A Movie Rental Service Information System for OnAir Movie Rental Shop

by

Ms. Pornsri Chanyapiphat

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
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Project Title	A Movie Rental Service Information System for On Air Movie Rental Shop
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Academic Year	November 2004

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

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ABSTRACT

This system development project presents the analysis and design of Movie Rental Service System for OnAir Movie Rental Shop. The project is developed to solve the problems of human error during operation process, loss of important data, delayed process, difficulty to make reports for decision making support and difficulty to expand the organization. The objectives of this project are to reduce repetitive manual work in order to save time and budget and also provide a good filing system.

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

It was found out that the new computerized system is implemented using 10Base-T LAN with 1 server, 3 clients, and 1 printer. Software for the purposed system are Windows XP/2000, MS Office 2000 Professional Edition, Microsoft Access 2000 and Microsoft Visual Basic 6.0. Based upon payback method, it shows that the initial investment will pay for itself after 1.25 years. In term of degree of achievement, the purposed system can process data about 4 times faster than the existing system.

To further improve the purposed system, it is recommended that barcode system solution should be developed and implemented. This will allow users and customers have rental service more easily and faster with movie rental service system.

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I. INTRODUCTION

1.1. Background of the Project

At the present, the Movie Rental Shops are becoming increasingly congested and overburdened. In addition to an over growing population of movie rental service companies, several factors have combined to stress the capabilities of the rental business such as faster service.

The nature of rental business management is the key to success. The major responsibilities of rental shops are revenue generation and profitability for the business. The process cycle normally includes customer registration, customer request for rental, customer request for returning, product registration and provide inquiry report to management. Rental Service Information System should provide adequate information to arrangement that appropriate level of rental volume. Furthermore, rental service system should generate report for management to perform periodic analytical review.

The computer system is designed for the Rental Service Information System for OnAir Movie Rental Shop that is a service system. To analyze the existing system and design the new system to meet the expectation and requirements of the executives will give to up-to-date information to management and customer in the system will provide the effectiveness and efficiency of Rental Service Information System.

1.2. Objectives of the Project

This project is developed to provide new proposed Rental Service Information System that reduces repetitive manual work, human error, operation's time and also provides a good filing system.

Objectives of the project are as follows:

(1) To analyze the existing Rental Service Information System and to design a new system to improve effectiveness and efficiency of the service.

(2) To identify the current problems and user requirements of the new system.

(3) To reduce transaction cost.

(4) To design and develop the computerized system that can reduce manual work.

(5) To generate reliable information via controlled procedures with complete verification.

(6) To accelerate the period of time and minimize the response time of the system.

(7) To increase customer satisfaction by providing a better service.

1.3. Scope of the Project

The scope of the project covers the major parts of operation service in Rental Service Information System, while can be categorized into the following functions:

(1) Customer Registration

(2) Operation Process

(3) Report Management

1.4. Deliverables

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

(1) Data Modeling (ER Diagram)

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

(3) System Specification (Hardware and software specification)

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

(5) Input Design (Input Screen of proposed system)

(6) Output Design (Report from proposed system)

(7) Structured Design (Structured Chart)

(8) Process Specification (Detail of each process of proposed system)

1.5. Project Plan

This project focuses on the information system that supports Rental Service to improve effectiveness and efficiency of the operation. The Gantt chart shows the activities in developing this project with the estimated time that is assigned to each job. The total period required to develop this project is 6 months. The activities are divided into three phases and each phase consists of sub-activities follows.

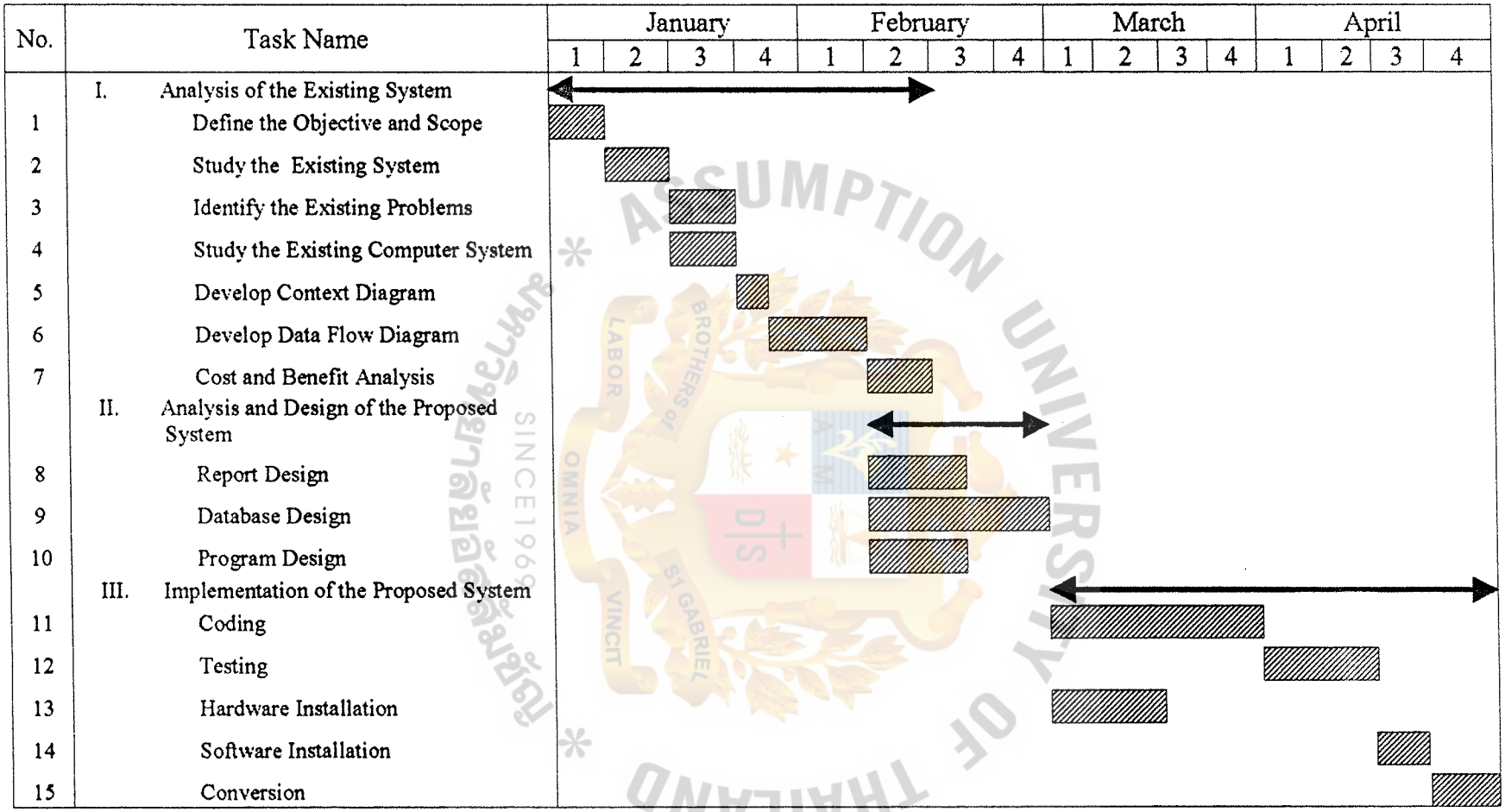


Figure1.1. Project Plan of Movie Rental Service Information System.

II. THE EXISTING SYSTEM

2.1. Background of the Organisation

Since 1995, OnAir Movie Rental Shop has been established with the vision of providing customers with a full-range of rental service over all types of movie media such as video, VCD and DVD depending on customer satisfaction. OnAir Movie Rental Shop is a shop with a family management style. Most decision making comes from the top management and all the work processes are manual.

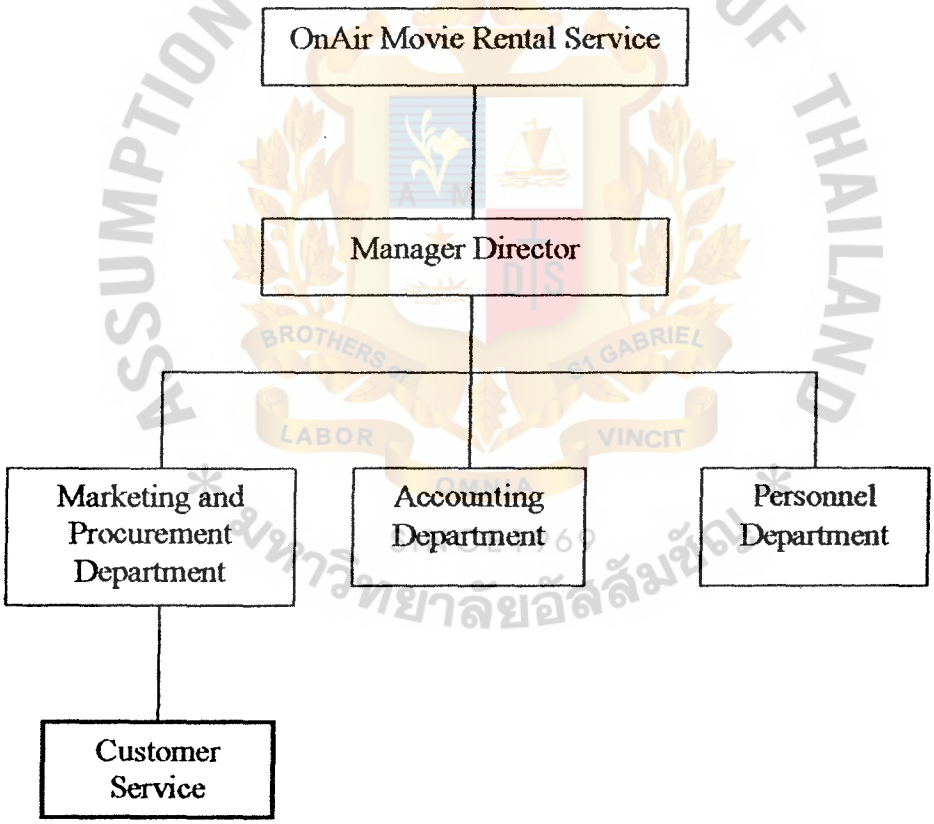


Figure 2.1. Organization Chart of Company.

2.2. Existing System and Business Functions

The main function of OnAir Movie Rental Shop is as follows:

(1) Customer Registration Process

Customer Registration process is responsible for checking customers' status. Once the customer is willing to make a request or do any transaction with the company the staff will have to check, if that customer is a member.

(2) Receive Rental Request Process

Staff will have to check for every movie rental request from the customer whether it can be found in the shop, if not the some of movie in the request will be rejected. If the request has been accepted, the staff will issue movie rental receipt to customer and record movie rental lists to the rental management book that identifies customer name, media type, movie name, rental date and due date to be returned.

(3) Receive Return Request Process

Staff will have to check the due date of returning from rental management book that identify proposed date to return. If customer returns movie late, staff will charge for late return to customer without providing late rental receipt. If not, customer and staff will sign to the book for movie return.

(4) Product Registration Process

Customers will register the new movie with all type media incoming from suppliers to the product profile management book that identifies movie name, media type and amount of item.

(5) Print Report Process

Manager can request some information to staff by monthly.

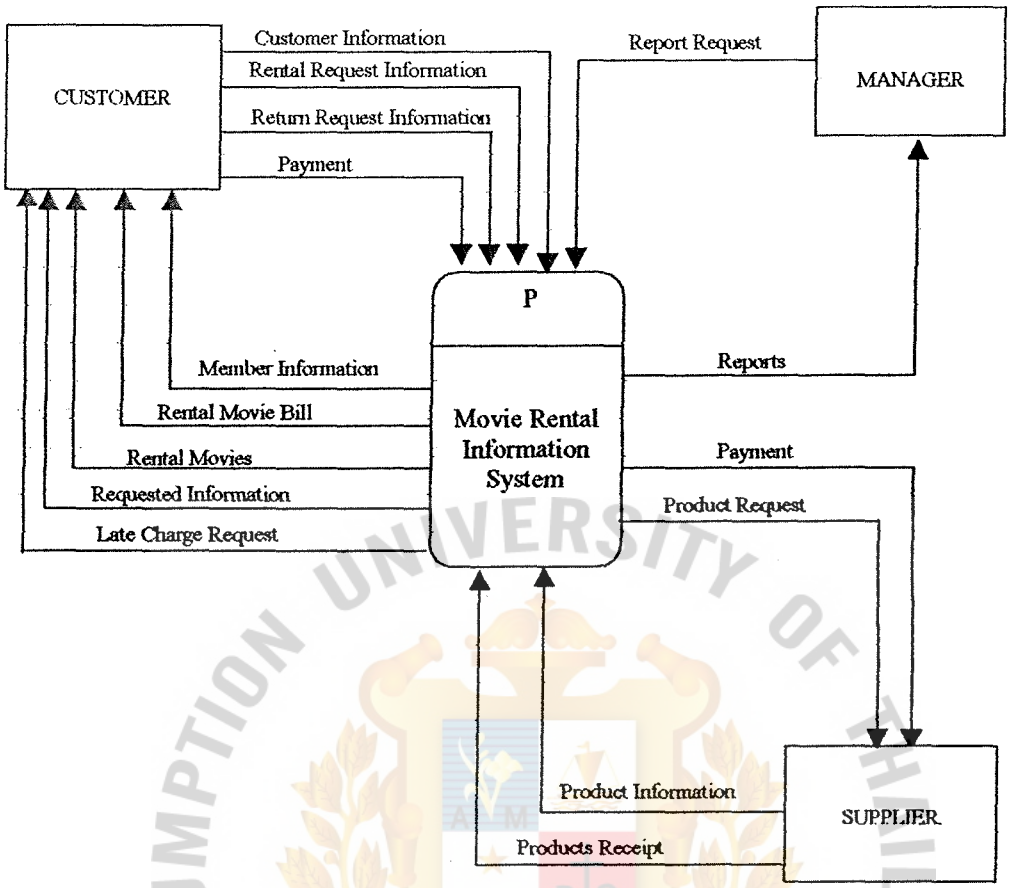


Figure 2.2. Context Diagram of the Existing System.

