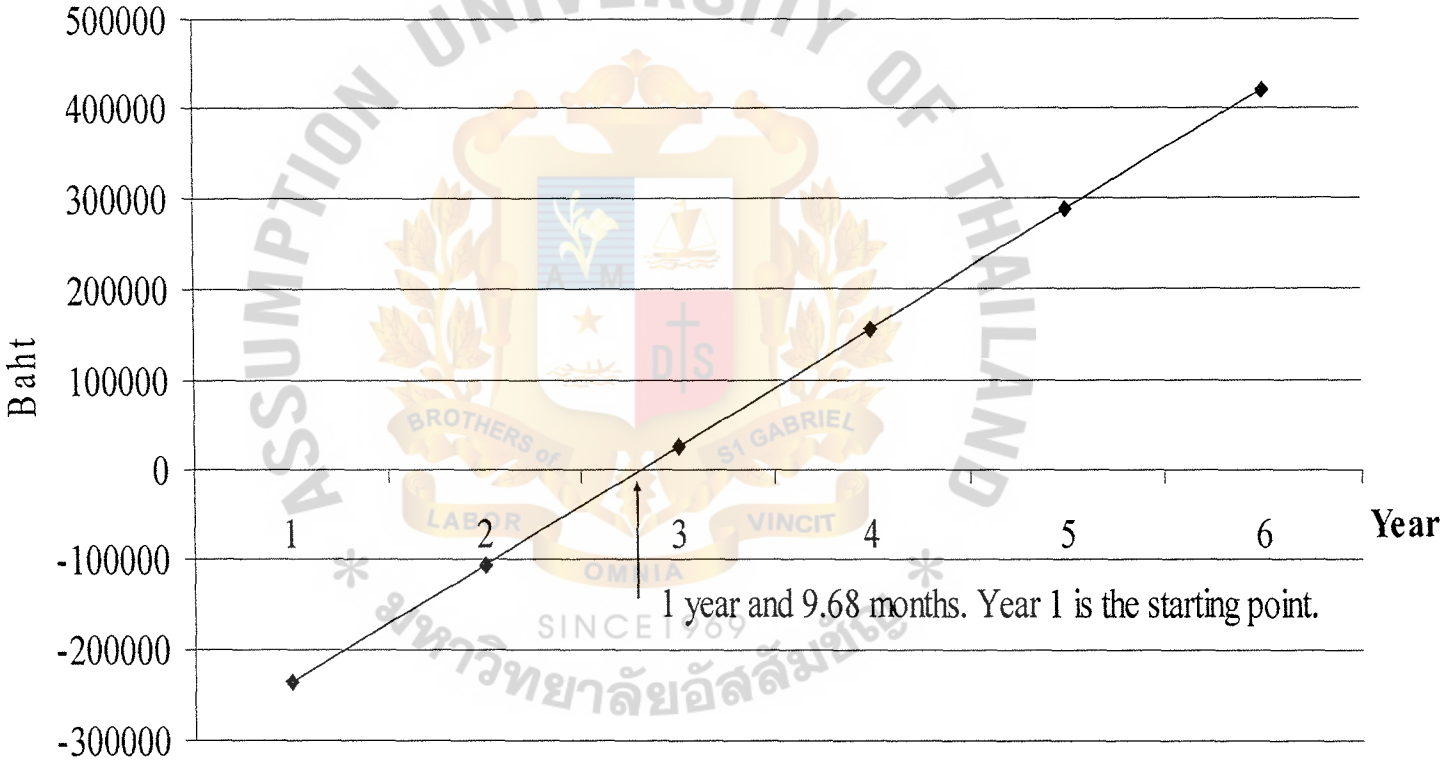

Figure 3.5 Cumulative lifetime time-adjusted costs+benefits

3.8.4 Net Present Value Analysis

Net present Value Analysis is a sophisticated capital budgeting technique that is calculated by subtracting the project's initial investment from the present value of cash inflows discounted at a rate to the firm's cost of capital.

Costs are represented by negative cash flows while benefits are represented by positive cash flows. Table3.14 shows net present value of the proposed system. If the sum of the discounted benefits is positive, the investment is good and vice versa.

Table 3.14 Net present value of the Proposed System

Cash Flow description	Years					
	0	1	2	3	4	5
Development cost	-236,400					
Operation & Maintenance cost	0	-20,000	-21,500	-23,000	-24,500	-26,000
Discount factor for 5%	1	0.952	0.907	0.864	0.823	0.784
Present value of annual costs	-236,400	-19,040	-19,501	-19,872	-20,164	-20,384
Total present value of lifetime cost						-335,361
Benefits derived from operation of new system	0	157,000	166,200	175,400	184,600	193,800
Discount factor for 5%	1	0.952	0.907	0.864	0.823	0.784
Present value of annual costs	0	149,464	150,743	151,545	151,925	151,939
Total present value of lifetime cost						755,616
Net Present Value of proposed system						**420,255**

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

The success of a book rental system can not be achieved from only the analysis and design phases but also the implementation. After analyzing and designing the system, the implementation is the next phase to complete. Project implementation is the construction of the new system and the delivery of the new system into production. It includes all those activities that convert the old system to the new system.

In many cases, new systems are built around existing system and network so it is not difficult for project implementation to perform the conversion. For our system, we change from manual and paper based system to a computerized system. Computer network must be fully set up and integrated for client and server services. Microsoft Access needed to be installed as our operation software. Testing, training and conversion are performed to ensure that the new system will work properly.

4.2 Testing

After developing the book renal service, the company has to test the new system to ensure that it works properly and meets all requirements. To determine whether the developed system is suitable for solving the existing problems, the testing includes network, database and software testing.

Because the new system is a network, network testing ensures that all workstations can connect and share data with server. The network structure can be implemented and tested before a database and software system to be developed and run on this network. For database testing, the staff is the best person who can provide the data to be used in the database. Sampling data must be loaded into the tables for testing the database. Insert, delete and update operations are also performed to ensure that the

data in database is consistent and valid. Final step is testing the new system. Software testing includes unit testing performed by a developer and system testing. This task is conducting a system test to ensure that the new system meet the user's requirements. Simulating many actual situations is also an important part of the system testing.

4.3 Training

The project implementation involves training individuals who will use the final system and developing documentation to aid system users. Training must get staffs involved in order for them to be familiar with the new system and allow them to perform their common tasks such as member registration, book registration and rental service.

As we outsource the software development to Freedomsoft company, user training is Freedomsoft's responsibility. Freedomsoft offers group training (two-five persons) to save time and encourages group-learning experience. The training also includes two days in house training and three days on site training. It is importance for freedomsoft to provide a clear, concise, step-by-step user manual and documentation. A call support is available for three months.

4.4 Conversion

To provide a smooth transition to the new system, a conversion plan should be prepared. Conversion is the process of changing all work processes from the old system to the new one. There are many conversion methods of handling systems conversions: abrupt cut-over, parallel, location, and stage conversion.

This project will use parallel method that convert step by step to prevent all works to stop immediately due to unsuitable processes. We must give time to the staff to be familiar with the computerized system. The parallel conversion of both old and

new system is operated for two months to ensure that all major problems in the new system have been solved before the old system is discarded. It increases the cost of running the two systems at the same time and consumes more resources with double workload of the staff. However, the double workload will be reduced once the staff can run the new system smoothly and all major problems are resolved.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Book rental system is the system that use Ton-Son bookshop as a case study of business application development. To complete this system, we integrate all knowledge from many subjects including planning, system design and implementation, cost and benefit analysis. Ton-Son bookshop provides all services manually. When the quantity of services increase, redundancy takes place and there is no statistic report for the manager, the new computer system is proposed to improve the capacity of the staff and reduce redundancy and create many kinds of report.

Book rental system supports major activities of Ton-Son bookshop in the rental service department. The system helps the staff to provide rental service faster and more effectively as illustrated in Table 5.1.

Table 5.1 Achievement of Proposed System

Process	Response time of existing system	Response time of proposed system
1.Customer requisition	15 minutes	1 minute
2.New customer registration	5 minutes	1 minute
3.Borrowed transaction	5 minutes	1 minute
4. Returned transaction	10 minutes	1 minute
5.New book registration	5 minutes	1 minute
6.Report generation	3 hours	1 minute

Table 5.1 shows that the response time of all processes of the proposed system is significantly faster than the response time of the existing system. The response time of

the proposed system includes the typing time to input information to the proposed system and processing time.

The proposed system allows staff to record member information, book information and rental transaction into proper format. The existing problems such as redundancy of record and error of information are eliminated by using computerized system. The new system can generate many types of report such as revenue report, rental report to support decision making for the manager.

5.2 Recommendations

The system developed in this project needs ongoing development, revision and modification similar to any other software system to meet the future user requirements. The improvement could be done through user feedback (customer and staff). Collecting user feedback is necessary.

After using the book developed system, the company considers and plans the next step of developing more business. First of all, we would maintain the current customer by providing many kinds of promotion for member such as "Borrow five get one free" and "10% rental fee discount for two or more years membership". These kinds of promotion can stimulate customer to borrow more book. Membership fee discount is one strategy to create new customer.

In the near future, we are going to open two new branches at MBK and Central Ladprow. It is possible for a manager to take care three branches at the same time by expanding the developed system. We are also interested in expanding our line of business to video rental and game rental service. Credit card payment is next item that we are considering.

APPENDIX A

DATA FLOW DIAGRAM

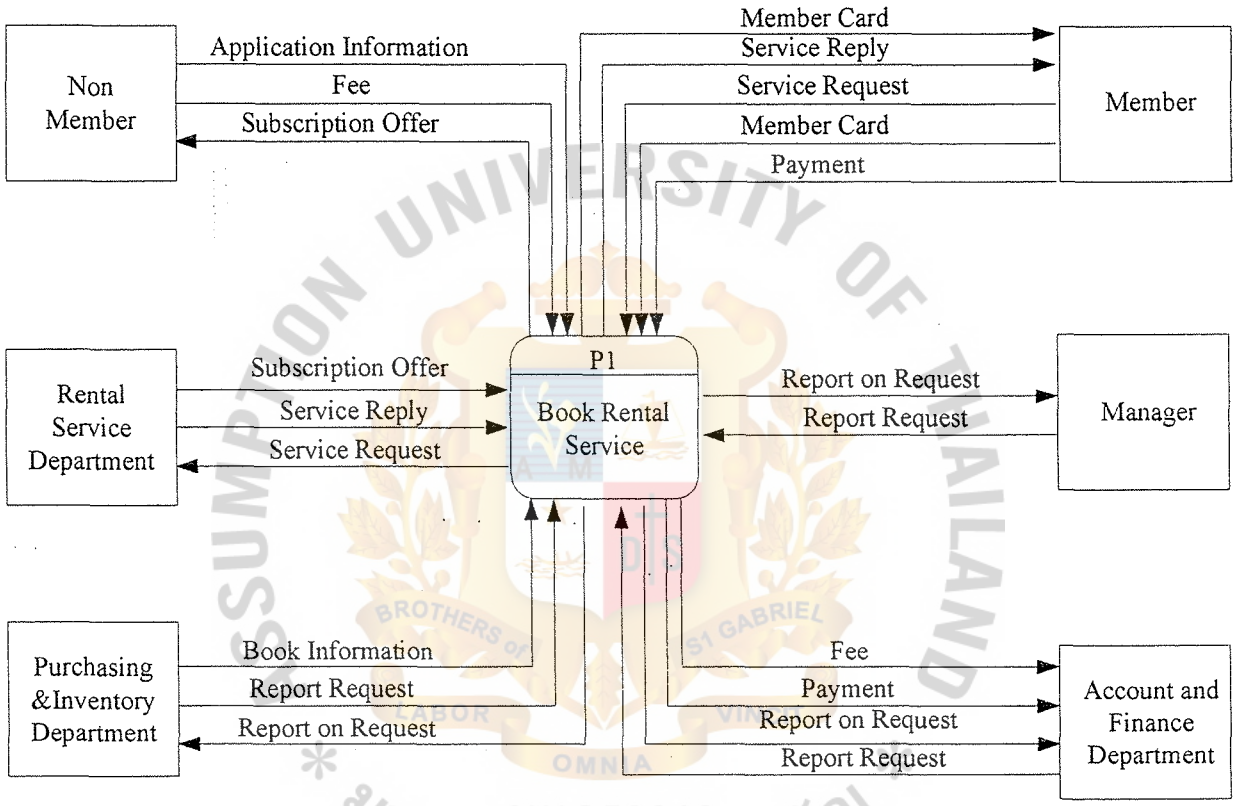

Figure A.1 Context Diagram of the Proposed System

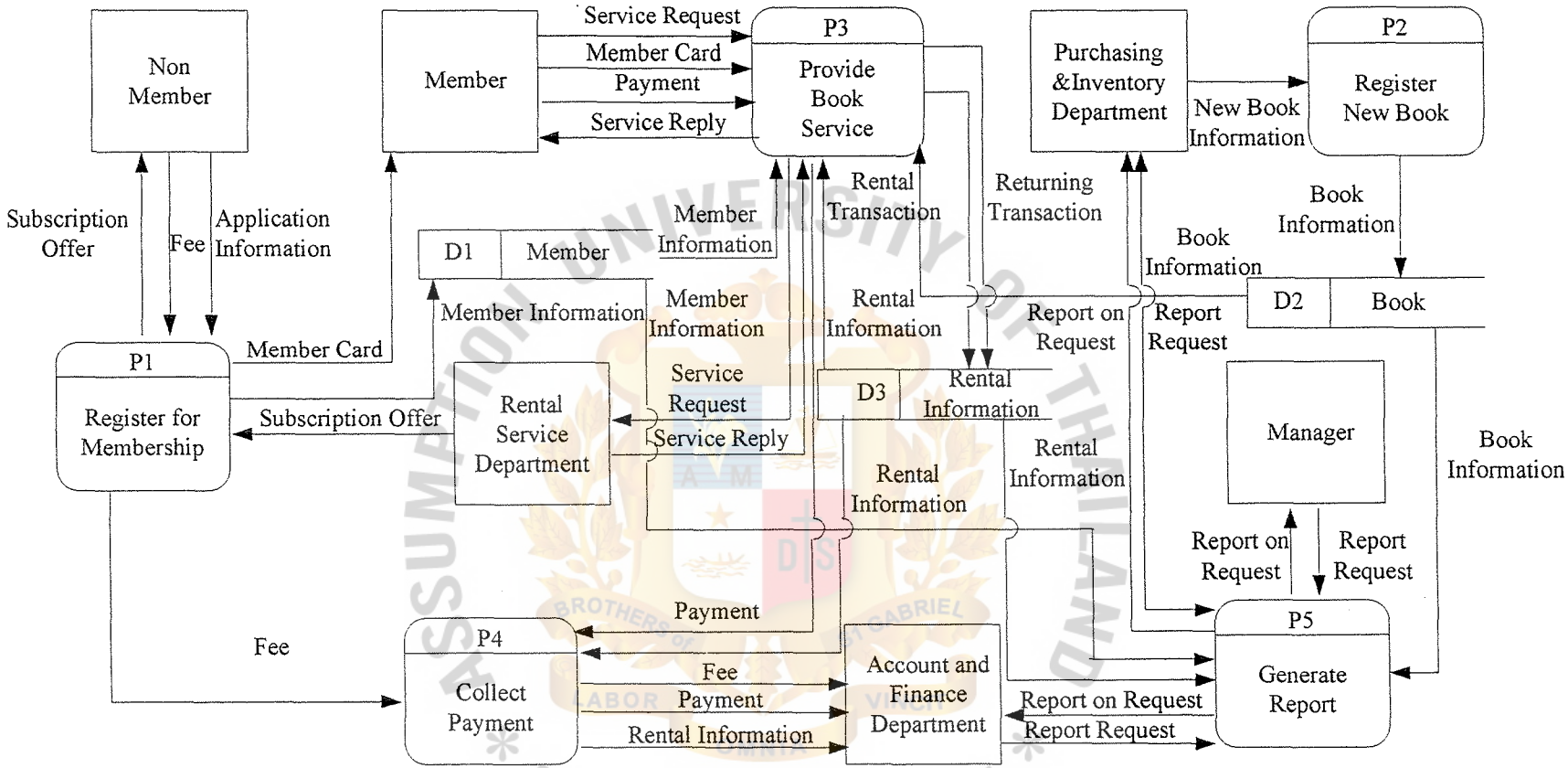

Figure A.2 Data Flow Diagram Level 0 of the Proposed System

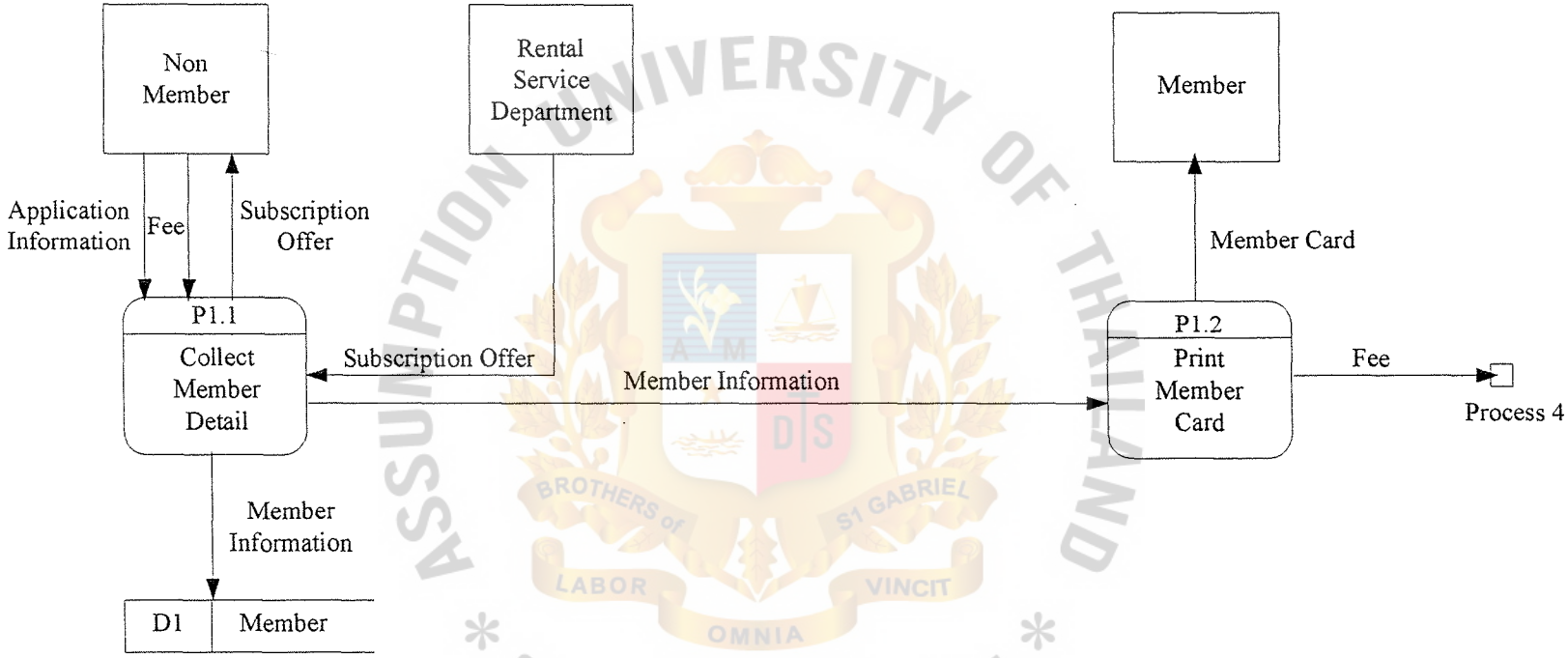

Figure A.3 Data Flow Diagram Level 1 of the Proposed System

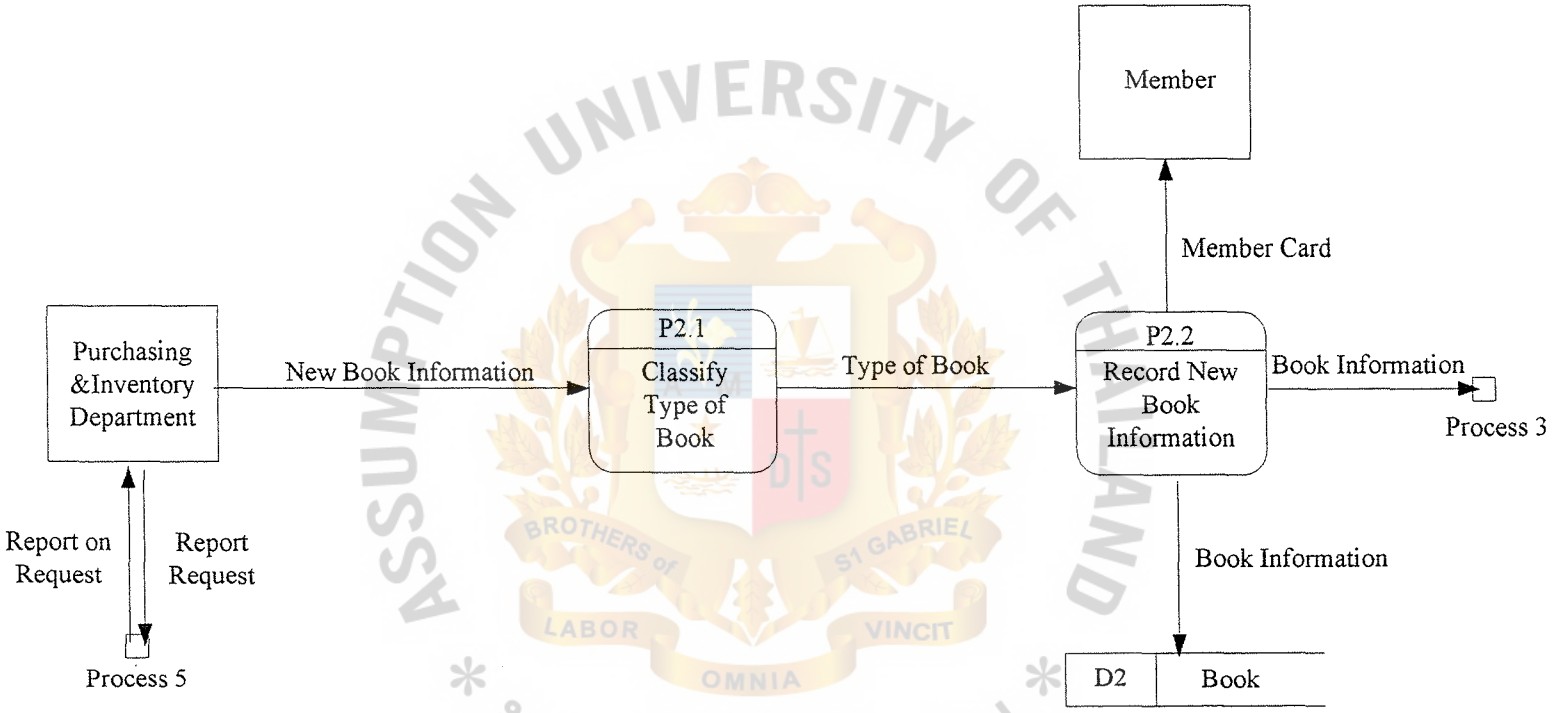

Figure A.4 Data Flow Diagram Level 1 of the Proposed System

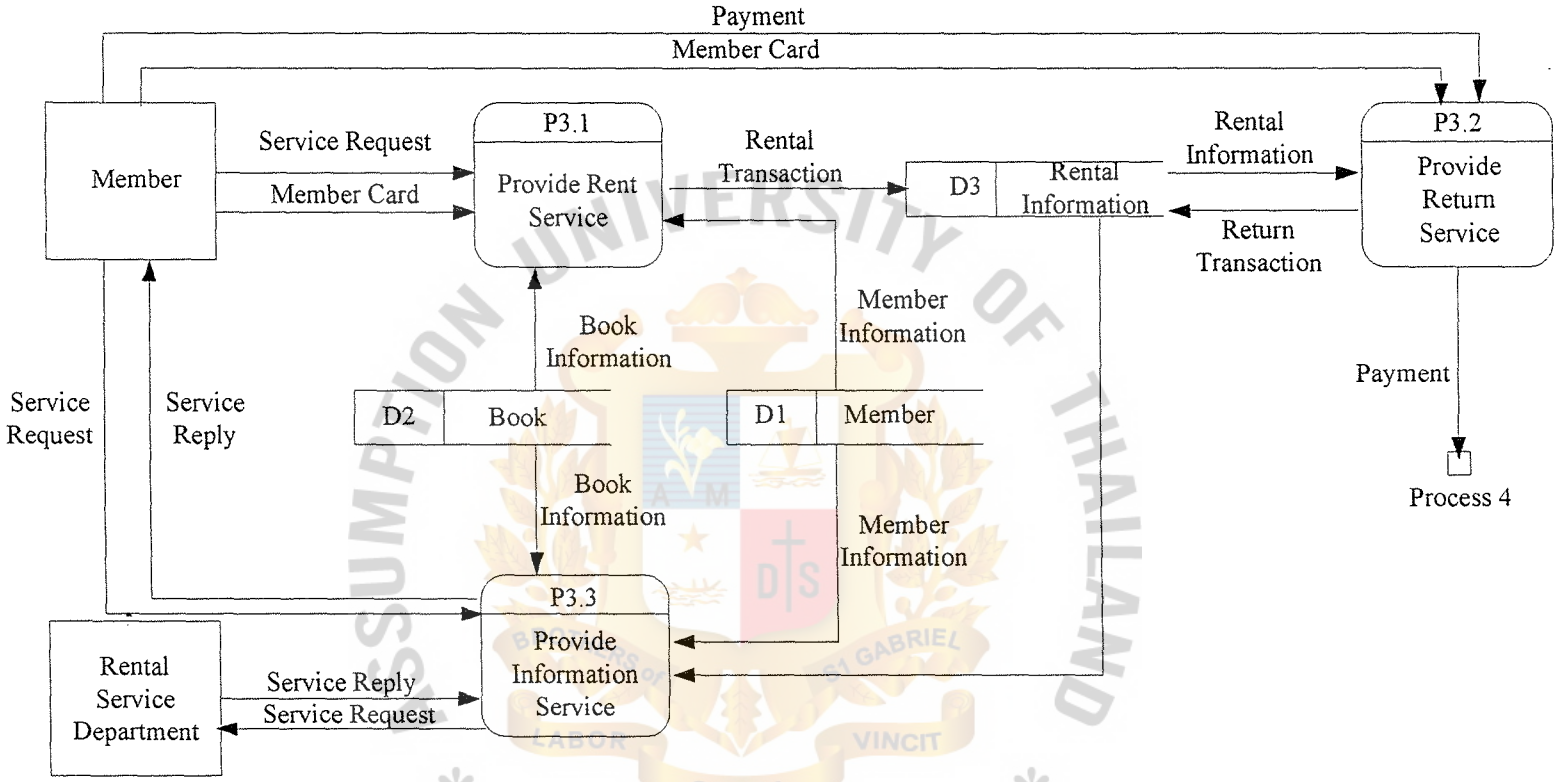

Figure A.5 Data Flow Diagram Level 1 of the Proposed System

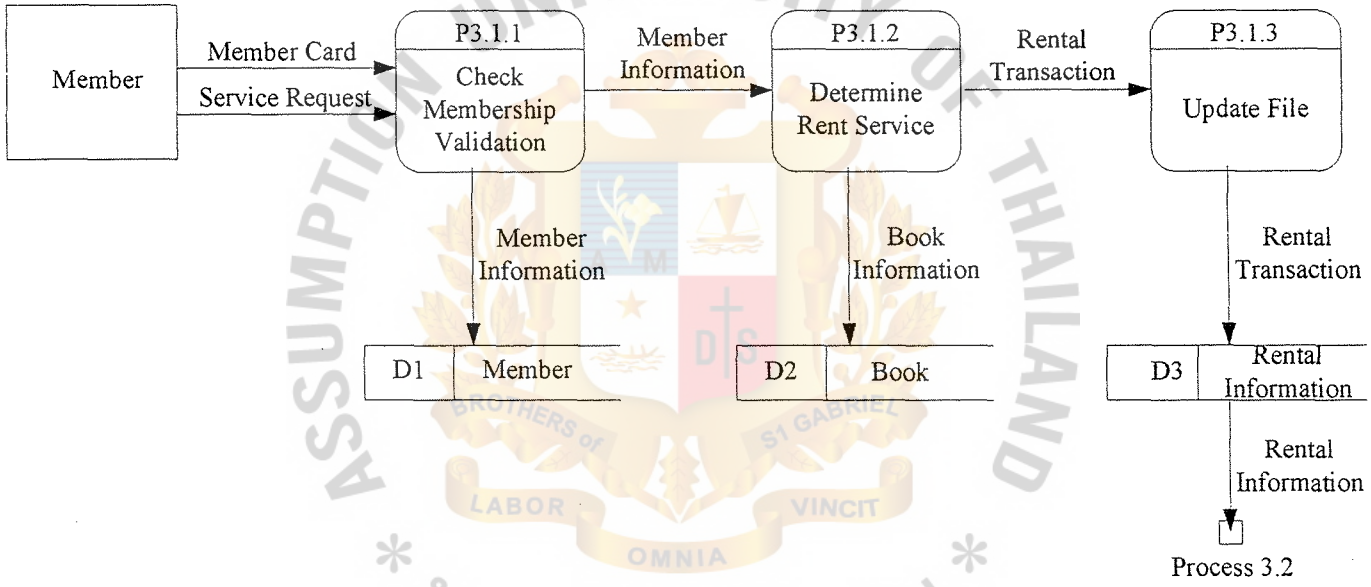

Figure A.6 Data Flow Diagram Level 2 of the Proposed System

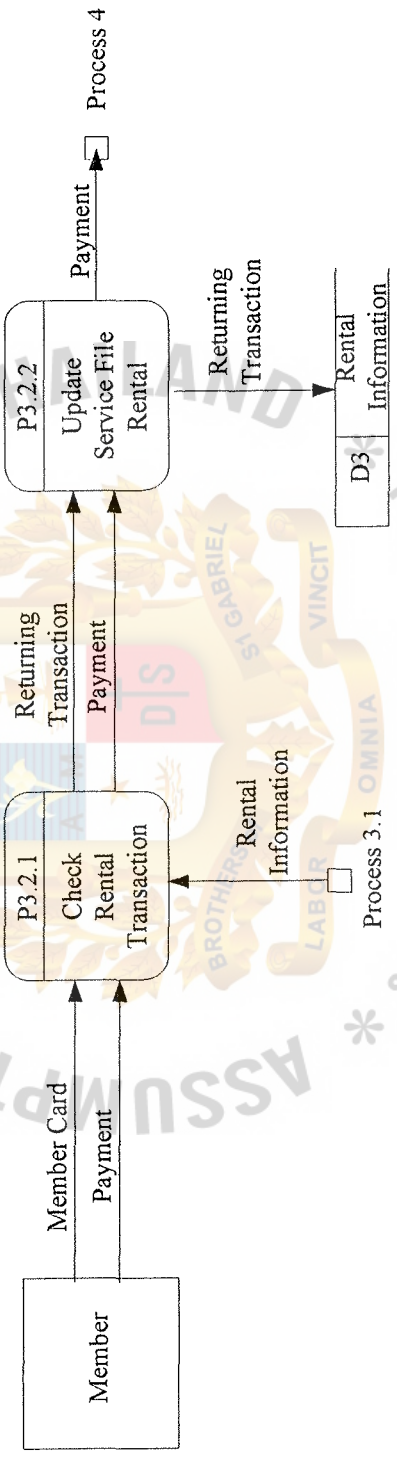

Figure A.7 Data Flow Diagram Level 2 of the Proposed System

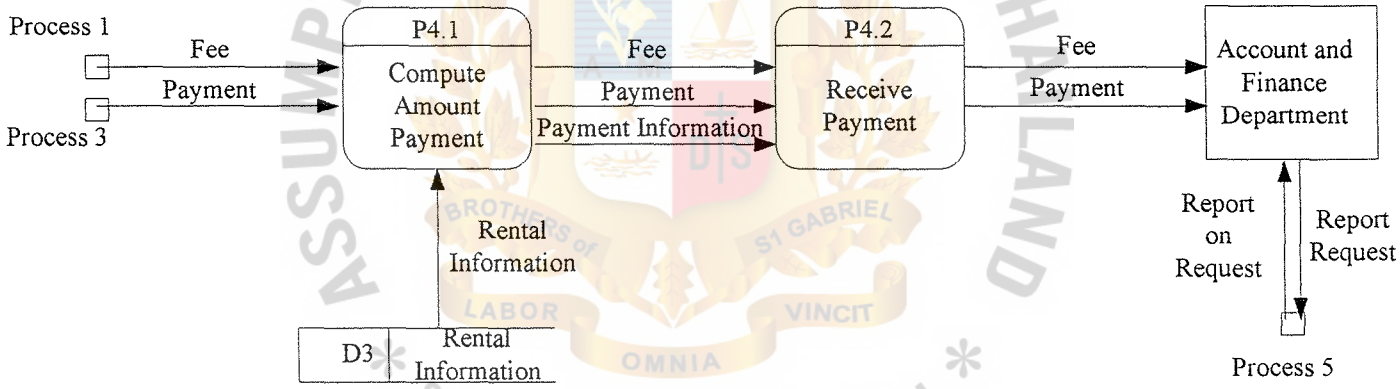

Figure A.8 Data Flow Diagram Level 1 of the Proposed System

APPENDIX B

STRUCTURE DESIGN

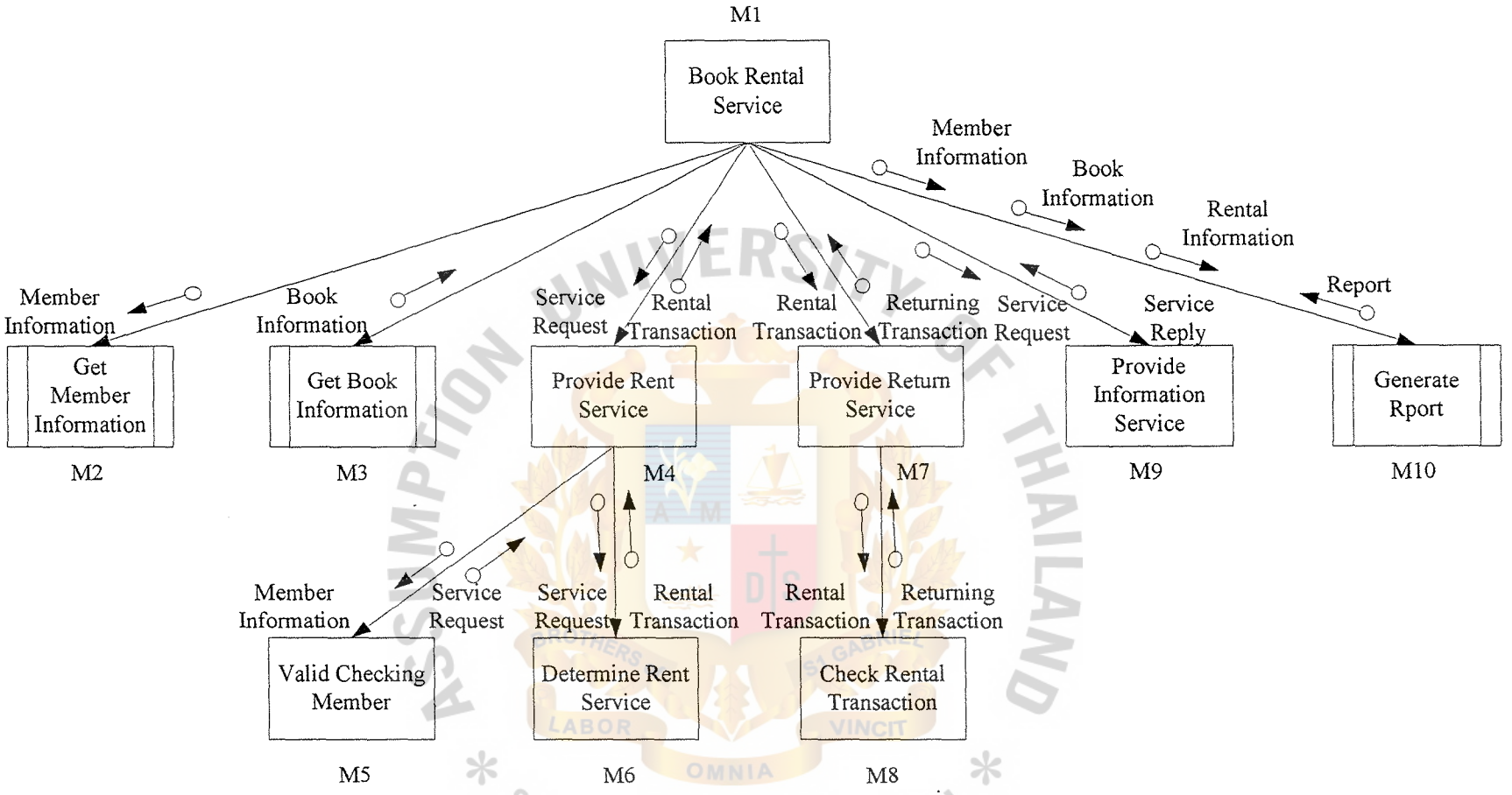

Figure B.1 Structure Chart of Book Rental Service System

APPENDIX C

PROCESS SPECIFICATION

PROCESS SPECIFICATION

Table C.1 Process Specification of Process 0

Items	Description
Process Name:	Book Rental Service
Data In:	Application Information Book Information Fee Member Card Payment Report Request Service Reply Service Request Subscription Offer
Data Out:	Fee Payment Member Card Report on Request Service Reply Service Request Subscription Offer

Table C.2 Process Specification of Process 1

Items	Description
Process Name:	Register for Membership
Data In:	Application Information Fee Subscription Offer
Data Out:	Fee Member Card Member Information Subscription Offer

Table C.3 Process Specification of Process 1.1

Items	Description