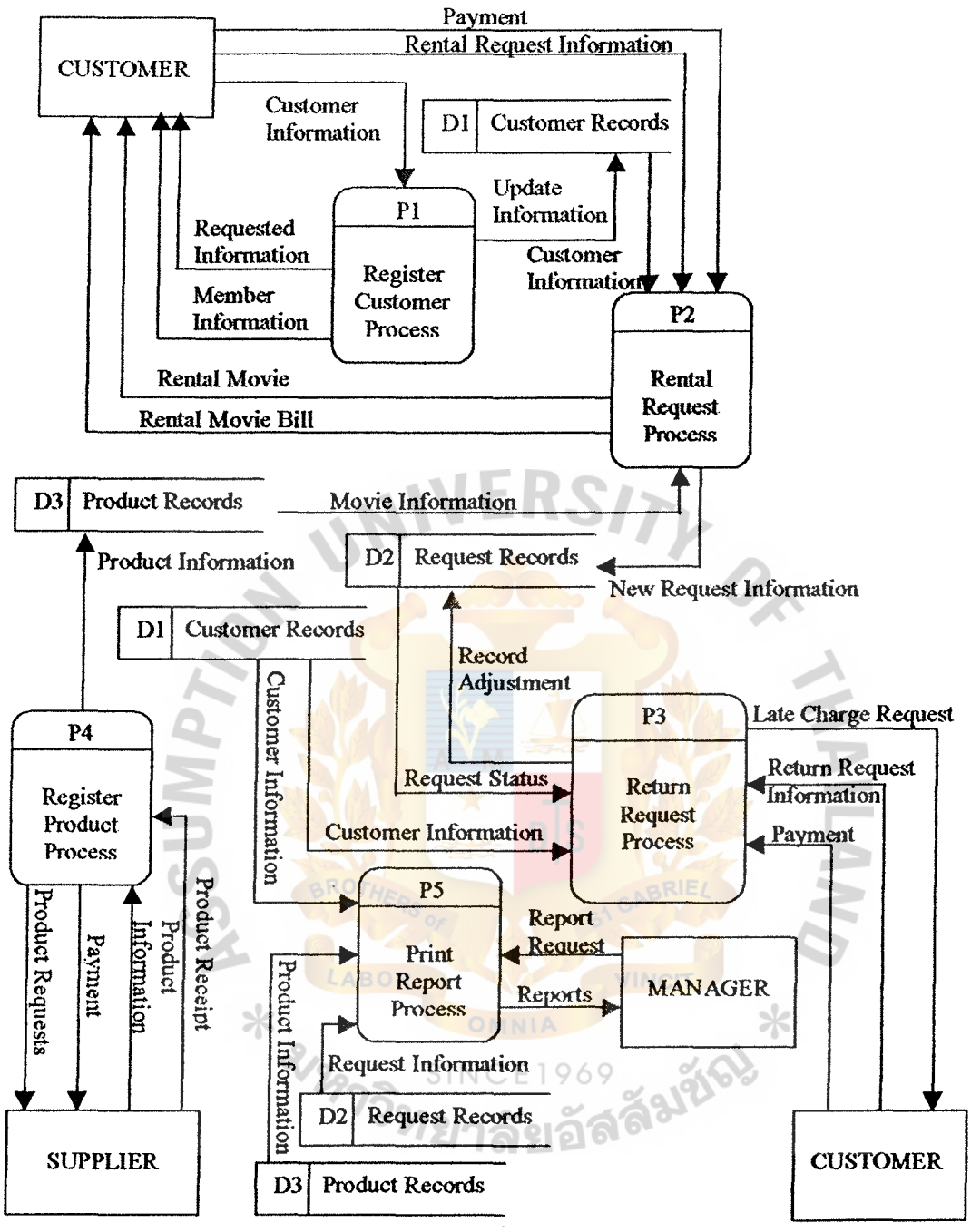


Figure 2.3. Data Flow Diagram of the Existing System.

2.3. Current Problems and Areas for Improvement

The existing system is a manual system. Manual system is fully operated by humans who contribute to a lot of mistakes.

The following problems are always found during the processes:

(1) Human Errors

Many human errors are being found during the operational process, since the staff are always tired due to the bundle of paperwork load on their table and the overtime required to complete their repetitive work. Mistakes are found such as staff input wrong information or give movie for rent in the wrong request to the wrong customer.

(2) Loss of important data

Sometimes customer data and movie rental bill are lost. Those data are one of the company's assets, which should be kept securely. They are used for other transactions, following rental movie back, customer behavior analysis and trend of movie that customer likes to get and so on.

(3) Delayed process

All problems that occurred in the existing manual system caused a delay in the operation. As time and service is the main success factor of the service business, the manual system cannot provide the efficient use of time for the operation. This problem may lead to the loss of competitive advantage over the competitors

(4) Difficulty to make reports for decision making support.

Since the company's operation is done manually, data is scattered and huge, it takes time to make reports, management makes decision without

supporting reports. Decision making is done inefficiently. Moreover, it affects the company profit and reputation

(5) Difficulty to expand the organization

In order to expand the company, the company's operation itself has to be systematic.

The important areas of systems can be defined as changes that will results in incremental yet worthwhile benefits. All sections need to improve according to the company mission. A computerized system needs to be implemented for the operation and management sections. Moreover, there are many areas to be improved.

(1) Speeding up the process to reduce time consumption.

(2) Reduce the staff workload by using a computerized system

(3) Improve the quality of service and response to customers

(4) Reducing errors in data input as to improve the information accuracy and data integrity.

III. THE PROPOSED SYSTEM

3.1. User's Requirement

After discussions with users, it is concluded that the main function of the company's operation should be automated standard procedures for many tasks and standard input and output forms of all the document processes need to be created.

Besides the improvement of existing tasks, the user also requires various kinds of reports, both ad hoc and periodic, to provide the management with the necessary information about customers, and customer's request. These reports help the management in strategic decision making.

The owner hopes that the investment in the new system will revolutionize the company's reputation and enable the company to compete with others in the future.

3.2. System Specification

The proposed system is the new system that is created to solve many problems of the existing manual system. From the analysis of the existing system, both process and resources and the problems found, the key functions need to be a proposed system that has a well-designed database organization that easily retrieves valuable and analytical information. Furthermore, the proposed system also covers additional functions that enhance the high capability of the company. The system specifications are as follows:

(1) To create better service and increase the effectiveness of work.

(2) To reduce the number of human errors.

(3) To provide user-friendly interfaces.

(4) To speed up each transaction process

(5) To enhance the efficiency and effectiveness of each work process

(6) To generate reliable information via control procedures

(7) To create information in the various kinds of forms without doing duplicated work

(8) To provide necessary information more rapidly

(9) To provide more accurate information to all concerned users

3.3. System Design

Application architecture in terms of data, process, interfaces and networks has been designed, before specifying technical solution for system component.

(1) Network Architectures: Two Tier Client/Server Architecture

The company applies the local area network (LAN) to connect the one server and three client computers under the two-tier client/server architecture. This architecture places the information system's stored data on a database server and the business logic and users interfaces on the clients.

(2) Data Architecture: Relational Database Technology

The company prefers to use the relational database technology, relational database management systems (DBMS). It applies the relational database. The benefits of a database that has been designed according to the relational model are numerous as follows:

(a) Data entry, updates and deletions are efficient.

(b) Data retrieval, summarization and reporting are efficient.

(c) Since the database follows a well-formulated model, it behaves predictably.

(d) Since much of the information is stored in the database rather than in the application, the database is somewhat self-documenting.

(e) Changes to the database are easy to make.

(3) Interface Architectures: Online Processing and Graphical User Interface (GUI)

The company implements the client-server application, which is the on-line processing, that provides for a conversational dialogue between the user and computer. Business transactions and inquiries are well processed when they occur. Errors are identified and corrected more quickly. Data editing and output formatting occur on client computers.

(4) Process Architectures: Software Development Environment for Two-Tier Client/Server

The company prefers Microsoft Visual Basic for software language and tools that is used to develop the business logic and application programs.

Microsoft Visual Basic is the most productive tool for creating high performance enterprise. Integrated Visual Data and RAD environment promote productivity while native code compilation provides fast application. It is GUI application, which associates system events, such as mouse-clicks.

(5) Database Design

In designing the database, the detailed description of the database will be created to meet the current and the future needs of the company. So the objectives of the database design are as follows:

(a) The data have to be available to support the operation.

(b) The data have to be available the management decision.

(c) The data must be accurate and consistent.

(d) The data must efficiently be stored, updated and retrieved.

The proposed database system is created to provide accurate information, timely information to users, whereby, they will be stored and managed with the most effective database technology, the relational database model.

The database of the proposed system consists of 7 tables to record all data for the system. Those tables include the following:

(a) Customer records

(b) Request records

(c) Product records

(1) Product Type records

(d) Payment records

(e) Reward records

The detail of database design are shown in Appendix A.

(6) User Interface Design and Prototyping

GUI Screen Design is conducted. Data validation is considered. Before data input into database, internal control of GUI program is used to ensure that data input to the computer is accurate and that the system is protected against accidental and intentional errors and abuse, including fraud. See Appendix E for GUI Screen Design.

(7) Output Design and Prototyping

The output design is also important, the project team design the output that follows business requirement such as a Product bill.

There are two basic types of computer outputs, which are:

(a) External outputs which are 2 types of issued bills:

(1) Rental movie bill: displays summary details of rental request.

(2) Late charge bill: displays summary detail for late charge request when a customer returns movie over than due date.

(b) Internal outputs which are six types of reports for different purposes (See Appendix F)

(1) Customer summary report: displays customer's information that data will be sorted by customer id.

(2) Customer request summary report: displays details customer's movie rental request that will be sorted by request date, customer id., request id., product id., rental item and rental price respectively.

(3) Product availability monthly report: displays details of product in stock at month end. There are options for user to select sorting method such as movie type, product id. and title.

(4) Sales monthly report: displays rental movie that can be rent at month end. There are options for user to select sorting method such as request date, product id. and movie type.

(5) Income monthly report: displays income summary report at month end and data will be sorted by payment date.

(6) Rental outstanding monthly report: displays requested products that have not been returned from customer. It will be generated at month end and data will be sorted by request date.

(8) Software Design

After the project team designs the databases, inputs and outputs, software design can proceed. A popular strategy for determining a modular

design for program is structured design. The details of process modeling are shown in Appendix B.

In order to provide the system that satisfies the system requirement three candidates are proposed for the solution of the system. The detail of those candidates and their various characteristics are shown as follows.

3.1.1 Candidate Solutions

(1) Alternative Candidate

(a) Candidate 1 :

There are fully supports all user requirements in terms of both functionality and business process. This solution also provides more powerful and more flexibility to expand the portion of the system to support other operation according to system customization upon user requests. Visual Basic 6, Microsoft Access 2000 and MS Access 2000 are the software tools needed. Storage devices and implications are MS Access 2000 and DBMS with 20 GB storage capacity. Project development time line is 2-3 months with 286,780 baht development cost. Payback period will be 1 year and 5 months.

(b) Candidate 2 :

There are also fully supports all user requirements in terms of both functionality and business process but it may be spent in higher cost because it is package solution covered overall rental operation management developed by Developer 2000 and Personal Oracle 8.0. Storage devices and implications are Oracle DBME with 20 GB storage capacity. Project development time line is 4-5 months with 412,780 baht development cost. Payback period will be 2 years.

(c) Candidate 3 :

There are also fully supports all user requirements in terms of both functionality and business process but it may be spent in higher cost more than first and second candidate because it is package solution covered overall rental operation management with quick

implementation and meet business requirement. Software development tool needed are Delphi 7.0 and Personal Oracle 8.0. Storage devices and implications are Oracle DBME with 40 GB storage capacity. Project development time line is 2 months with 463,780 baht development cost. Payback period will be 2 years 5 months.