Process Name:	Collect Member Detail
Data In:	Application Information Fee Subscription Offer
Data Out:	Application Information Fee Subscription Offer

Table C.4 Process Specification of Process 1.2

Items	Description
Process Name:	Print Member Card
Data In:	Member Information
Data Out:	Fee Member Card

Table C.5 Process Specification of Process 2

Items	Description
Process Name:	Register New Book
Data In:	New Book Information
Data Out:	Book Information

Table C.6 Process Specification of Process 2.1

Items	Description
Process Name:	Classify Type of Book
Data In:	New Book Information
Data Out:	Type of Book

Table C.7 Process Specification of Process 2.2

Items	Description
Process Name:	Record New Book Information
Data In:	Type of Book
Data Out:	Book Information

Table C.8 Process Specification of Process 3

Items	Description
Process Name:	Provide Book Service
Data In:	Book Information Member Card Member Information Payment Rental Information Service Reply Service Request
Data Out:	Payment Rental Transaction Returning Transaction Service Reply Service Request

Table C.9 Process Specification of Process 3.1

Items	Description
Process Name:	Provide Rent Service
Data In:	Book Information Member Card Member Information Service Request
Data Out:	Rental Transaction

Table C.10 Process Specification of Process 3.1.1

Items	Description
Process Name:	Check Membership Validation
Data In:	Member Card Member Information Service Request
Data Out:	Member Information

Table C.11 Process Specification of Process 3.1.2

Items	Description
Process Name:	Determine Rent Service
Data In:	Book Information Member Information
Data Out:	Rental Transaction

Table C.12 Process Specification of Process 3.1.3