Table 3.1. Candidate System Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of system computerized Brief description of that portion of the system that would be computerized in this candidate.	Fully supports all user requirements in terms of both functionality and business process. This solution also provide more powerful and more flexibility to expand the portion of system to support other operation.	Fully supports all user requirements in terms of both functionality and business process.	Fully supports all user requirements in terms of both functionality and business process.
Benefits Brief description of the business that would be realized for this candidate.	Easy to develop and implement.	High technology & technical support	Quick implementation and meet business required
Servers and workstations A description of the servers and workstations needed to support this candidate.	Server : Pentium 4 2.93 GHz, 120GB. HDD, Cache 1 MB., RAM 256 MB., 1.44 MB Floppy Drive, With Windows XP Client : Pentium 4 2.80GHz, 40 GB HDD, Cache 512 KB, RAM 128 MB., 1.44 MB. Floppy Drive, with MS Window 2000	Server : Pentium 4 2.93 GHz, 120GB. HDD, Cache 1 MB., RAM 256 MB., 1.44 MB Floppy Drive, With Windows XP Client : Pentium 4 2.80GHz, 40 GB HDD, Cache 512 KB, RAM 128 MB., 1.44 MB. Floppy Drive, with MS Window 2000	Server : Pentium 4 2.93 GHz, 120GB. HDD, Cache 1 MB., RAM 256 MB., 1.44 MB Floppy Drive, With Windows XP Client : Pentium 4 2.80GHz, 40 GB HDD, Cache 512 KB, RAM 128 MB., 1.44 MB. Floppy Drive, with MS Window 2000
Software Tools needed Software tools needed to design and build the candidate Not generally applicable if applications software packages are to be purchased.	Visual Basic 6 Microsoft Access 2000, Window 2000 / XP	Developer 2000 Personal Oracle 8.0	Delphi 7.0 Personal Oracle 8.0

Table 3.1. Candidate System Matrix (Continued).

Characteristics	Candidate 1	Candidate 2	Candidate 3
Application Software A description of the software to be purchased, built, accessed, or some combination of these techniques.	Custom Solution	Package Solution	Package Solution
Output Devices and Implications A description of output devices that would be used, special output requirements	Laser Printer	Dot Matrix Printer	Laser Jet Printer
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.	MS Access 2000 DBMS with 20 GB storage capacity	Oracle DBME with 20 GB storage capacity.	Oracle DBME with 40 GB storage capacity.
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	Keyboard & mouse	Keyboard & mouse
Method of Data Processing Generally some combination of : on-line, batch, deferred batch, remote batch, and real-time.	Database stored on server and process on workstation	Oracle uses a two-tier Client/Server architecture with a powerful database server	Database stored on server and process on workstation

Table 3.2. Feasibility Matrix.

Characteristics	Weight	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility	30%	Fully supports user required functionality. Many of users and management highly accept this solution. They are convinced that this solution will meet all their requirements by using not too long time of construction. IT can also be expanded easily to support other functions in the future. SCORE : 90	Supports user required functionality only partially Many of users and management accept this solution, as it all supports their requirements. But they afraid that the system can not be expanded to support other functions in the future. SCORE : 75	Supports user required functionality only partially but more than Candidate 2 Many of users and management accept this solution, as it all supports their requirements. But they afraid that the system can not be expanded to support other functions in the future. SCORE : 80
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.	30%	Programmer is familiar with Microsoft products therefore this reduces development process. Ms Access 2000 for both client and server. This solution is using Ms-access, which has been understood by current system so it decreases software and training cost. SCORE : 90	Most of the application development is outsource. The problem with this approach is that expensive consultants must be hired to put the system into operation and for periodic checks. Also personnel have to be trained SCORE : 75	Only a small portion of the application development is outsource. Most of it is developed in-house leading to a high development cost. SCORE : 80

Table 3.2. Feasibility Matrix(Continued).

Characteristics	Weight	Candidate 1	Candidate 2	Candidate 3
Schedule Feasibility An assessment of how long the solution will take to design and implement	10%	2-3 months SCORE : 95	4-5 months SCORE : 80	2 Months SCORE : 85
Economic Feasibility Cost to develop: Payback periods (discounted) Net present value Detailed Calculations :	30%	286,780 1 year and 5 months 1,057,052 See Appendix D SCORE : 85	412,780 2year 829,815 See Appendix D SCORE : 80	463,780 2 years and 5 months 666,811 See Appendix D SCORE : 75
Ranking	100%	89	77	79

Candidate 1 is selected as a target system. The main purpose of this target system is to fully support the user required functionality and system owner satisfaction. The best candidate will be selected based on the cost, benefits, payback period, return on investment, and net present value. The selected system should provide the benefits to the present Movie Rental Service Information System as follows:

(a) The application for the new system can be easily obtained and there are varieties of choice to select from. The application such as Microsoft Access will lead to lower application expense than propriety application.

(b) All the functions are displayed by GUI, which is ease of use and nice

graphic display. The system user and system owner will be highly satisfied.

(c) No training is needed for the new system because all the information and system guide can be easily obtained or searched for. In addition, the new system can be learnt and understood by the users themselves. Thus, the suggested system will not have any additional training cost incurred.

(d) The new DBMS is located at the server. It is capable of calculating and selecting the best way to draw information from database. Therefore, all data are retrieved very quickly from the database without any traffic problem.

(e) The DBMS at server supports and allows multi-user to retrieve information from database simultaneously. While the DBMS located at the client does not support multi user, there will be traffic jam at one terminal, and the work of Database Administrator will be more sophisticated to distribute the requested information from various users.

3.4 Hardware and Software Requirements

The proposed Movie Rental Service Information System will be developed In the form of windows based. Microsoft Access 2000 is the major software tool used to develop the input and output design of the system. The hardware & software specifications for the server are shown in the Tables 3.3 and 3.4 respectively.

Table 3.3. The Hardware Specification for the Server.

Hardware	Specification
CPU	Intel Pentium IV Processor Hyper-Threading Technology
Memory	256 MB DDR RAM
Cache	1 MB or Higher
Hard Disk	120 GB
Combo Drive	16X DVD-ROM / 8X DVD+RW/ +R & CD-RW Combo Drive
Floppy Drive	1.44 MB diskette drive
Network Adapter	10/100 Base-T Network
Display Screen	17" SVGA Monitor
Display Adapter	SVGA Card
Keyboard	USB Internet Keyboard
Mouse	Internet Scroll Mouse
UPS	UPS 1050 VA

Table 3.4. The Software Specification for the Server.

Software	Specification
Operating System	Microsoft Windows XP
Database Software	Microsoft Access 2000
Application Software	Microsoft Office 2000 Professional Edition

The client machines should be at least standard to support Microsoft Windows 98 and Microsoft Office 2000 professional. The hardware & software specifications for each client machine is shown in the Tables 3.5 and 3.6 respectively.

Table 3.5. Hardware Specification for Client Machine.

Hardware	Specification
CPU	Intel Pentium IV Processor 2.8 GHz.
Memory	128 MB DDR RAM
Cache	512 KB or Higher
Hard Disk	40 GB
CD-ROM Drive	52x CD-RW Drive
Floppy Drive	1.44 MB diskette drive
Network Adapter	10/100 Base-T Network
Display Screen	15" SVGA Monitor
Display Adapter	SVGA Card
Keyboard	USB Internet Keyboard
Mouse	Internet Scroll Mouse
UPS	UPS 1050 VA

Table 3.6. Software Specification for Client Machine.

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

Other important hardware required for the proposed system is switch, network printer and cable. The specification of this hardware is shown in Table 3.7.

Table 3.7. Other Hardware Requirement.

Hardware	Specification
Hub	8 ports
Cable	LAN Cable UTP
Printer	Laser Printer

The network configuration of the proposed Movie Rental Service Information System is shown in Figure 3.1.

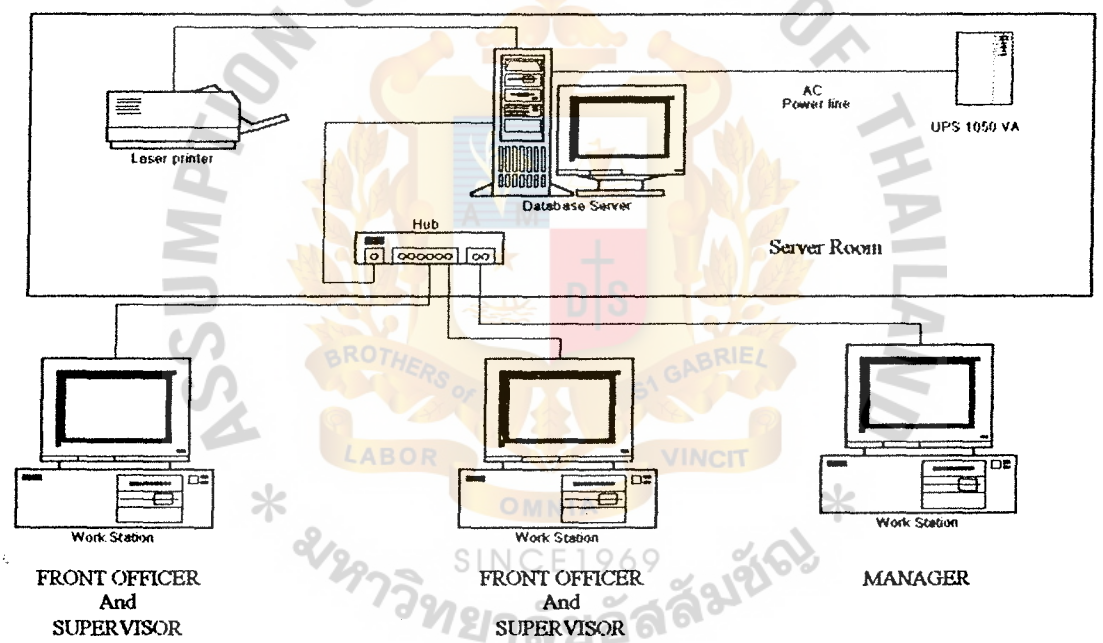


Figure 3.1. Network Configuration of the Proposed System.

3.5 Security and Control

System security is also considered an important factor in system design. The development of the information system is to gain the competitive advantage. Without good security control, the information system may backfire on the company. Computer downtime caused by the insider could lead to poor service. Or if the competitors could access the company information, it would lead to the loss of the company.

The aim of security control is to ensure that valuable business data will not be subject to unauthorized access, change or destruction. The controls are required for the data both at the time when they are in use and when they are being held for storage.

Following are the recommended practices to be implemented for the security control of the proposed system:

(1) To Protect against Unauthorized Access.

In order to access the system, each user must have their own login names and password, where by passwords must be changed regularly to prevent the risk exposure. And fail to login for three times, the user login name will be automatically locked to prevent unauthorized access.

(2) Enforcement of Least Possible Privilege

This is to ensure that the system user can only access to the information that are required for their work with the appropriate access level. For example, front officer could only monitor the request information but unable the alter it. So each user will be able to access only certain information at the level appropriate to their job.

(3) Eliminate Computer Downtime

Computer downtime could accidentally damage the system. So powerful tools such as UPS will be installed in order to prevent the damage of the computer and the network.

(4) Control Configuration and Setting

Users should not authorized to change the configuration and the setting of the system. System should be periodically (3-4 months) monitored and audited to prevent loss or damage that may caused by the change of the configuration and setting.

(5) To Protect Against Physical Destruction

Physically, the computer should be placed at a safe place in a room with authorized access. This is to prevent the system from both physical destruction and unauthorized access. The database server should be well places in a separate room in order to avoid any physical destruction.

(6) To Protect Against Loss of Data

The database backup procedure must be scheduled (twice a week) and well placed at the safe place. This is to ensure that the database can be recovered anytime the damage occurred to the database.

3.6 Cost and Benefit Analysis

In cost and Benefit Analysis step, the information concerning the cost and benefit of the proposed system will be estimated. This is to support the management decision.

(1) Cost of Manual System

Cost of the system could be classified into 2 categories: cost associated with system development and cost associated with system operation. Development cost occurred during the system development and is

being considered as sunk cost as it occurs only one time. It includes hardware, software and people used in setting up the system. System operation is the cost to be paid during the life of the system. It is the cost in running the system including staff, maintenance cost and other utility expense. The following table shows the cost of the Manual system.