Items	Description
Process Name:	Update File
Data In:	Rental Transaction
Data Out:	Rental Information

Table C.13 Process Specification of Process 3.2

Items	Description
Process Name:	Provide Return Service
Data In:	Member Card Payment Rental Information
Data Out:	Payment Returning Transaction

Table C.14 Process Specification of Process 3.2.1

Items	Description
Process Name:	Check Rental Transaction
Data In:	Member Card Payment Rental Information
Data Out:	Payment Returning Transaction

Table C.15 Process Specification of Process 3.2.2

Items	Description
Process Name:	Update Rental Service File
Data In:	Payment Rental Transaction
Data Out:	Payment Returning Transaction

Table C.16 Process Specification of Process 3.3

Items	Description
Process Name:	Provide Information Service
Data In:	Book Information Member Information Rental Information Service Reply Service Request
Data Out:	Service Reply Service Request

Table C.17 Process Specification of Process 4

Items	Description
Process Name:	Collect Payment
Data In:	Fee Payment Rental Information
Data Out:	Fee Payment Rental Information

Table C.18 Process Specification of Process 4.1

Items	Description
Process Name:	Compute Amount Payment
Data In:	Fee Payment Rental Information
Data Out:	Fee Payment Payment Information

Table C.19 Process Specification of Process 4.2

Items	Description
Process Name:	Receive Payment
Data In:	Fee Payment Rental Information
Data Out:	Fee Payment

Table C.20 Process Specification of Process 5

Items	Description
Process Name:	Generate Report
Data In:	Book Information Member Information Rental Information Report Request
Data Out:	Report on Request