Table 3.8. Manual System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
Fixed Cost					
Hardware Cost :					
Cashiers 2 units @ 15,000	9,000	9,000	9,000	9,000	9,000
Calculator 1 unit @ 550	110	110	110	110	110
Total Fixed Cost	9,110	9,110	9,110	9,110	9,110
Operation Cost					
Salary Cost:					
Customer Service Manager 1 person @ 20000	20,000	22,000	24,200	26,620	29,282
Front Officer 3 persons @ 10,000	30,000	33,000	36,300	39,930	43,923
Store Staff 2 person @ 8,000	16,000	17,600	19,360	21,296	23,426
Total Monthly Salary Cost	66,000	72,600	79,860	87,846	96,631
Total Annual Salary Cost	792,000	871,200	958,320	1,054,152	1,159,572
Office Suppliers and Miscellaneous Cost:					
Stationary Per Annual	17,500	19,250	21,175	23292.5	25,621.75
Office Supplier Per Annual	8,000	8,800	9,680	10,648	1,1713
Utility Per Annual	14,000	15,400	16,940	18,634	20,497
Miscellaneous Per Annual	16,000	17,600	19,360	21,296	23,426
Total Annual Office Supplies & Miscellaneous Cost	55,500	61,050	67,155	73,870.5	81,257.75
Total Annual Operating Cost	847,500	932,250	1025475	1128023	1240830
Total Manual System Cost	856,610	941,360	1034585	1137133	1249940

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

Year	Total Manual System Cost	Accumulated Cost
1	856,610	856,610
2	941,360	1,797,970
3	1,034,585	2,832,555
4	1,137,133	3,969,688
5	1,249,940	5,219,628
Total	5,219,628	-

(2) Cost of Proposed System

Table 3.10. Computerized System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
Hardware Cost :					
Computer Server Cost 1 Unit @ 40,000	8,000	8,000	8,000	8,000	8,000
Client Machine Cost 3 Units @ 30,000	18,000	18,000	18,000	18,000	18,000
Printer 1 Unit @ 20,400	4,080	4,080	4,080	4,080	4,080
UPS 1050 VA 1 Unit @ 3,500	700	700	700	700	700
Total Hardware Cost	30,780	30,780	30,780	30,780	30,780
Software Cost:					
Software Cost	22,000	22,000	22,000	22,000	22,000
Network Cost	10,000	10,000	10,000	10,000	10,000
Total Software Cost	32,000	32,000	32,000	32,000	32,000
Implementation Cost:					
Training Cost	27,000	-	-	-	-
Set up Cost	16,000	-	-	-	-
Total Implementation Cost	33,000	-	-	-	-
People-Ware Cost:					
System analysis 1 person @ 3 months @ 20,000	60,000	-	-	-	-
Programmer 1 person @ 2 months @ 18,000	36,000	-	-	-	-
Database Specialist 1 person @ 3 months @ 19,000	57,000	-	-	-	-
Network Specialist 1 person @ 2 months @ 19,000	38,000	-	-	-	-
Total People-Ware Cost	191,000	-	-	-	-
Total Development Cost	286,780	62,780	62,780	62,780	62,780
Operation Cost					
Maintenance Cost:					
Server Maintenance cost 1 set @ 32,000 per annual	32,000	35,200	38,720	42,592	46,851
Workstation Maintenance cost 3 sets @ 6,000 per annual	18,000	19,800	21,780	23,958	26,354
Software Maintenance cost 3,500 per annual	3,500	3,850	4,235	4,658.5	5,124
Total Maintenance Cost	53,500	58,850	64,735	71,208.5	78,329
People Ware Cost:					
Customer Service Manager 1 person @ 20,000	20,000	22,000	24,200	26,620	29,282
Supervisor 1 person @ 15,000	15,000	16,500	18,150	19,965	21,961.5
Front Officer 2 persons @ 8,000	16,000	17,600	19,360	21,296	23,426
Total Monthly Salary Cost	51,000	56,100	61,710	67,881	74,669.5
Total Annual Salary Cost	612,000	673,200	740,520	814,572	896,034
Miscellaneous Cost Per Annual					
Office Supplies	11,000	12,100	13,310	14,641	16,105
Office Supplier	6,500	7,150	7,865	8,652	9,517
Utility	12,000	13,200	14,520	15,972	17,569
Miscellaneous	10,000	11,000	12,100	13,310	14,641
Total Miscellaneous Cost	39,500	43,450	47,795	52,575	57,832
Total Operating Cost	705,000	775,500	853,050	938,355	1032195
Total Computerized Cost	991,780	838,280	915,830	1001135	1094975

Table 3.11. Five Years Accumulated Computerized Cost, Baht.

Year	Total Computerized	Accumulated Cost
1	991,780	991,780
2	838,280	1,830,060
3	915,830	2,745,890
4	1,001,135	3,747,025
5	1,094,975	4,842,000
Total	4,842,000	-

Table 3.12. The Comparison between Computerized System Cost and Manual System Cost, Baht.

Year	Accumulated Manual Cost	Accumulated Computerized Cost
1	856,610	991,780
2	1,797,970	1,830,060
3	2,832,555	2,745,890
4	3,969,688	3,747,025
5	5,219,628	4,842,000

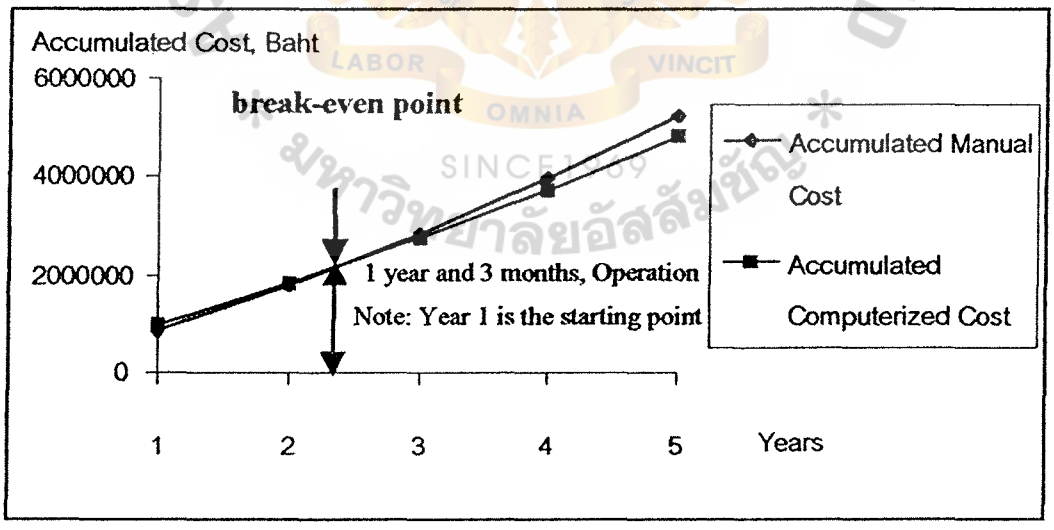


Figure 3.2. Break – Even Point Analysis.

(3) Payback analysis

Payback period is the commonly used technique to assess the value of investment. Generally, payback period is that cash inflows can recover the initial investment within a specified period. To reflect the real value of money, the time value of money concept is also applied in this analysis. This discount rate is required to calculate discount value of all costs and benefits after the second year to the present value at the present year. If the payback period is performed without time adjusting the costs and benefits (time value of money), non-time-adjusted paybacks tend to be over-optimistic and misleading.

As in Figure 3.2., The graph of commutative cost of computerized system cross the x-axis at 1 year and 5 months or the payback period of the computerized system is 1 year and 5 months (See Figure D.1).

(4) Net Present Value

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

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

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

Whichever alternative gives the highest net present value, that alternative will be selected.

(See the full details of Net Present Value calculation in Appendix D)

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

System Implementation is the conversion process from a current manual system to new computerized information system. The final design should be evaluated first by the users and management teams to make sure that the new computerized system can meet the requirement and objectives, and then the other remaining process will be performed. It is expected that the system implementation would take approximately six weeks. The duration may vary depending on the readiness of the staff to use the new system. The process of System Implementation are:

(1) Software acquisition, development and installation

(2) Hardware acquisition and installation

(3) Personnel training

(4) Data preparation

(5) Testing

(6) Conversion

(7) Documentation

4.2 Installation

The installation of the proposed system is to combine 2 majors processed, software installation and hardware installation.

(1) Software Installation

The proposed system had to install new software, which is designed for solving the current problems and increasing the ability of the system. The development them has designed to use Visual Basic 6.0 for the development of the movie information service information system. Only the executed file is installed on each client. Microsoft Access 2000 has been

chosen to be the database of the proposed system. As the system is designed to use the client-server based architecture, the database will be set up only in the server.

(2) Hardware Installation

By employing the proposed system, some new hardware that does not exits in the existing system must be installed. In order to establish the Intranet Server, the new server computer and one network device, that is LAN card, are required to be installed together with other client computers.

4.3 Test Plan

After the new application software has been installed and tested, the final system test must be conducted to ensure that it can work together with all other existing programs. The following step is needed to complete the testing:

(1) System data test must be prepared.

(2) Ensure that all software packages and existing program have been installed and that unit testing has been completed.

(3) Perform tests to check that all programs work properly together.

(4) If there is any problem found, appropriate revision is needed and tested again.

4.4 Conversion

As the existing system, which is based on manual operations, has been used since the establishment of the company, the user is still familiar with the manual-working environment. Gradually changing the working environment from manually based to computerized based must be considered. Parallel conversion which is the approach that both the old and new systems are operated for some period is the approach in this situation. This is done to ensure that all major problems in the new system have been

solved before the old system is discarded. This approach minimizes the risk of major flaws in the new system causing irreparable harm to the business. The period for parallel run will take 3 months long and after that the new proposed system will run fully functionality.

4.5 Training

Converting to a new system necessitates that system users be trained and provided with documentation or user manuals that guides them through using the new system. Training the staff is an important step in implementing the computerized system, because the user can use the system correctly when they understand it well. The user must be instructed in how to operate the equipment and be instructed in troubleshooting the system. The training will be conducted to the users in groups and 30 hours of training time is provided for the system users.

4.6 Documentation

Documentation of the proposed system is separated into 2 documents. First is the user guide, which describes how to access and use the program, how to correct the problems and how to use interface screens. The second is the flow of the system and data dictionary. Both documents can help the users whenever they need or get the problem when using the program and also can help programmers to develop and maintain the system

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

With more competitive environment nowadays, most of the companies should recognize the importance of technology. Information should be treated as one of the most important tools in the business area. The information system must be developed not just to replace the old manual system, but to increase the speed of the service, to discover the analysis that has never been discovered using the old manual system. This is to increase the competitiveness of the business either by increasing sales or reducing costs or doing both.

This proposed system aims at increasing the competitiveness of the business. The system will be able to facilitate the users for providing the necessary tools, and facilitate the management with the necessary information. Table 5.1 will provide the comparison of the proposed system to the existing system.

Table 5.1 shows the time performance on each process of the proposed system compared with the existing system. It shows that each process of the proposed system performs in less time than each process of the existing system, which has to operate with many work steps in the manual system. So, it can be concluded that the proposed system is more efficient and effective than the existing system. Examples of cycle time reduction in various process are as follows:

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

Process	Existing	Proposed System
Customer Registration Process	20 minutes	3 minutes
Request for Rental / Return Service Process	15 minutes	1 minute
Check Point for Reward Request Process	None: difficult to manage	5 seconds
Reward Request Process	None: difficult to mange	5 seconds
Product Registration Process	20 minutes	3 minutes

From Table 5.1, the proposed system can save around 30 minutes in the operating process. Furthermore, the proposed system can generate is more precise and timely information than the existing system for management to make decisions.

The proposed system has several expected benefits as follows:

(1) Accuracy: As it uses computers to control production it can guarantee accuracy than human control.

(2) Fast: As it uses computers to control production it can guarantee faster than human control.

(3) Low costs: From cost and benefit analysis, it shows the proposed system costs less than the manual system.

(4) High quality: Since it uses computers to control operations it has high a quality of service.

(5) High loyalty: As it uses computer to manage loyalty program, it has high loyalty from customer with reward promotion that can be provided.

(6) Less problems: As it uses computers to control operation it has less problems.

5.2 Recommendations

The Information System is just one of the examples where computerization can be applied to ease daily business operations. Given its simplicity, the system can be modified and adapted to suit other types of business.

After consideration of all concerns with the existing system and the proposed computerized system, it is believed that the proposed computerized system is more attractive that the existing system. The proposed system has more effectiveness and efficiency of work, with a chance of faster service to customer and to gain higher revenues and cost saving. It is expected that the expansion of the system can serve the business in the future.

Movie Rental Service Information System can be developed in future for increased efficiency in a system that can be separated to 3 steps as follows:

(1) Applying barcode system solution for rental service in order to get more easier and faster service and reduce key-in process to the system.

(2) Extending the information system to cover purchasing to be fully integrated purchasing information system.

(3) Developing the system to be an Enterprise Application Integration (EAI) by integrating all systems together.

APPENDIX A

ENTITY RELATIONSHIP DIAGRAM

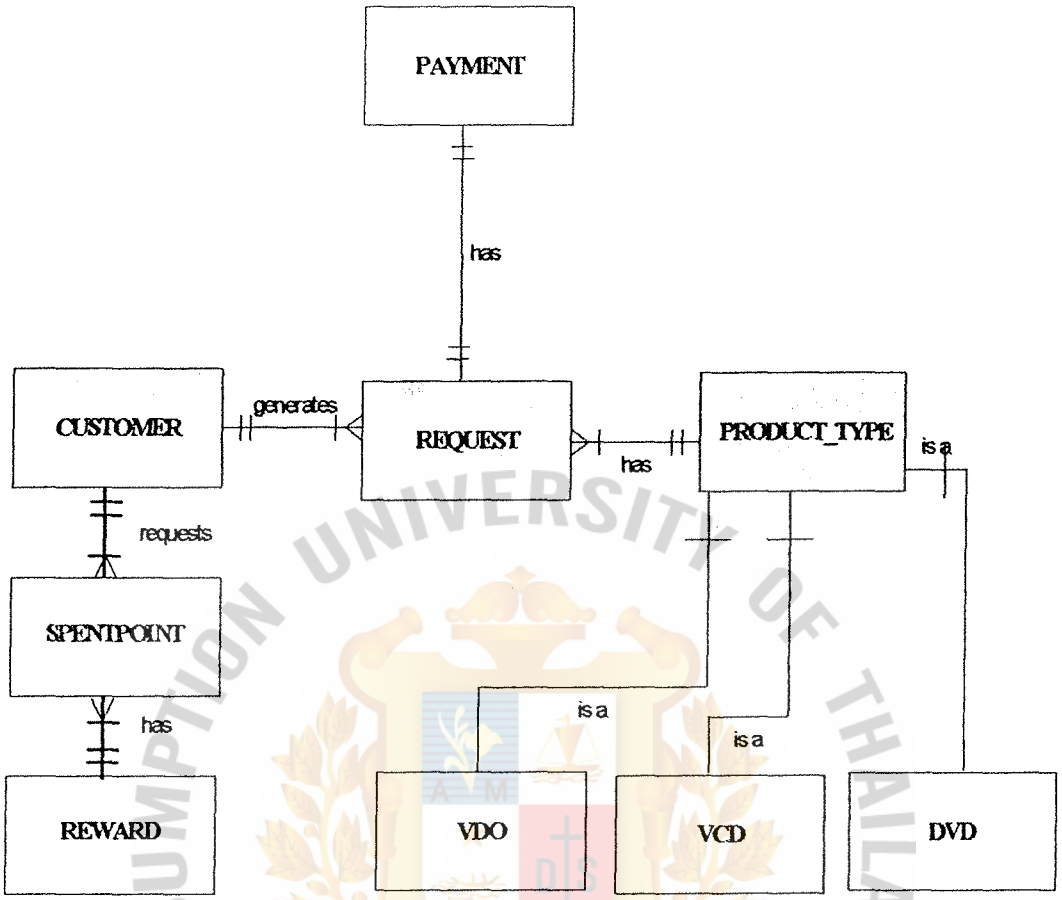


Figure A.1. Context Entity Relationship Diagram of Proposed System.