APPENDIX D

ENTITY RELATIONSHIP DIAGRAM

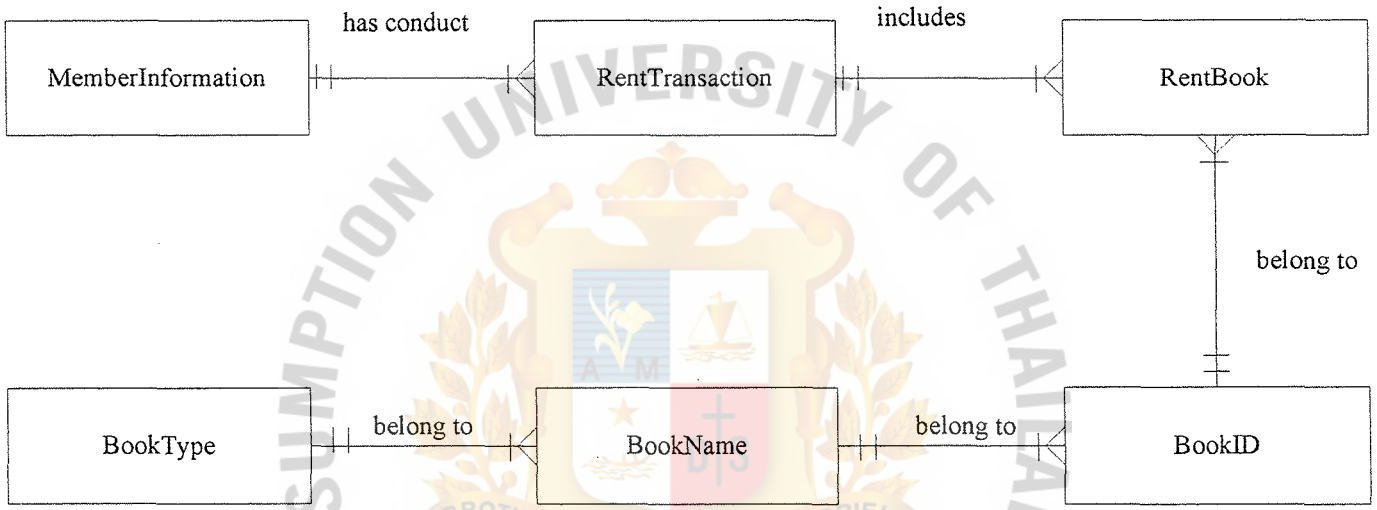

Figure D.1 The Context Data Model of Entity Relationship Diagram

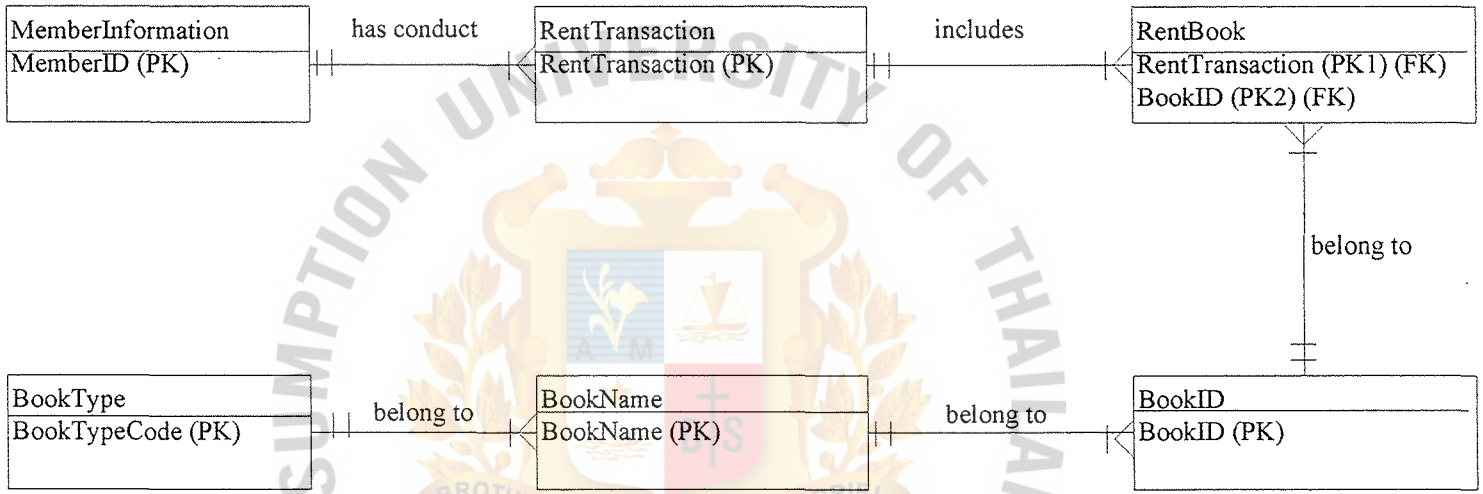

Figure D.2 The Key-Based Data Model of Entity Relationship Diagram

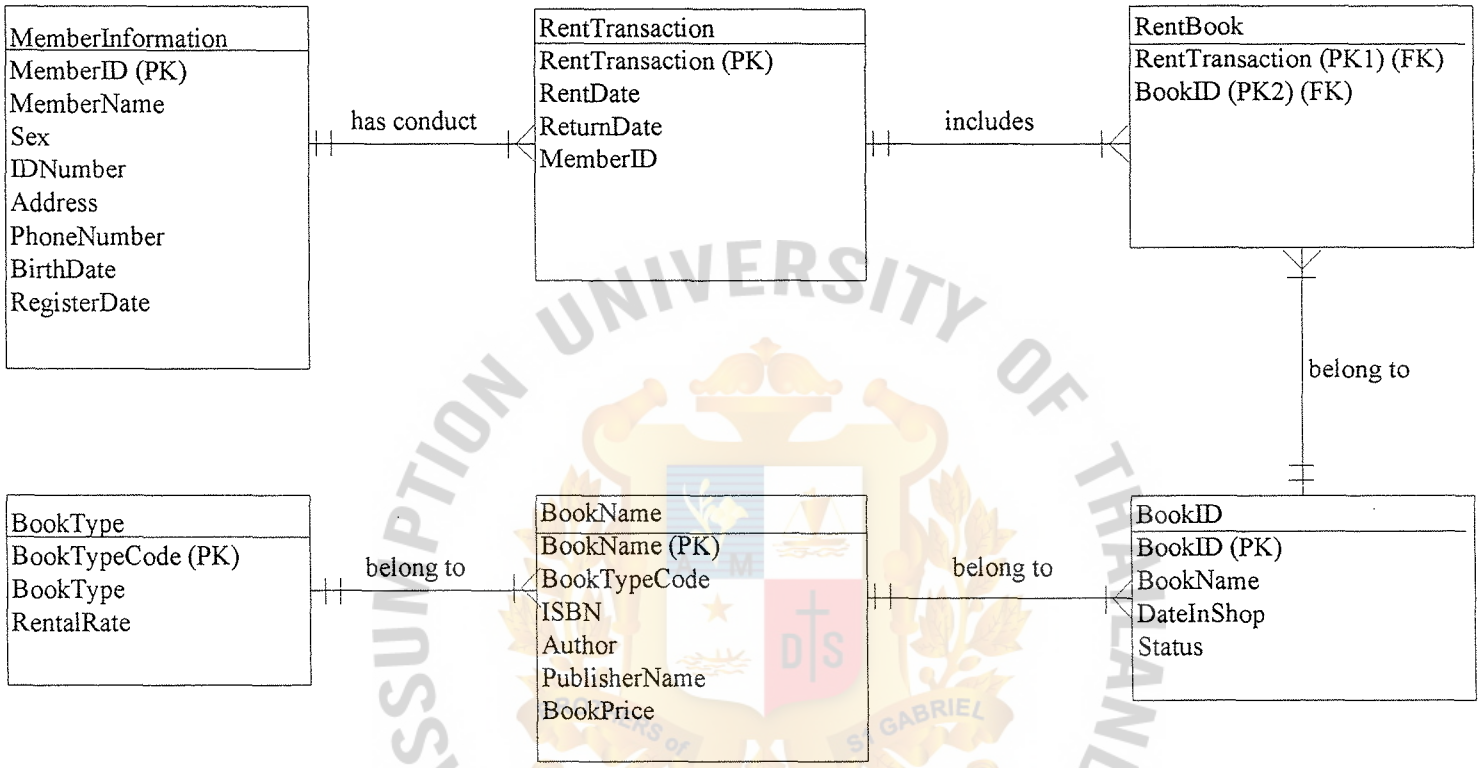

Figure D.3 The Fully Attribute Data Model of Entity Relationship Diagram

APPENDIX E

DATABASE DESIGN

Table E.1 Member Information Table

Number	Field Name	Data Type	Length
1	MemberID	Text	5
2	MemberName	Text	50
3	Sex	Text	6
4	IDNumber	Text	17
5	Address	Text	200
6	PhoneNumber	Text	13
7	BirthDate	Date/Time	6
8	RegisterDate	Date/Time	6

Table E.2 Book Detail Table

Number	Field Name	Data Type	Length
1	BookName	Text	50
2	BookTypeCode	Text	2
3	ISBN	Text	13
4	Author	Text	50
5	PublisherName	Text	50
6	BookPrice	Currency	5

Table E.3 Book Type Table

Number	Field Name	Data Type	Length
1	BookTypeCode	Text	2
2	BookType	Text	50
3	RentalRate	Currency	4

Table E.4 Book ID Table

Number	Field Name	Data Type	Length
1	BookID	Text	5
2	BookName	Text	50
3	DateInShop	Date/Time	6
4	Status	Text	8

Table E.5 Rent Transaction Table

Number	Field Name	Data Type	Length
1	RentTransaction	Text	10
2	RentDate	Date/Time	6
3	ReturnDate	Date/Time	6
4	MemberID	Text	5

Table E.6 Rent Book Table

Number	Field Name	Data Type	Length
1	RentTransaction	Text	10
2	BookID	Text	5

APPENDIX F

DATA DICTIONARY

DATA DICTIONARY

Table F.1 Data Dictionary

Data	Description	Data Type
Account and Finance Department	The department responsible for all receiving incomes and the expenses of the bookshop.	External Entity
Application Information	The application form provides for customer who would like to be a member of the bookshop to fill in the information.	Data Flow
Book Information	The book information about books in the bookshop such as book name, book ID, data received, publisher name, price, etc.	Data Flow
Book Rental Service	The system that provides book rental service to member of bookshop by using the computer.	Process
Books	The file that stores information about books in the bookshop such as book name, book ID, data received, publisher name, price, etc.	Data Store
Check Membership Validation	The process that checks the status of a customer.	Process
Check Rental Transaction	The process that checks the status of the rental book and the rental transaction of member.	Process
Classify Type of Book	The process that classifies type of book.	Process
Collect Customer Detail	The process that collects information of customer who would like to be a member of the bookshop from the application form.	Process
Collect Payment	The process that receives money from members and keeps record of all financial transactions.	Process
Compute Amount Payment	The process that computes the amount of money that member has to pay to the bookshop.	Process
Customer Service Department	The department responsible for all members' requests.	External Entity
Determine Rent Service	The process that determines rental service to member from rental service file.	Process
Fees	The money that customer who would like to be a member of the bookshop must pay when they apply.	Data Flow

Data	Description	Data Type
Generate Report	The process that generates reports by gathering all the information from the entire file to present periodically required report to other department.	Process
Manager	The owner of bookshop that sets the objectives, target of each strategy to manage maximum benefit, and the regulations of the bookshop.	External Entity
Member	The customer who has already applied and paid the bookshop.	External Entity
Member Card	The card that stating that only member can rent, return and retrieve information of books in the bookshop.	Data Flow
Member Information	The information about member status in bookshop such as member name, member ID, address, telephone number, sex, date issue, etc.	Data Flow
Members	The file that stores member information of the book shop such as member name, member ID, address, telephone number, sex, date issue, etc.	Data Store
New Book Information	The information of new books that come into the bookshop such as book name, publisher name, etc.	Data Flow
Non Member	The customer who has not applied or paid membership fees yet.	External Entity
Payment	The money that a member has to pay to the bookshop for renting book.	Data Flow
Print Member Card	The process that provides a member card to register the members after they have already applied and paid the membership fees to the bookshop.	Process
Provide Book Service	The process that provides service to members such as rental book, return book and provides information about the books.	Process
Provide Information Service	The process that gives information about the required book that member requests.	Process
Provide Rent Service	The process that provides rental service to members who need the book.	Process
Provide Return Service	The process that provides return transaction.	Process

Data	Description	Data Type
Purchasing Department	The department responsible for purchasing new books for bookshop.	External Entity
Receive Payment	The process that the bookshop receives money of rental, and returned book from members.	Process
Record New Book Information	The process that keeps records about information of the new book that has just come into the bookshop.	Process
Register for Membership	The process which customers apply to be members of the bookshop.	Process
Register New Book	The process that records information of the new books that comes into the bookshop.	Process
Rental Information	The file that keeps record of rental, returning transaction of each member in the bookshop.	Data Store
Rental Transaction	The information of rental service transaction that occurs in the bookshop such as date of rent, book ID.	Data Flow
Report on Request	The information that department would like to know.	Data Flow
Report Request	The need of information that department would like to know.	Data Flow
Returning Transaction	The information about returning service transaction that occurs in the bookshop.	Data Flow
Service Reply	The information and process that the bookshop provides to members who request.	Data Flow
Service Request	The information and process requested by members.	Data Flow
Subscription Offer	The customer service department will provide application form for customers who want to be members of the bookshop.	Data Flow
Type of Book	The information about type of new books that have just come into the bookshop.	Data Flow
Update File	The process that provides file to be updated all the time when some transaction change.	Process
Update Rental Service File	The process of registering the returning status of books after members return them.	Process