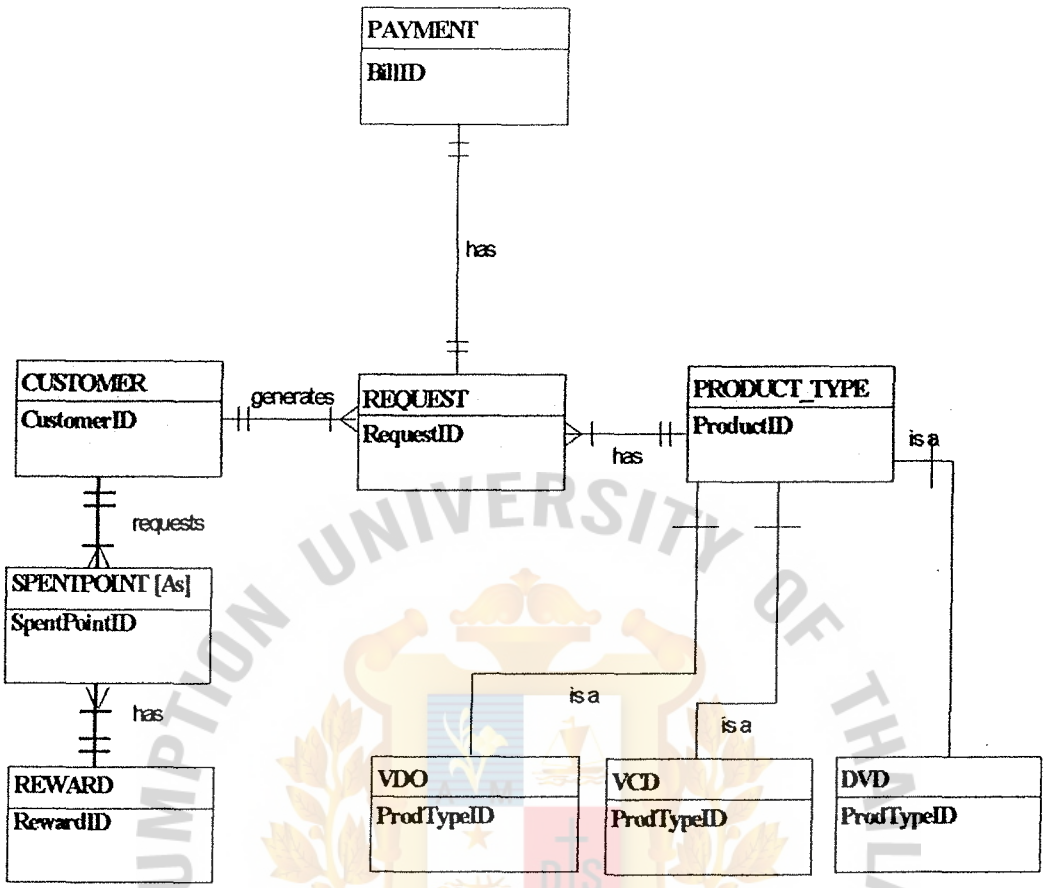


Figure A.2. Key Based Entity Relationship Diagram.

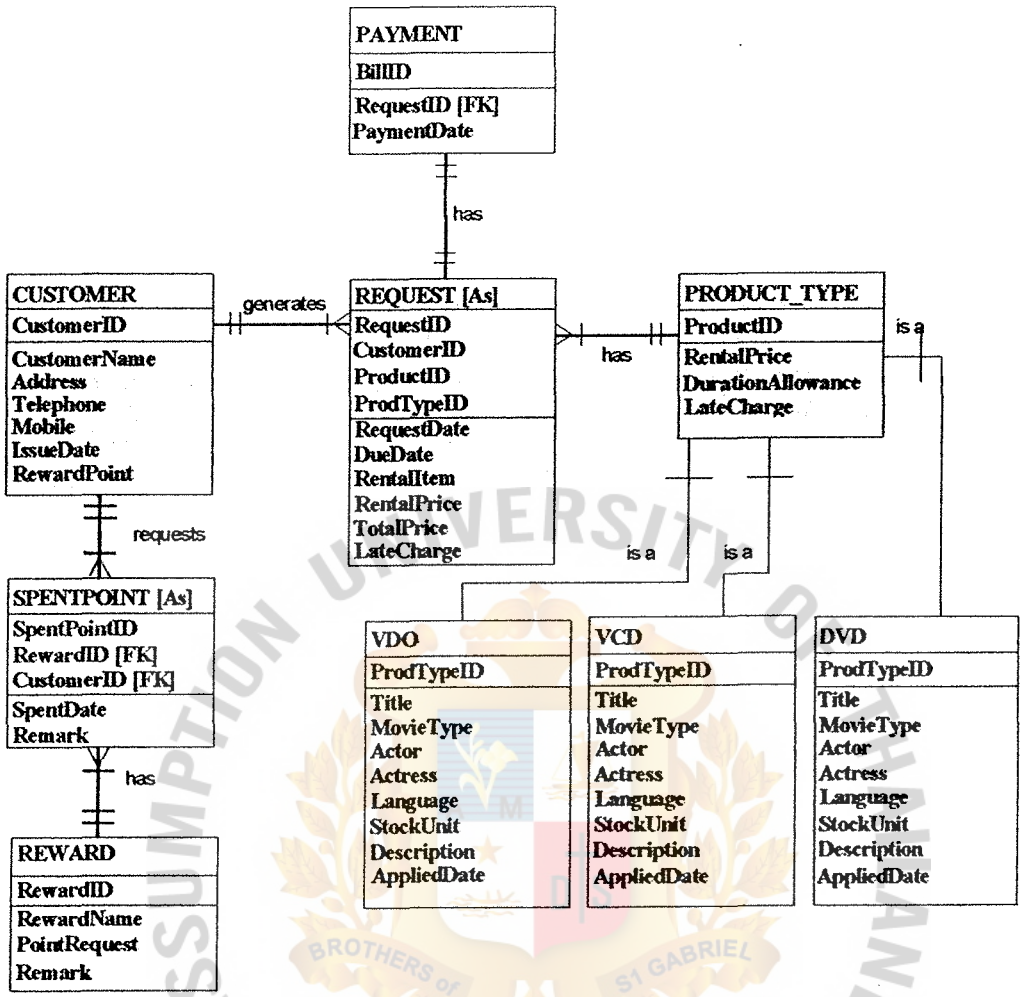


Figure A.3. Fully Entity Relationship Diagram.

APPENDIX B

DATA FLOW DIAGRAM

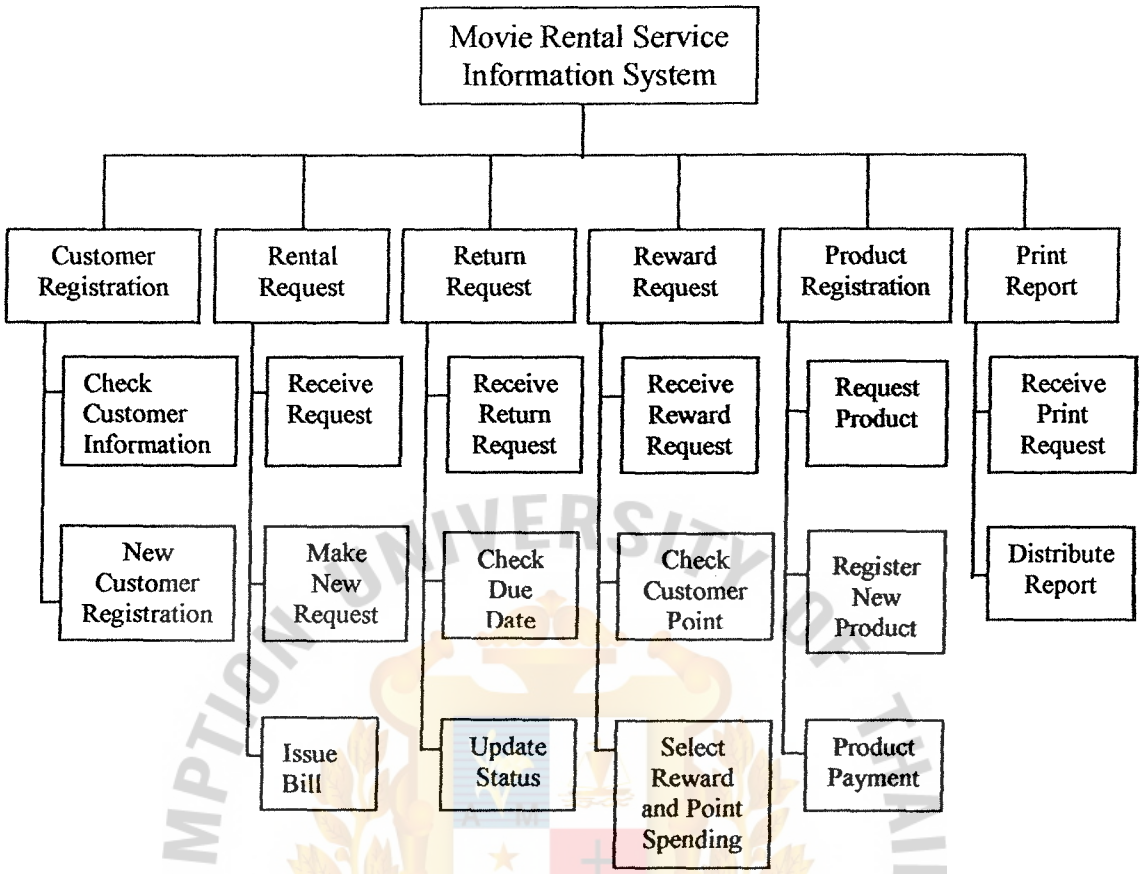


Figure B.1. Functional Decomposition Diagram.

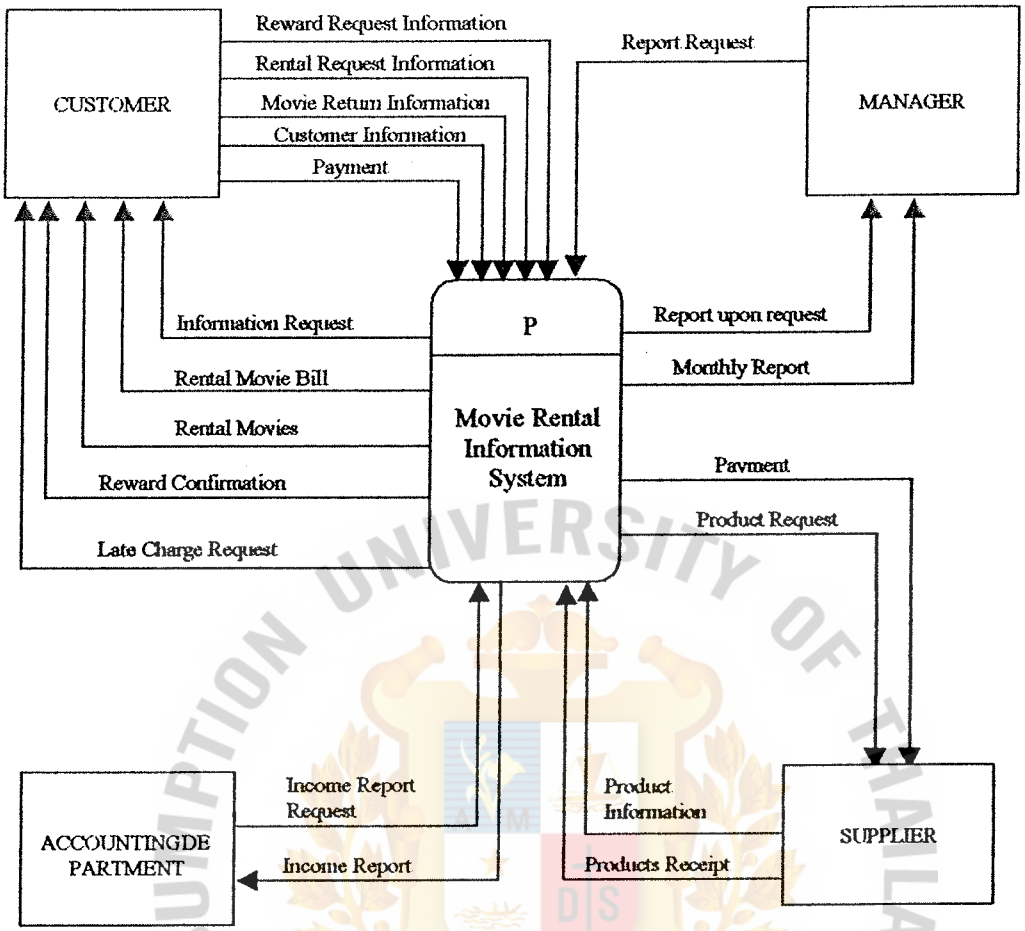


Figure B.2. Context Diagram of the Proposed System.