APPENDIX G

USER INTERFACE

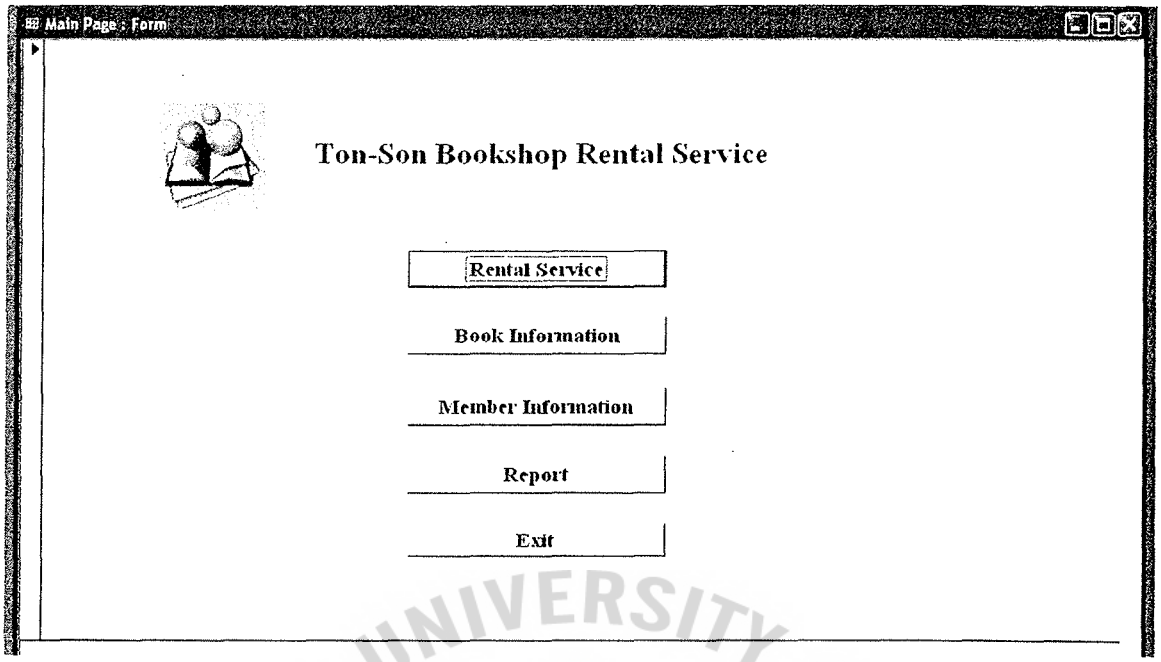

Figure G.1 Main Manu Screen

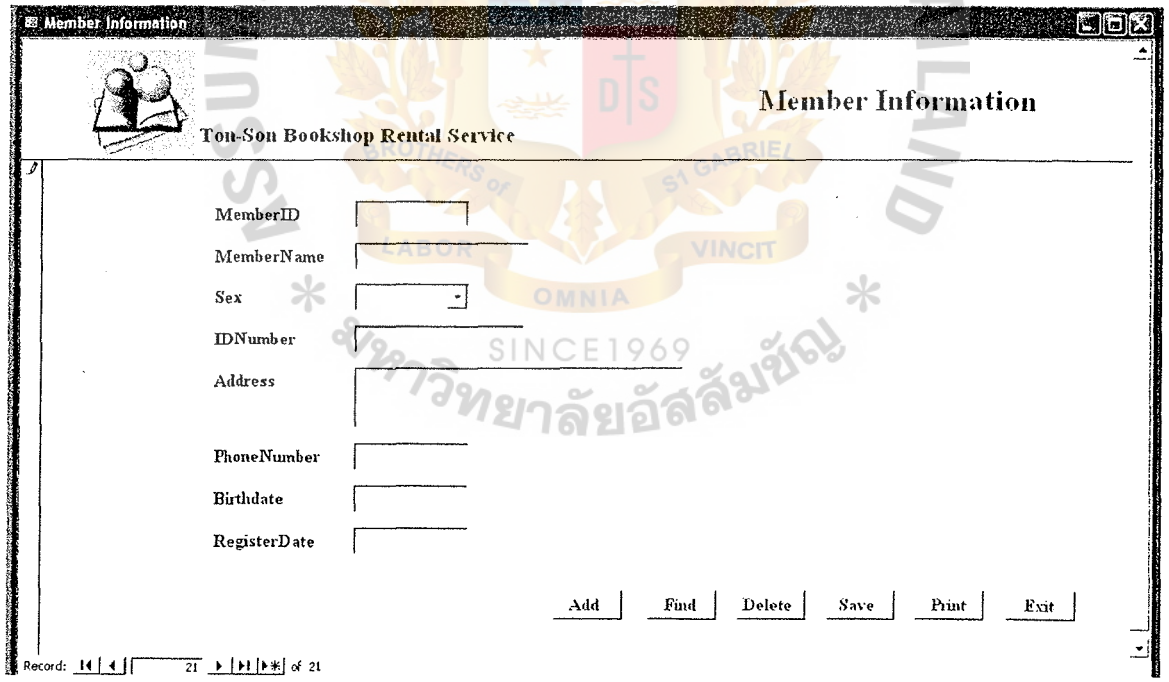

Figure G.2 Member Information Screen

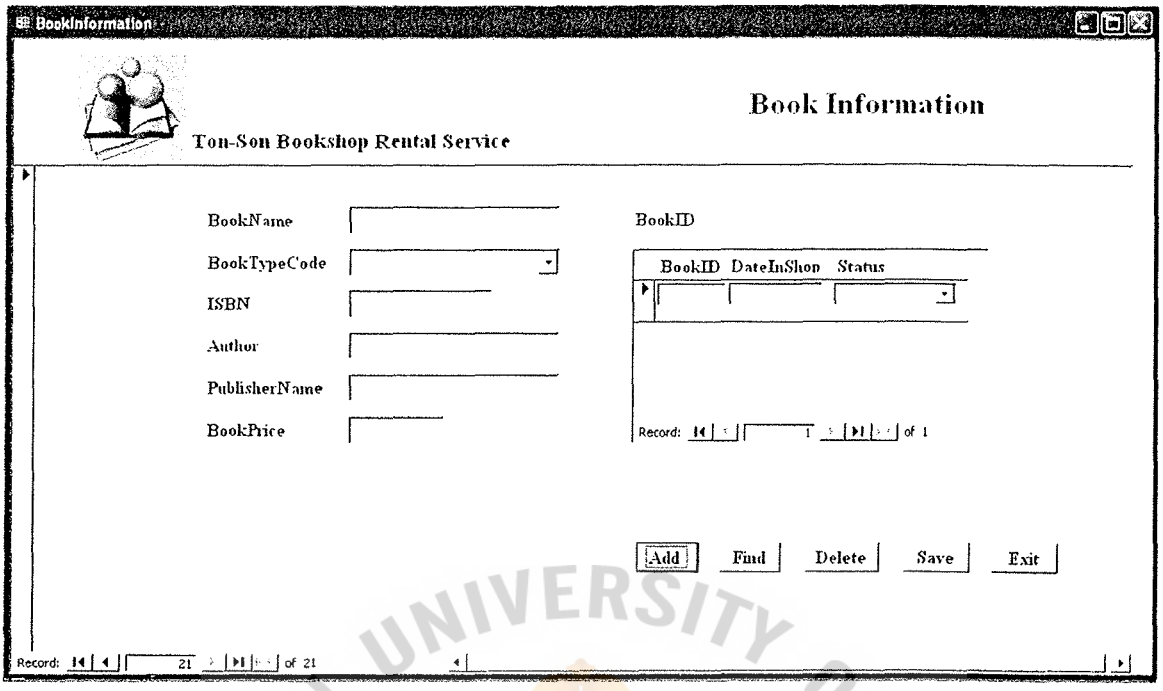

Figure G.3 Book Information Screen

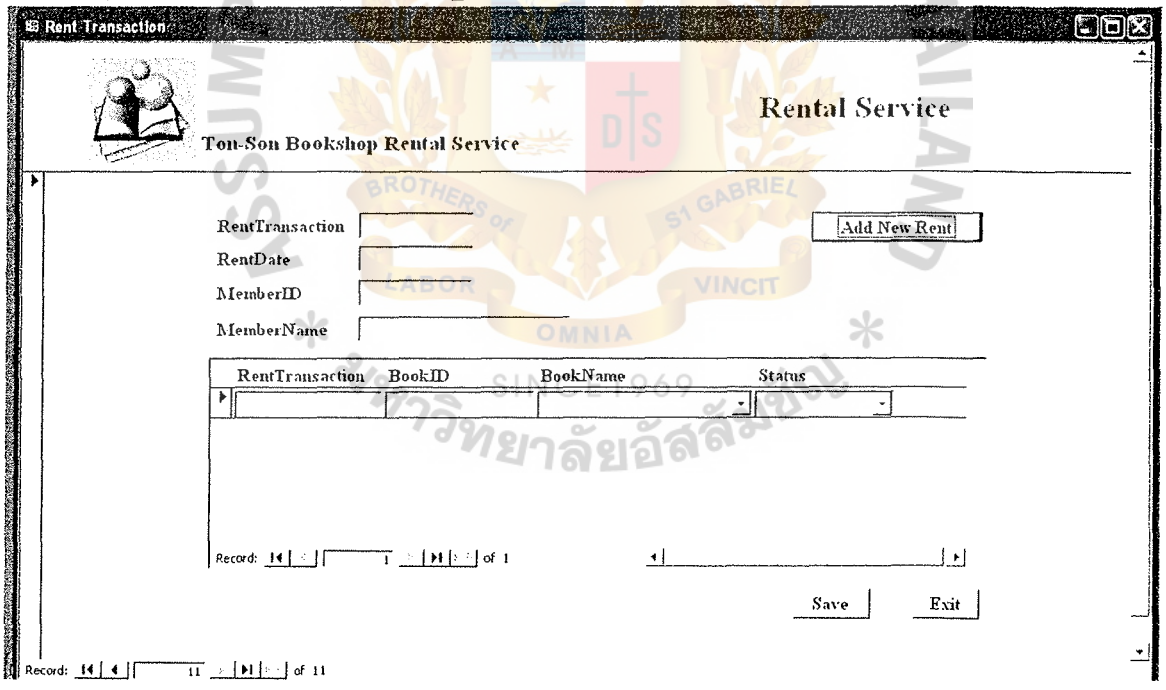

Figure G.4 Rent Service Screen

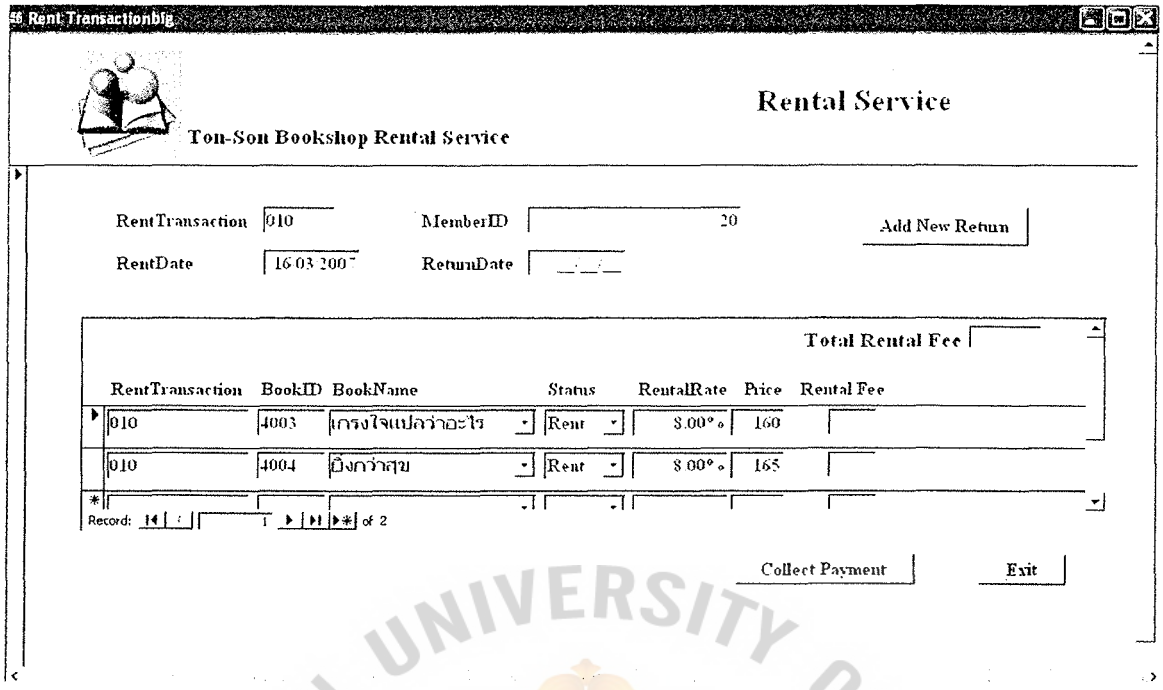

Figure G.5 Return Service Screen

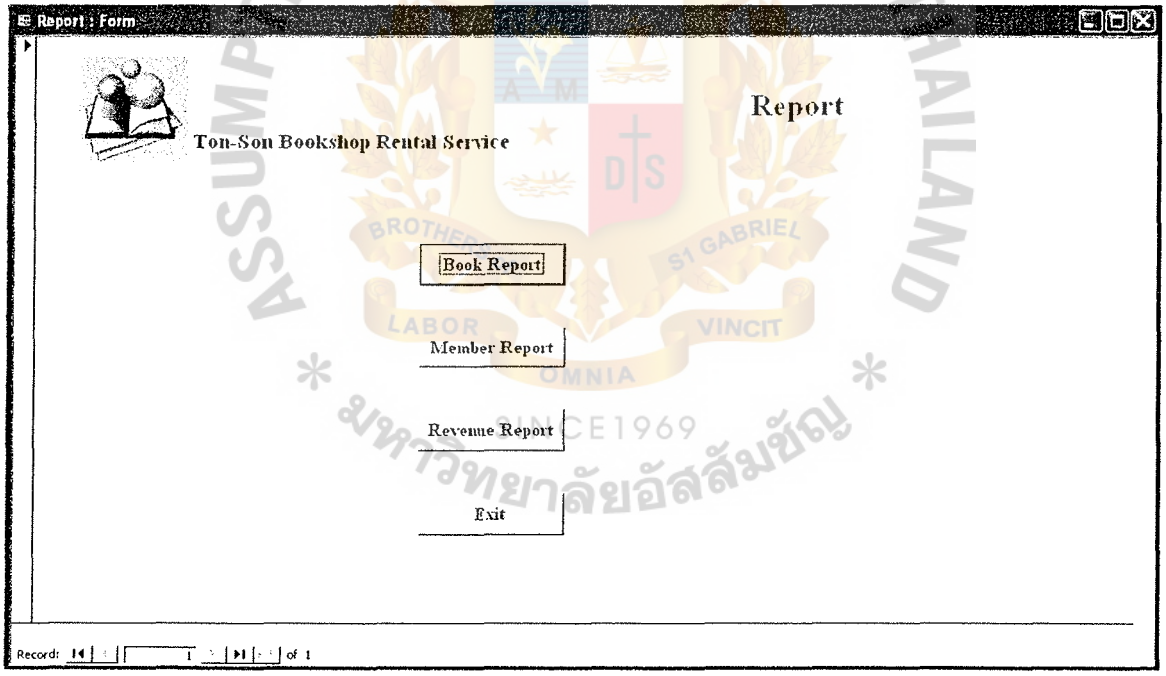

Figure G.6 Report Menu Screen

APPENDIX H

OUTPUT REPORT

Member Information

MemberID	MemberName	Sex	IDNumber	Address	PhoneNumbe	Birthdate	RegisterDat
1	Anna Lee	Female	3-6699-00211-03-3	235 Prannok Soi23 Bangkoknoi Bangkok	081- 374-4434	10/2/2523	1/1/2549
2	Jane Ura	Female	3-6699-00214-56-3	12 Jaransanitwong3 Bangpplad Bangkok	087- 342-5679	11/5/2525	1/1/2549
3	Jimmy Shu	Male	3-6699-00211-41-2	42/5 Prachachun Bangsue Bangkok	089- 582-3747	4/9/2518	13/1/2549
4	Kim Berry	Male	3-6699-02114-87-4	96 Jaransanitwong 35 Bangplad Bangkok	087- 543-625	30/11/2514	25/1/2549
5	Naja Kim	Female	3-6699-02123-54-2	5 Prannok Soi5 Bangkoknoi Bangkok	087- 787-8989	19/3/2522	31/1/2549
6	Boy Lyn	Male	3-6699-00234-76-1	87 Jaransanitwong 1 Bangplad Bangkok	081- 567-3499	4/12/2533	3/2/2549
7	Boom Nim	Male	3-6699-00475-13-0	9/2 Sukumvit 37 Bangkok	089- 364-5467	23/4/2522	18/2/2549
8	Tony Shin	Male	3-6699-00211-36-4	2 Samsen5 Samsen Bangkok	087- 549-0561	8/1/2530	24/2/2549
9	John Woo	Male	3-6699-00214-09-0	154 Tawet Bangkok	089- 547-323	11/11/2523	28/2/2549
10	Tom Lane	Male	3-6699-00214-08-9	8 PrannokSoi7 Bangkoknoi Bangkok	089- 231-4114	3/1/2520	3/3/2549
11	Smith Fefa	Male	3-6699-00214-67-4	1 Sukothai Sansen Bangkok	081- 767-6845	26/5/2519	14/3/2549
12	Pook Dean	Female	3-6699-00211-76-7	43 Bangruk Soi9 BangruknBangkok	089- 400-7233	3/7/2523	22/5/2549
13	Simson Vanson	Male	3-6699-00215-76-8	36 Sukumvit Soi27 , Sukumvit Rd. Bangk	087- 354-4232	23/9/2513	15/7/2549
14	Thomas Tin	Male	3-6699-00213-65-8	56/29 Prannok Soi37 Bangkoknoi Bangk	089- 464-3322	14/2/2516	8/9/2549
15	Kathy Smith	Female	3-6699-00217-56-4	87 Prannok Soi24 Bangkoknoi Bangkok	081- 232-5455	30/1/2518	3/10/2549
16	Mike Mix	Female	3-6699-02211-54-7	35/1 Jaransanitwong 37 Bangpplad Bang	097- 354-3086	16/3/2522	10/11/2549
17	Natale Cope	Female	3-6699-00216-46-8	56/37 Jaransanitwong 45 Bangpplad Bang	081- 274-8553	6/8/2512	14/11/2549