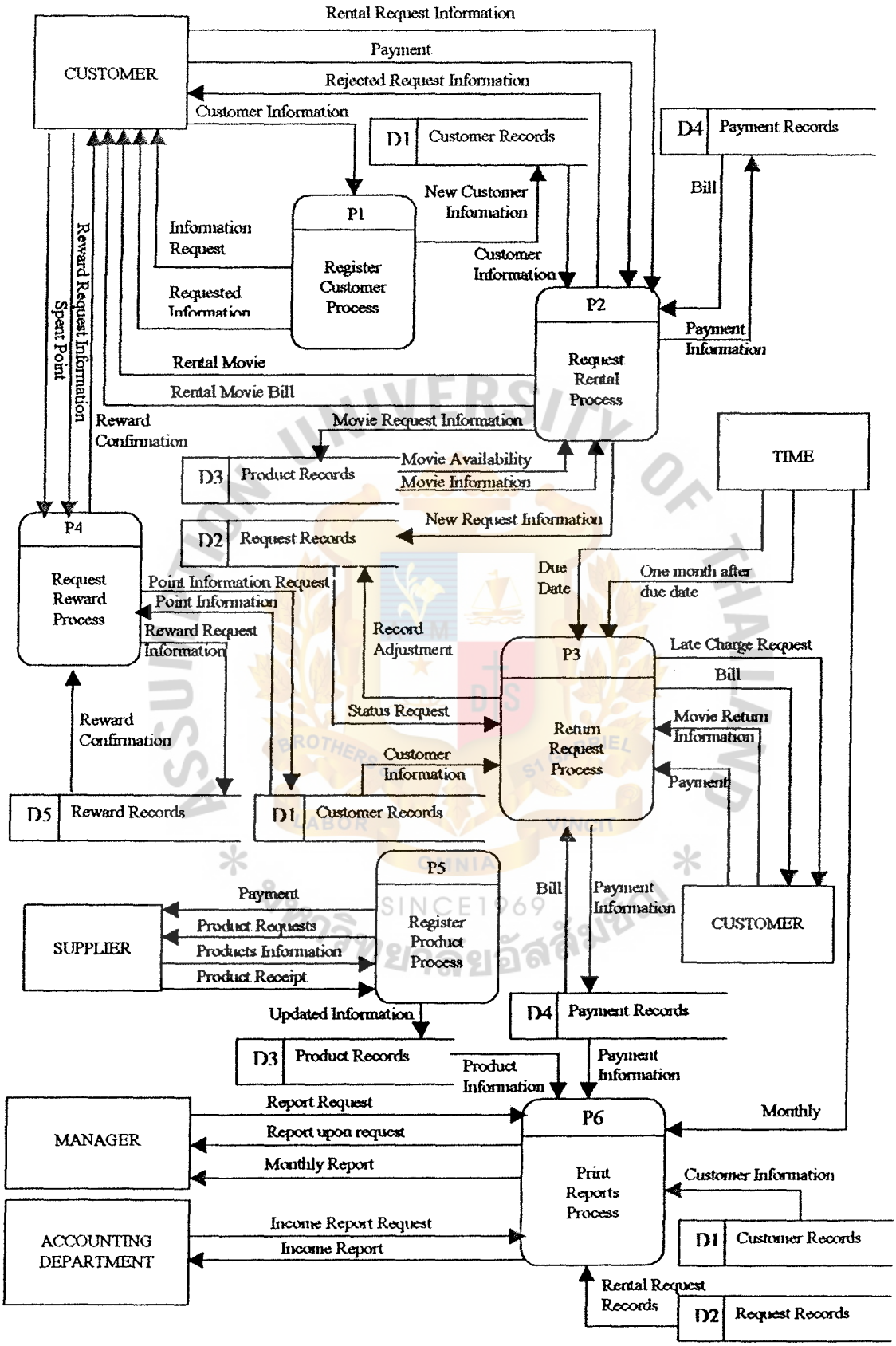


Figure B.3. Data Flow Diagram of the Proposed System.

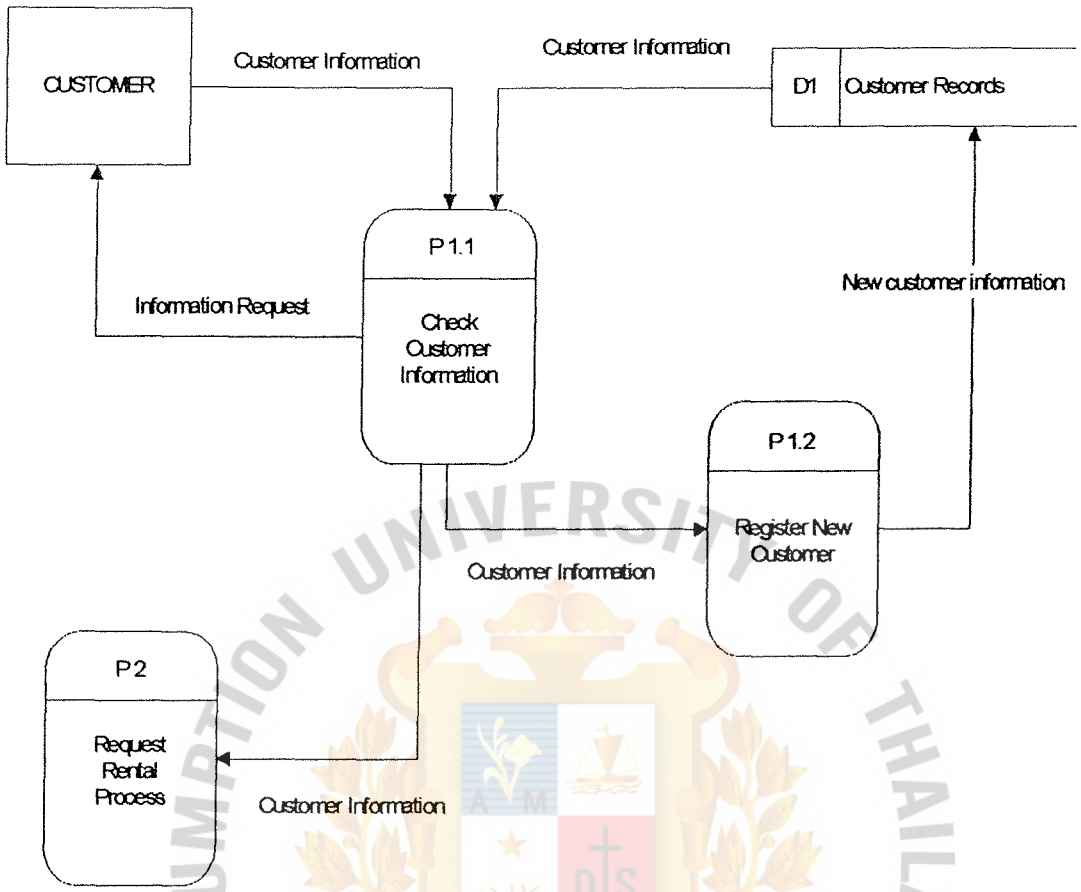


Figure B.4. Data Flow Diagram – Customer Registration.

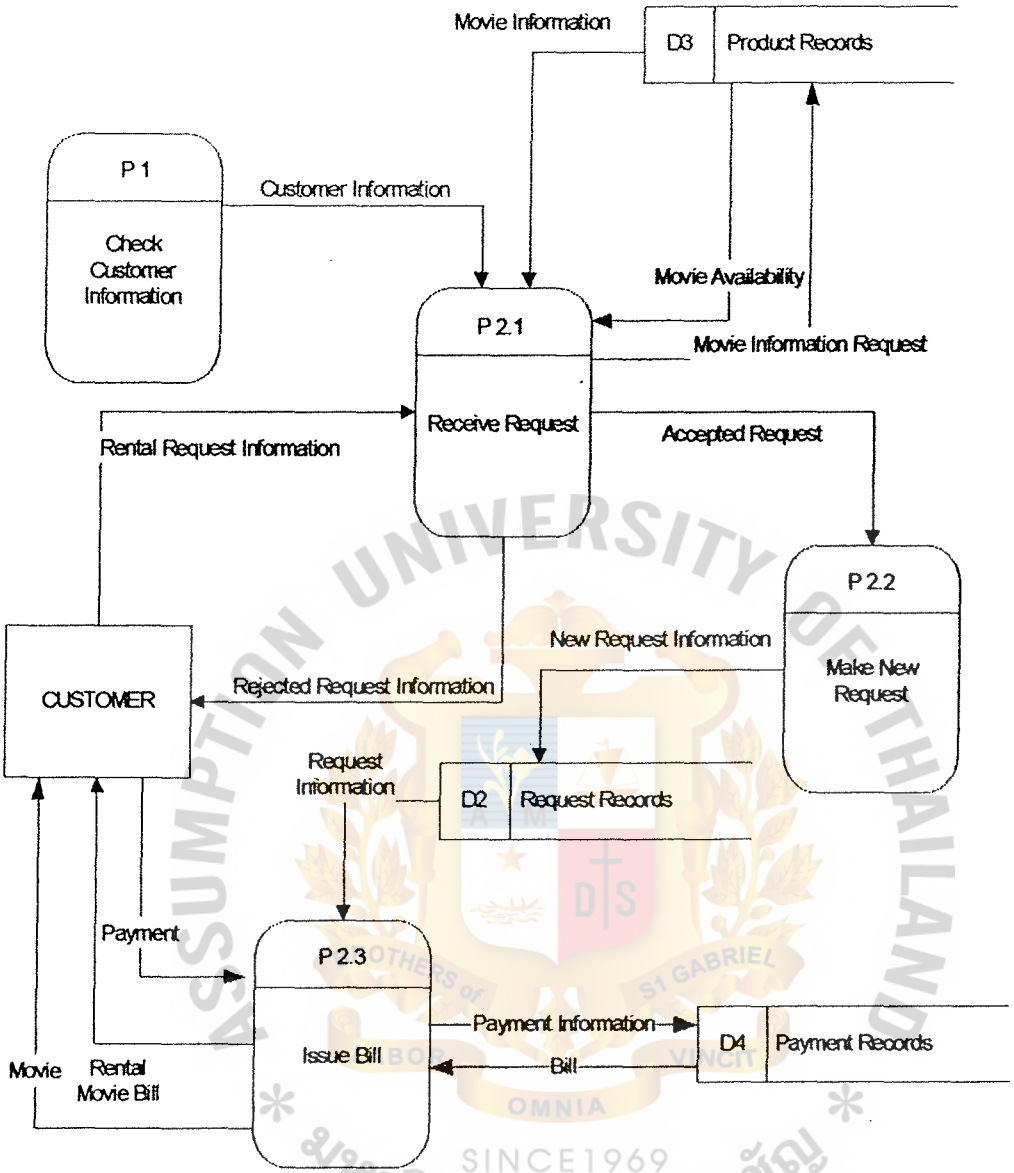


Figure B.5. Data Flow Diagram – Rental Request.

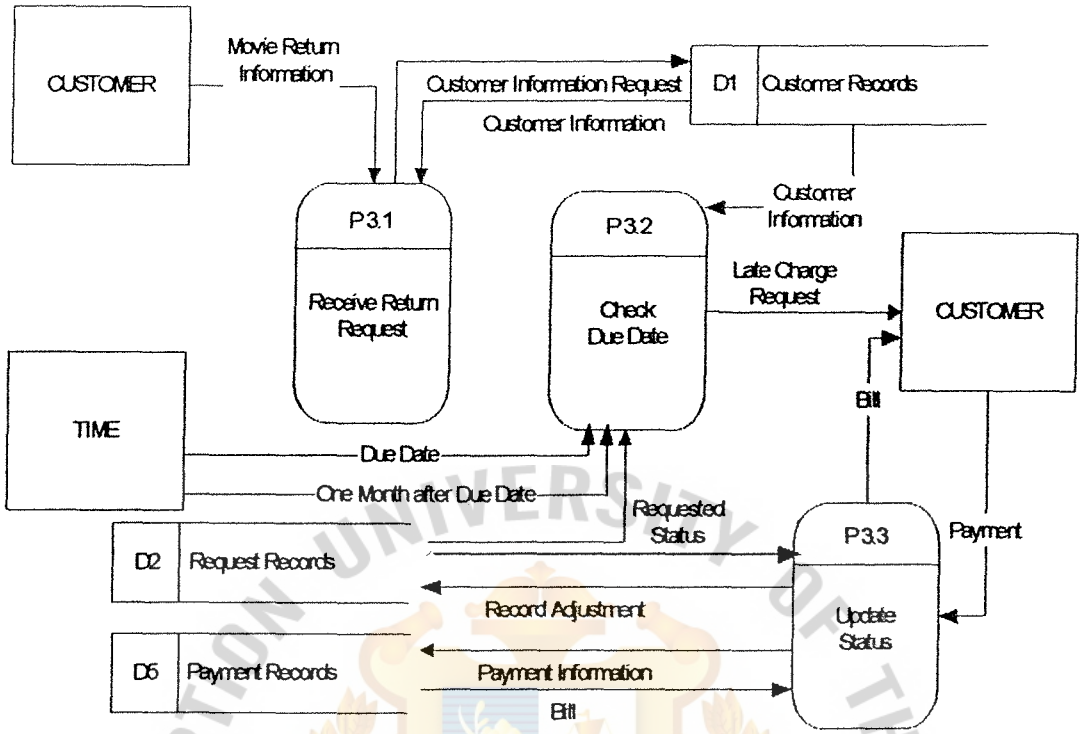


Figure B.6. Data Flow Diagram – Return Request.

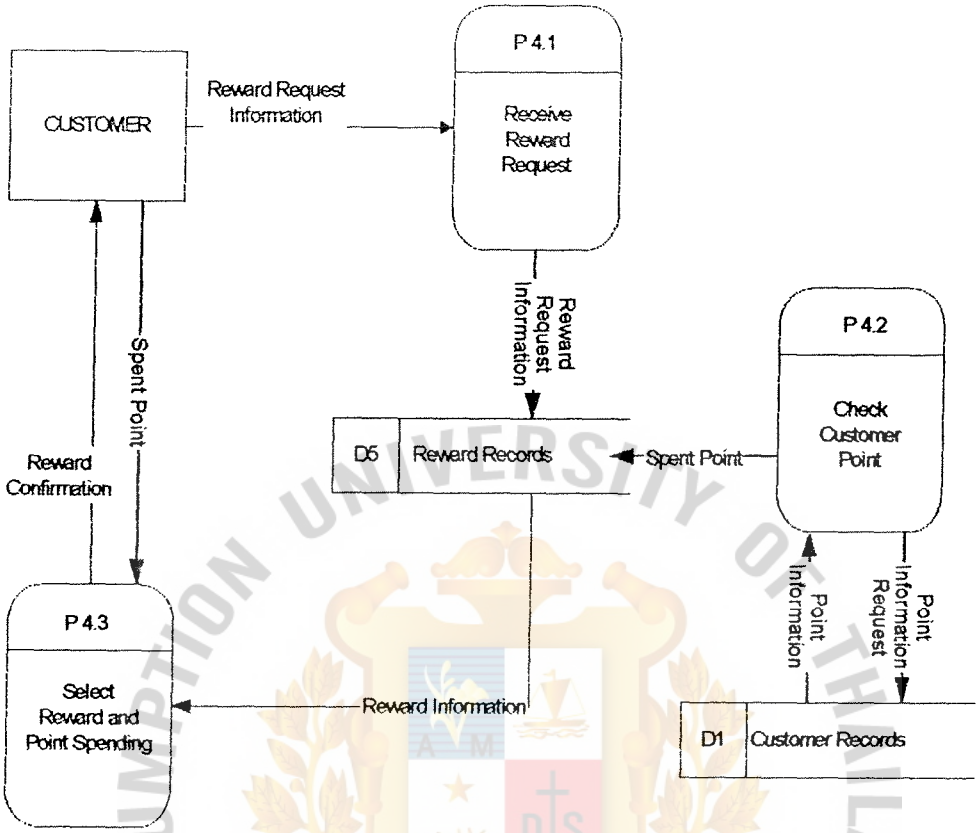


Figure B.7. Data Flow Diagram – Reward Request.

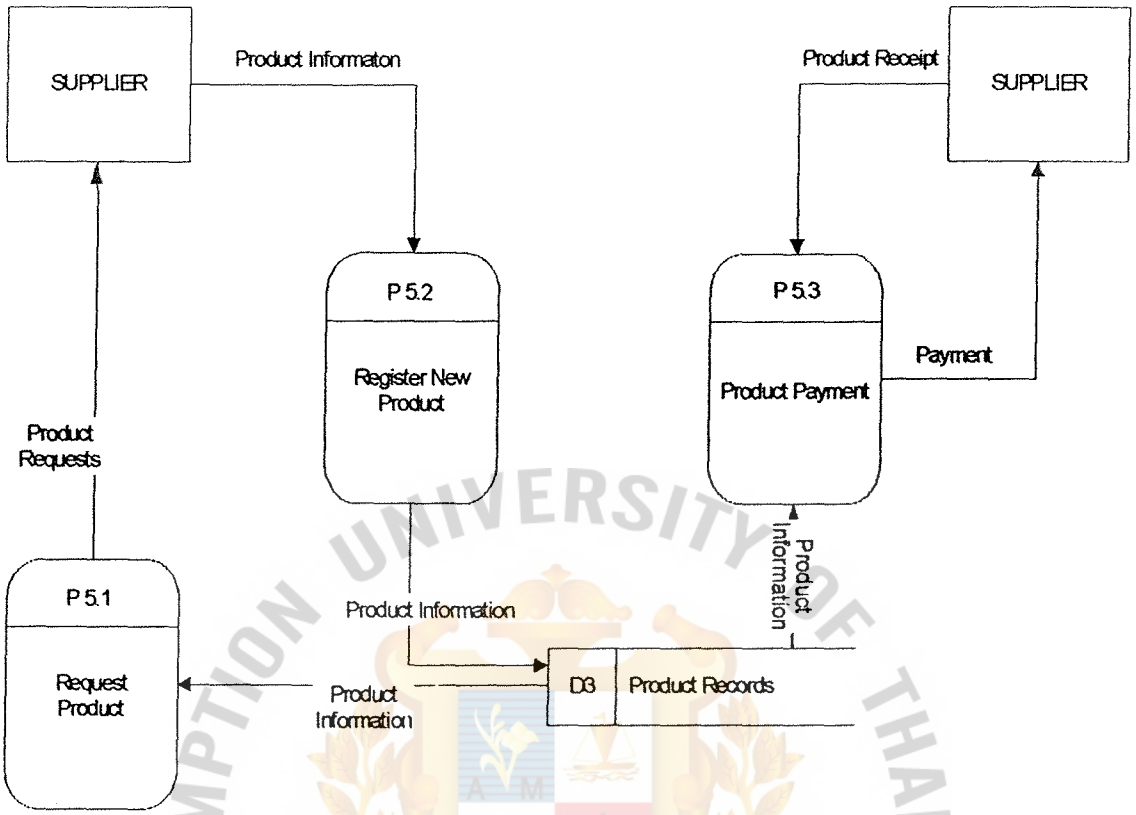


Figure B.8. Data Flow Diagram – Product Registration.

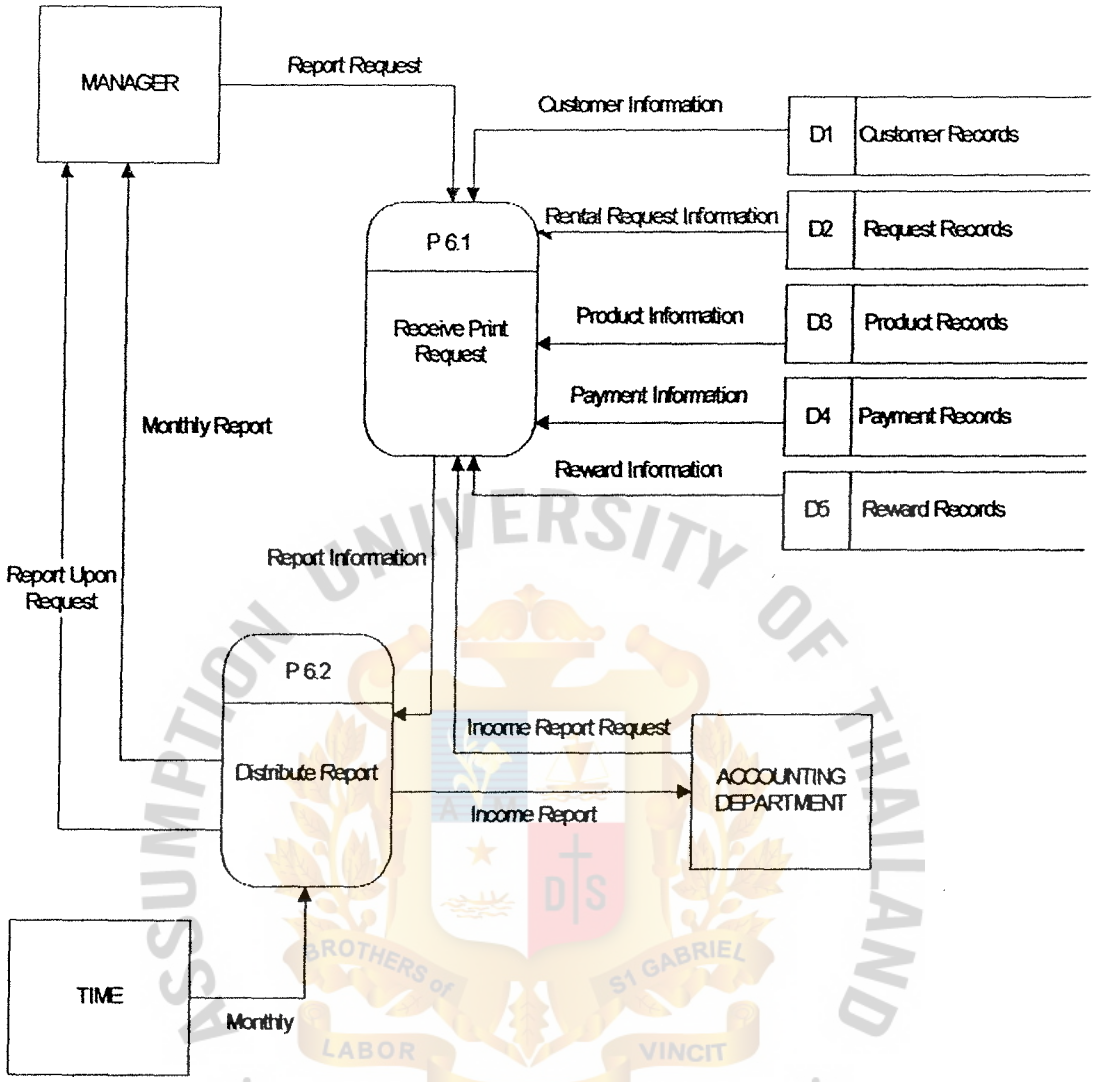


Figure B.9. Data Flow Diagram – Print Report.

APPENDIX C

STRUCTURE DIAGRAM

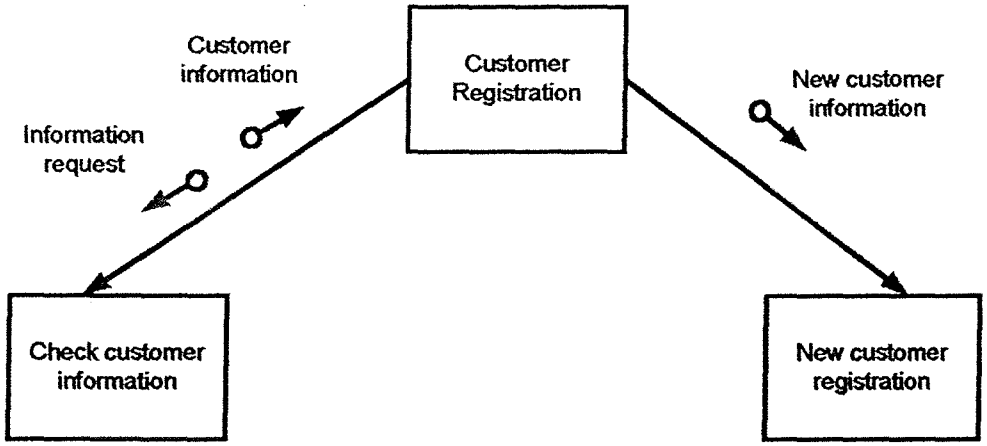


Figure C.1. Structure Chart of Customer Registration.