Book Information

BookType	CartoonBook						
BookID	**BookName**	**ISBN**	**Author**	**PublisherName**	**BookPrice**	**DateInShop**	**Status**
1001	Touch1		Nagase	KK	55	3/1/2544	Return
1002	Touch2		Nagase	KK	55	3/1/2544	Return
1003	Touch3		Nagase	KK	55	3/1/2544	Return
1004	Touch4		Nagase	KK	55	3/1/2544	Return

BookType	Magazine						
BookID	**BookName**	**ISBN**	**Author**	**PublisherName**	**BookPrice**	**DateInShop**	**Status**
2001	Her World#01			GMM Times	80	5/1/2548	Rent
2002	Buzz#1			MMC Plus	65	10/1/2548	Return
2003	Cheeze#26			Matching Studio	70	15/1/2548	Return
2004	Her World#2			GMM Times	80	5/2/2548	Return
2005	Buzz#2			MMC Plus	65	10/2/2548	Return
2006	The Boy#05			RS	70	8/3/2548	Return
7009	ey	12345	aqsde	ffff	100	12/3/2550	Return

BookType	Novel						
BookID	**BookName**	**ISBN**	**Author**	**PublisherName**	**BookPrice**	**DateInShop**	**Status**

The Revenue Report

Date	Rental Fee
12/3/2550	11
13/3/2550	72
14/3/2550	49.5
15/3/2550	120.5
16/3/2550	74
17/3/2550	28
18/3/2550	78
19/3/2550	32
20/3/2550	28
22/3/2550	36
23/3/2550	96

APPENDIX I

COST-BENEFIT ANALYSIS

Table I.1 Cost of Candidate System 1, Baht

Cost items	Years				
	1	2	3	4	5
Hardware Cost:					
HP ProLiant ML310 TO3 P640 Server	49,000	0	0	0	0
HP Compaq dx2700 1 item @26,000	82,000	0	0	0	0
Network Peripherals	1,100	0	0	0	0
UPS 500 VA 1item@2,500	7,500	0	0	0	0
HP Laser Jet 3055 printer	17,000	0	0	0	0
Cabling	2,500	0	0	0	0
Total Hardware Cost	159,100	0	0	0	0
Software Cost:					
MS Windows 2000 Server	40,000	0	0	0	0
MS Windows XP professional	21,000	0	0	0	0
MS office for Windows XP professional	21,000	0	0	0	0
Media Rental System Software License 1 item @12,000	95,000	0	0	0	0
	36,000	0	0	0	0
Total Software Cost	213,000	0	0	0	0
Implementation Cost:					
Software development and training cost	20,000	22,000	24,000	26,000	28,000
Salary for 3 people	288,000	292,800	297,600	302,400	307,200
Total Implementation Cost	308,000	314,800	321,600	328,400	335,200
Annual Operating Cost:					
Stationary cost	10,000	11,000	12,000	13,000	14,000
Miscellaneous cost	5,000	5,000	5,000	5,000	5,000
Total Annual Operating Cost	15,000	16,000	17,000	18,000	19,000
Total Computerized System Cost	**695,100**	**330,800**	**338,600**	**346,400**	**354,200**

Table I.2 Cost of Candidate System 2, Baht

Cost items	Years				
	1	2	3	4	5
Hardware Cost:					
Acer Server	39,000	0	0	0	0
Acer Aspire SA10 1 item @14,000	42,000	0	0	0	0
Network Peripherals	1,100	0	0	0	0
UPS 500 VA 1item@2,500	7,500	0	0	0	0
HP Laser Jet 3055 printer	17,000	0	0	0	0
Cabling	2,500	0	0	0	0
Total Hardware Cost	109,100	0	0	0	0
Software Cost:					
MS Windows 2000 Server	40,000	0	0	0	0
MS Windows XP professional	21,000	0	0	0	0
MS office for Windows XP professional	21,000	0	0	0	0
Total Software Cost	82,000	0	0	0	0
Implementation Cost:					
Software development and training cost	35,000	5,500	6,000	6,500	7,000
Salary for 3 people	288,000	292,800	297,600	302,400	307,200
Total Implementation Cost	323,000	298,300	303,600	308,900	314,200
Annual Operating Cost:					
Stationary cost	10,000	11,000	12,000	13,000	14,000
Miscellaneous cost	5,000	5,000	5,000	5,000	5,000
Total Annual Operating Cost	15,000	16,000	17,000	18,000	19,000
Total Computerized System Cost	**529,100**	**314,300**	**320,600**	**326,900**	**333,200**

Table I.3 Cost of Candidate System 3, Baht

Cost items	Years				
	1	2	3	4	5
Hardware Cost:					
Acer Server	39,000	0	0	0	0
Acer Aspire SA10 1 item @14,000	42,000	0	0	0	0
Network Peripherals	1,100	0	0	0	0
UPS 500 VA 1item@2,500	7,500	0	0	0	0
All in one printer	9,900	0	0	0	0
Deskjet printer	2,400	0	0	0	0
Cabling	2,500	0	0	0	0
Total Hardware Cost	104,400	0	0	0	0
Software Cost:					
MS Windows 2000 Server	40,000	0	0	0	0
MS Windows XP professional	21,000	0	0	0	0
MS office for Windows XP professional	21,000	0	0	0	0
Book Rental System	50,000	0	0	0	0
Total Software Cost	132,000	0	0	0	0
Implementation Cost:					
Software development and training cost	5,000	5,500	6,000	6,500	7,000
Salary for 3 people	288,000	292,800	297,600	302,400	307,200
Total Implementation Cost	293,000	298,300	303,600	308,900	314,200
Annual Operating Cost:					
Stationary cost	10,000	11,000	12,000	13,000	14,000
Miscellaneous cost	5,000	5,000	5,000	5,000	5,000
Total Annual Operating Cost	15,000	16,000	17,000	18,000	19,000
Total Computerized System Cost	**544,400**	**314,300**	**320,600**	**326,900**	**333,200**

Table I.4 Payback Analysis of Candidate System 1,Baht

Cash Flow description	Years					
	0	1	2	3	4	5
Development cost:	-372,100					
Operation & Maintenance cost:	0	-35,000	-38,000	-41,000	-44,000	-47,000
Discount factor for 5%:	1	0.952	0.907	0.864	0.823	0.784
Time-adjusted costs(adjusted to present value):	-372,100	-33,320	-34,466	-35,424	-36,212	-36,848
Cumulative time-adjusted costs over lifetime:	-372,100	-405420	- 439,886	-475,310	-511,522	-548,370
Benefits derived from operation of new system:	0	157,000	166,200	175,400	184,600	193,800
Discount factor for 5%:	1	0.952	0.907	0.864	0.823	0.784
Time-adjusted benefits (current of present value):	0	149,464	150,743	151,545	151,925	151,939
Cumulative time-adjusted benefit over lifetime:	0	149,464	300,207	451,752	603,677	755,616
Cumulative lifetime time-adjusted costs + benefits:	**-372,100**	**-255,956**	**-139,679**	**-23,558**	**92,155**	**207,246**

Table I.5 Payback Analysis of Candidate System 2, Baht

Cash Flow description	Years					
	0	1	2	3	4	5
Development cost:	-191,100					
Operation & Maintenance cost:	0	-50,000	-21,500	-23,000	-24,500	-26,000
Discount factor for 5%:	1	0.952	0.907	0.864	0.823	0.784
Time-adjusted costs(adjusted to present value):	-191,100	-47,600	-19,501	-19,872	-20,164	-20,384
Cumulative time-adjusted costs over lifetime:	-191,100	-238,700	-258,201	-278,073	-298,237	-318,621
Benefits derived from operation of new system:	0	157,000	166,200	175,400	184,600	193,800
Discount factor for 5%:	1	0.952	0.907	0.864	0.823	0.784
Time-adjusted benefits (current of present value):	0	149,464	150,743	151,545	151,925	151,939
Cumulative time-adjusted benefit over lifetime:	0	149,464	300,207	451,752	603,677	755,616
Cumulative lifetime time-adjusted costs + benefits:	**-191,100**	**-89,236**	**42,006**	**173,679**	**305,440**	**436,995**

Table I.6 Payback Analysis of Candidate System 3, Baht

Cash Flow description	Years					
	0	1	2	3	4	5
Development cost:	-236,400					
Operation & Maintenance cost:	0	-20,000	-21,500	-23,000	-24,500	-26,000
Discount factor for 5%:	1	0.952	0.907	0.864	0.823	0.784
Time-adjusted costs(adjusted to present value):	-236,400	-19,040	-19,501	-19,872	-20,164	-20,384
Cumulative time-adjusted costs over lifetime:	-236,400	-255,440	-274,941	- 294,813	-314,977	-335,361
Benefits derived from operation of new system:	0	157,000	166,200	175,400	184,600	193,800
Discount factor for 5%:	1	0.952	0.907	0.864	0.823	0.784
Time-adjusted benefits (current of present value):	0	149,464	150,743	151,545	151,925	151,939
Cumulative time-adjusted benefit over lifetime:	0	149,464	300,207	451,752	603,677	755,616
Cumulative lifetime time-adjusted costs + benefits:	**-236,400**	**-105,976**	**25,266**	**156,939**	**288,700**	**420,255**

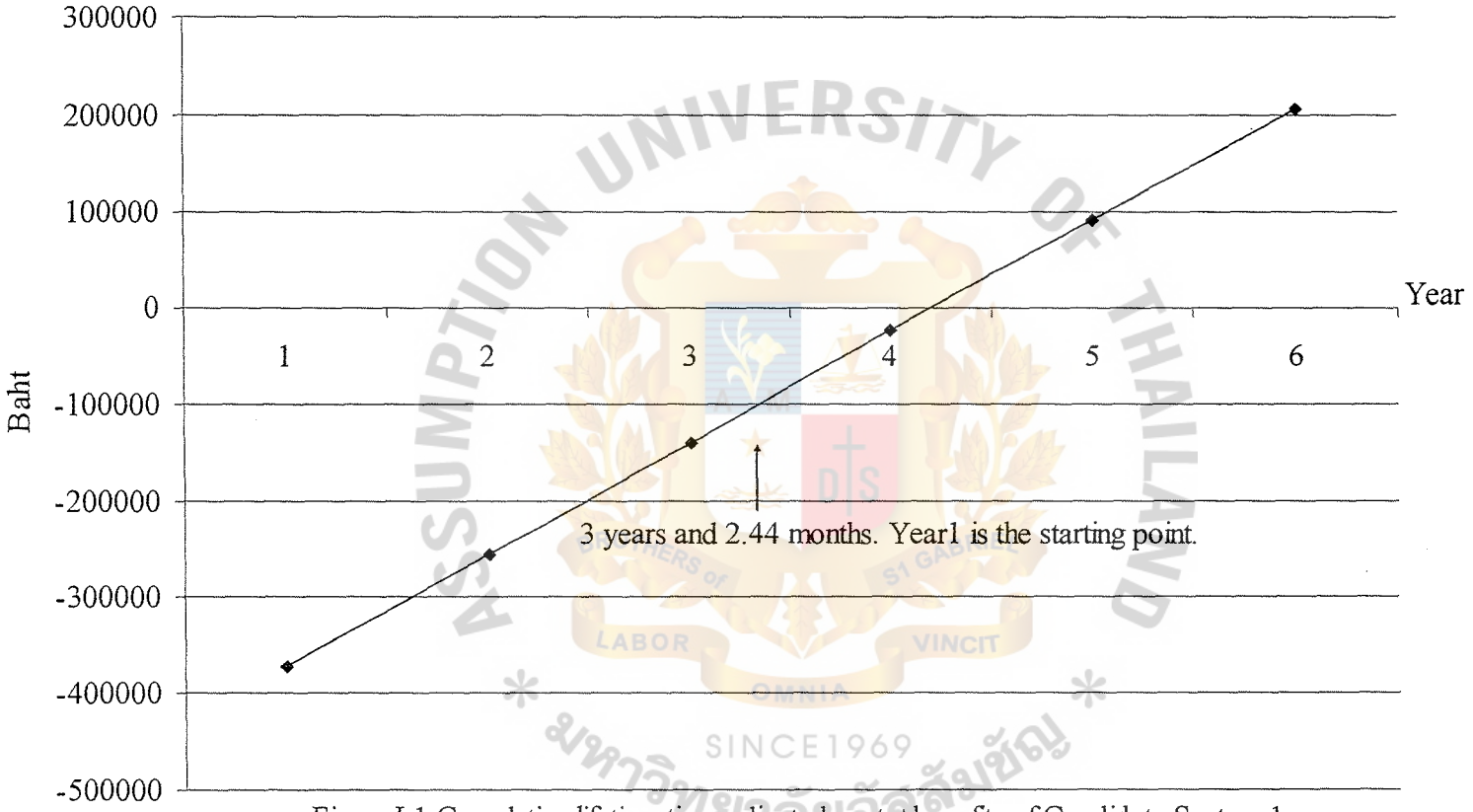

Figure I.1 Cumulative lifetime time-adjusted costs+benefits of Candidate System 1

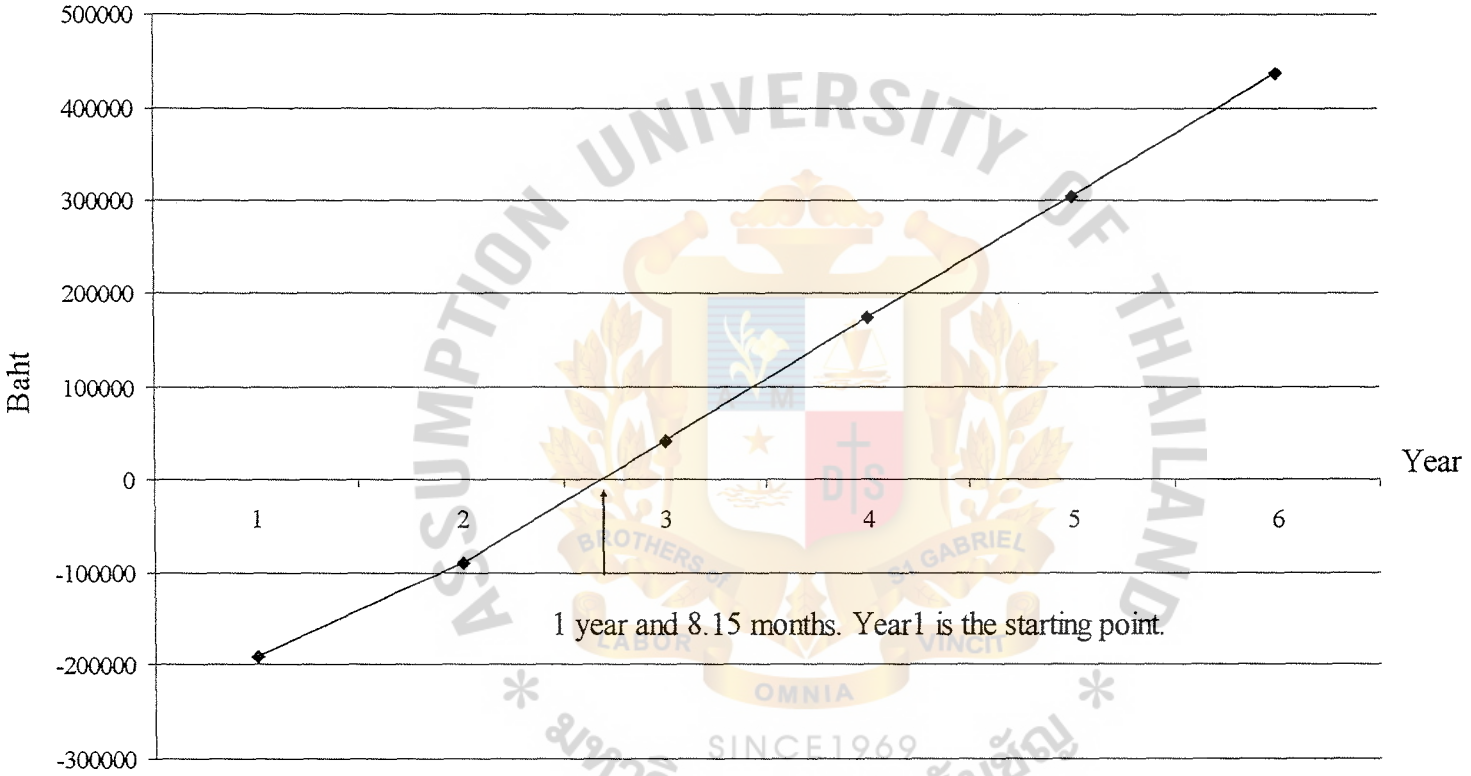

Figure I.2 Cumulative lifetime time-adjusted costs+benefits of Candidate System 2

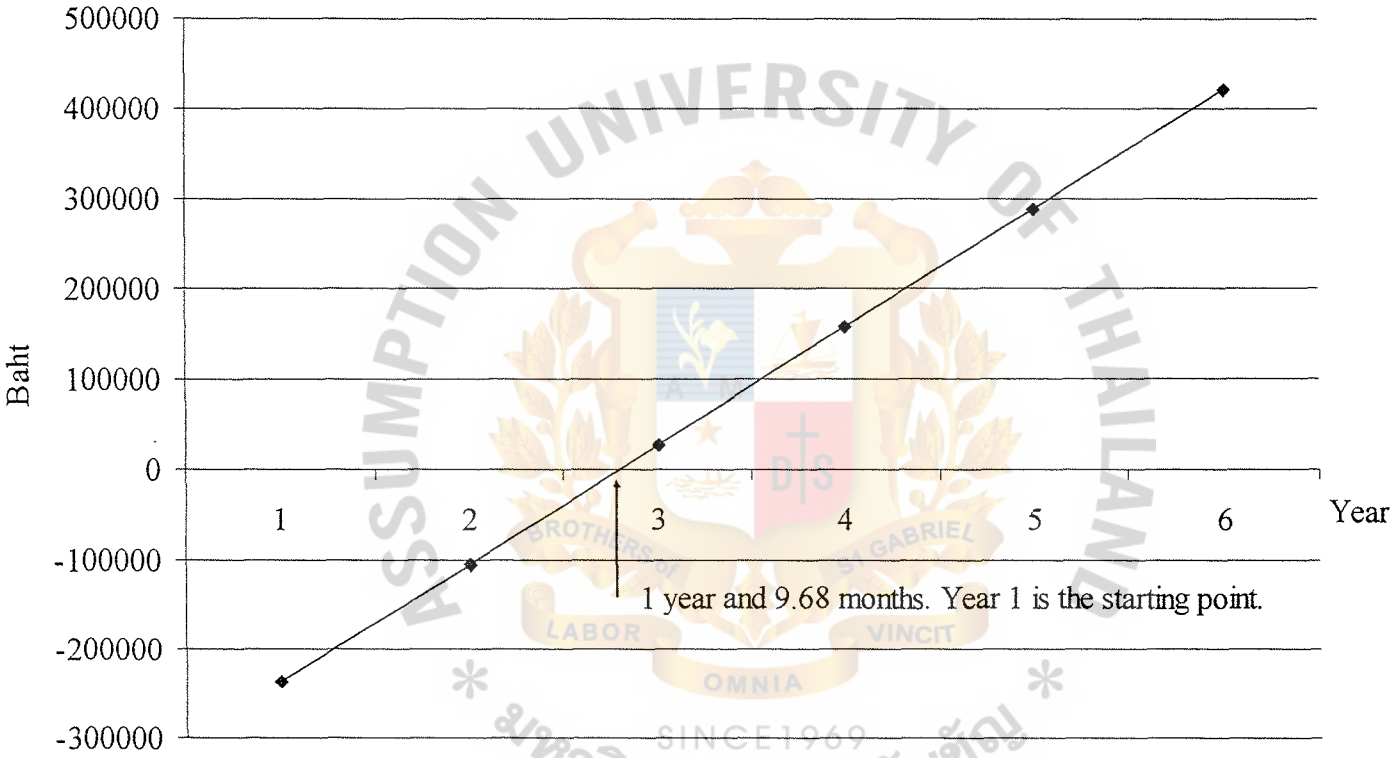

Figure I.3 Cumulative lifetime time-adjusted costs+benefits of Candidate System 3

Table I.7 Net present value of Candidate System 1, Baht

Cash Flow description	Years					
	0	1	2	3	4	5
Development cost	-372,100					
Operation & Maintenance cost	0	-35,000	-38,000	-41,000	-44,000	-47,000
Discount factor for 5%	1	0.952	0.907	0.864	0.823	0.784
Present value of annual costs	-372,100	-33,320	-34,466	-35,424	-36,212	-36,848
Total present value of lifetime cost						-548,370
Benefits derived from operation of new system	0	157,000	166,200	175,400	184,600	193,800
Discount factor for 5%	1	0.952	0.907	0.864	0.823	0.784
Present value of annual costs	0	149,464	150,743	151,545	151,925	151,939
Total present value of lifetime cost	0	149,464	300,207	451,752	603,677	755,616
Net Present Value of proposed system						**207,246**

Table I.8 Net present value of Candidate System 2, Baht

Cash Flow description	Years					
	0	1	2	3	4	5
Development cost	-191,100					
Operation & Maintenance cost	0	-50,000	-21,500	-23,000	-24,500	-26,000
Discount factor for 5%	1	0.952	0.907	0.864	0.823	0.784
Present value of annual costs	-191,100	-47,600	-19,501	-19,872	-20,164	-20,384
Total present value of lifetime cost						-318,621
Benefits derived from operation of new system	0	157,000	166,200	175,400	184,600	193,800
Discount factor for 5%	1	0.952	0.907	0.864	0.823	0.784
Present value of annual costs	0	149,464	150,743	151,545	151,925	151,939
Total present value of lifetime cost	0	149,464	300,207	451,752	603,677	755,616
Net Present Value of proposed system						**436,995**

Table I.9 Net present value of Candidate System 3, Baht

Cash Flow description	Years					
	0	1	2	3	4	5
Development cost	-236,400					
Operation & Maintenance cost	0	-20,000	-21,500	-23,000	-24,500	-26,000
Discount factor for 5%	1	0.952	0.907	0.864	0.823	0.784
Present value of annual costs	-236,400	-19,040	-19,501	-19,872	-20,164	-20,384
Total present value of lifetime cost						-335,361
Benefits derived from operation of new system	0	157,000	166,200	175,400	184,600	193,800
Discount factor for 5%	1	0.952	0.907	0.864	0.823	0.784
Present value of annual costs	0	149,464	150,743	151,545	151,925	151,939
Total present value of lifetime cost						755,616
Net Present Value of proposed system						**420,255**

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