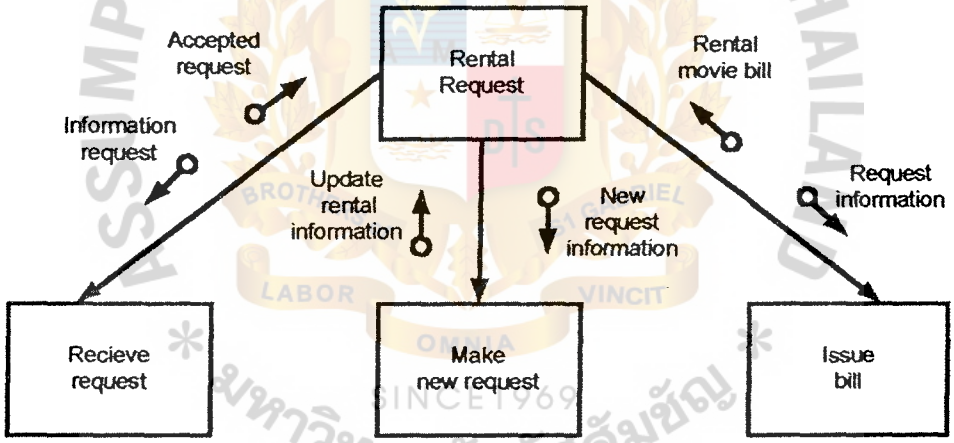


Figure C.2. Structure Chart of Rental Request.

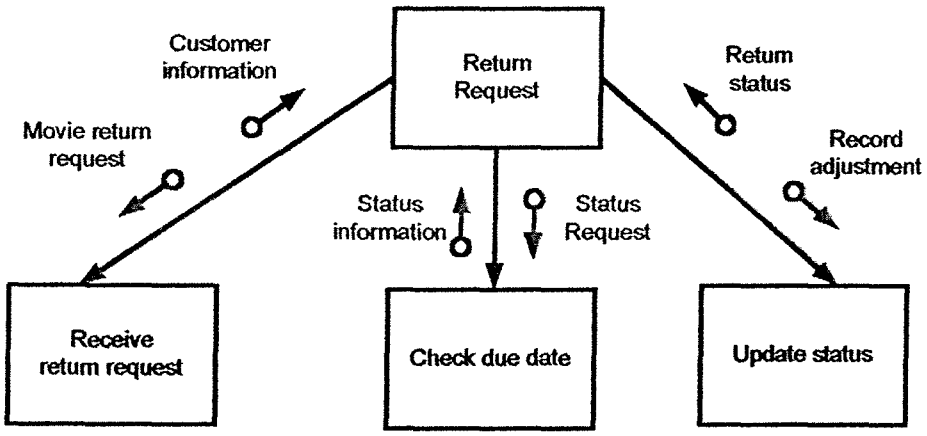


Figure C.3. Structure Chart of Return Request.

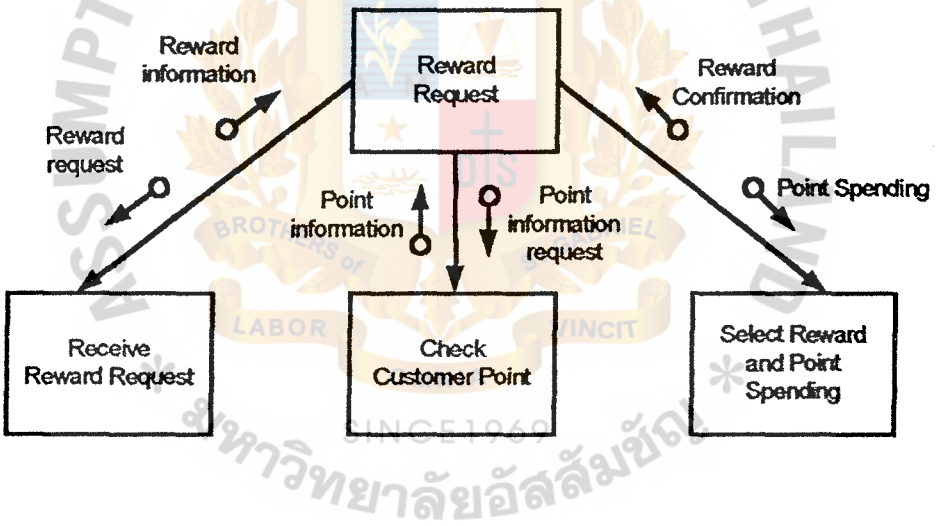


Figure C.4. Structure Chart of Reward Request.

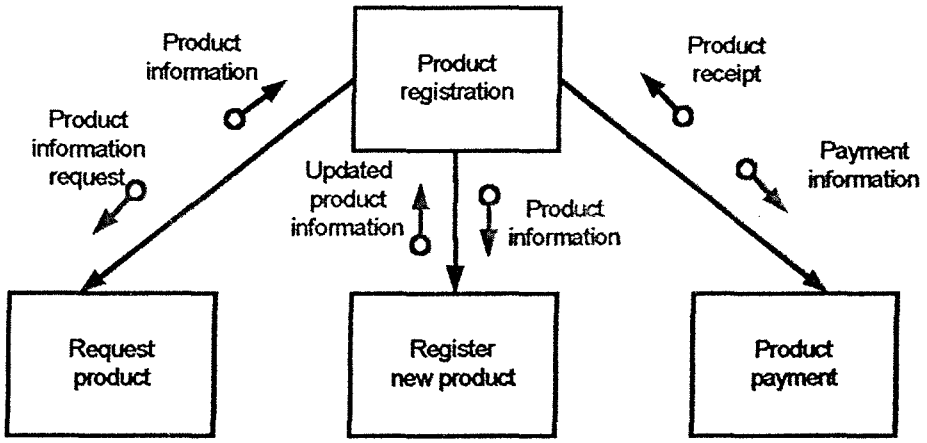


Figure C.5. Structure Chart of Product Registration.

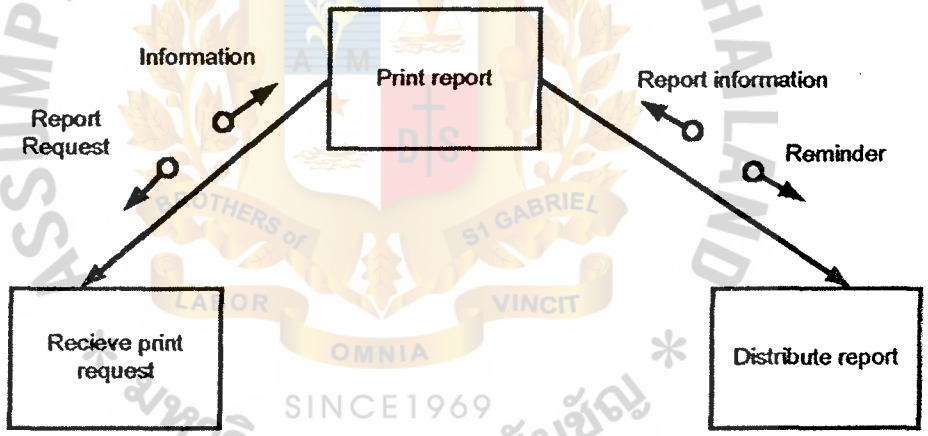


Figure C.6. Structure Chart of Print Report.

APPENDIX D

FEASIBILITY ANALYSIS

Table D.1. The Cost of the Candidate2, baht.

Cost items	Years				
	1	2	3	4	5
Hardware Cost :					
Computer Server Cost 1 Unit @ 40,000	8,000	8,000	8,000	8,000	8,000
Client Machine Cost 3 Units @ 30,000	18,000	18,000	18,000	18,000	18,000
Printer 1 Unit @ 20,400	4,080	4,080	4,080	4,080	4,080
UPS 1050 VA 1 Unit @ 3,500	700	700	700	700	700
Total Hardware Cost	30,780	30,780	30,780	30,780	30,780
Software Cost:					
Software Cost	45,000	45,000	45,000	45,000	45,000
Network Cost	16,000	16,000	16,000	16,000	16,000
Total Software Cost	61,000	61,000	61,000	61,000	61,000
Implementation Cost:					
Training Cost	45,000	-	-	-	-
Set up Cost	37,000	-	-	-	-
Total Implementation Cost	82,000	-	-	-	-
People-Ware Cost:					
System analysis 1 person @ 3 months @ 25,000	75,000	-	-	-	-
Programmer 1 person @ 2 months @ 22,000	44,000	-	-	-	-
Database Specialist 1 person @ 3 months @ 24,000	72,000	-	-	-	-
Network Specialist 1 person @ 2 months @ 24,000	48,000	-	-	-	-
Total People-Ware Cost	239,000	-	-	-	-
Total Development Cost	412,780	91,780	91,780	91,780	91,780
Operation Cost					
Maintenance Cost:					
Server Maintenance cost 1 set @ 45,000 per annual	45,000	49,500	54,450	59,895	65,885
Workstation Maintenance cost 3 sets @ 9,000 per annual	27,000	29,700	32,670	35,937	39,531
Software Maintenance cost 5,000 per annual	5,000	5,500	6,050	6,655	7,321
Total Maintenance Cost	77,000	84,700	93,170	102,487	112,737
People Ware Cost:					
Customer Service Manager 1 person @ 20,000	20,000	22,000	24,200	26,620	29,282
Supervisor 1 person @ 15,000	15,000	16,500	18,150	19,965	21,961.5
Front Officer 2 persons @ 8,000	16,000	17,600	19,360	21,296	23,426
Total Monthly Salary Cost	51,000	56,100	61,710	67,881	74,669.5
Total Annual Salary Cost	612,000	673,200	740,520	814,572	896,034
Miscellaneous Cost Per Annual					
Stationary	11,000	12,100	13,310	14,641	16,105
Office Supply	6,500	7,150	7,865	8,652	9,517
Utility	12,000	13,200	14,520	15,972	17,569
Miscellaneous	10,000	11,000	12,100	13,310	14,641
Total Miscellaneous Cost	39,500	43,450	47,795	52,575	57,832
Total Operating Cost	728,500	801,350	881,485	969,634	1066603
Total Computerized Cost	1141280	893130	973265	1061414	1158383

Table D.2. The Cost of the Candidate3, baht.

Cost items	Years				
	1	2	3	4	5
Hardware Cost :					
Computer Server Cost 1 Unit @ 40,000	8,000	8,000	8,000	8,000	8,000
Client Machine Cost 3 Units @ 30,000	18,000	18,000	18,000	18,000	18,000
Printer 1 Unit @ 20,400	4,080	4,080	4,080	4,080	4,080
UPS 1050 VA 1 Unit @ 3,500	700	700	700	700	700
Total Hardware Cost	30780	30780	30780	30780	30780
Software Cost:					
Software Package Cost	55,000	55,000	55,000	55,000	55,000
Network Cost	20,000	20,000	20,000	20,000	20,000
Total Software Cost	75,000	75,000	75,000	75,000	75,000
Implementation Cost:					
Training Cost	45,000	-	-	-	-
Set up Cost	30,000	-	-	-	-
Total Implementation Cost	75,000	-	-	-	-
People-Ware Cost:					
System analysis 1 person @ 3 months @ 35,000	105000	-	-	-	-
Programmer 1 person @ 2 months @ 24,000	48,000	-	-	-	-
Database Specialist 1 person @ 3 months @ 26,000	78,000	-	-	-	-
Network Specialist 1 person @ 2 months @ 26,000	52,000	-	-	-	-
Total People-Ware Cost	283,000	-	-	-	-
Total Development Cost	463,780	105780	105780	105780	105780
Maintenance Cost:					
Server Maintenance cost 1 set @ 60,000 per annual	60,000	66,000	72,600	79,860	87,846
Workstation Maintenance cost 3 sets @ 12,000 per annual	36,000	39,600	43,560	47,916	52,708
Software Maintenance cost 7,000 per annual	7,000	7,700	8,470	9,317	10,249
Total Maintenance Cost	103,000	113,300	124,630	137,093	150,803
People Ware Cost:					
Customer Service Manager 1 person @ 20,000	20,000	22,000	24,200	26,620	29,282
Supervisor 1 person @ 15,000	15,000	16,500	18,150	19,965	21,961.5
Front Officer 2 persons @ 8,000	16,000	17,600	19,360	21,296	23,426
Total Monthly Salary Cost	51,000	56,100	61,710	67,881	74,669.5
Total Annual Salary Cost	612,000	673,200	740,520	814,572	896,034
Miscellaneous Cost Per Annual					
Stationary	11,000	12,100	13,310	14,641	16,105
Office Supplier	6,500	7,150	7,865	8,652	9,517
Utility	12,000	13,200	14,520	15,972	17,569
Miscellaneous	10,000	11,000	12,100	13,310	14,641
Total Miscellaneous Cost	39,500	43,450	47,795	52,575	57,832
Total Operating Cost	754,500	829,950	912,945	1004240	1104669
Total Computerized Cost	1218280	935730	1018725	1110020	1210449

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

Benefit Item	Price
1. Personnel Reduction	120,000
Front Officer (10,000 per month)	192,000
Store Staff (2 persons @ 8,000 per month)	
2. Office Supplier & Miscellaneous cost reduction	6,500
Stationary (6,500 annual)	1,500
Office Supply (1,500 annual)	2,000
Utility (2,000 annual)	4,000
Miscellaneous (4,000 annual)	14,000
Total Office Supplier & Miscellaneous	
3. Elimination of the possible long run cost	120,000
Front Officer (10,000 per month)	192,000
Store Staff (2 persons @ 8,000 per month)	
Total Benefit	638,000

Table D.4. The Payback Period for the Candidate1, baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-286,780					
Operation & maintenance cost:		-705,000	-775,500	-853,050	-938,355	-1,032,195
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted costs (adjusted to present value):	-286,780	-629,565	-618,074	-607,372	-596,794	-585,255
Cumulative time-adjusted costs over lifetime:	-286,780	-916,345	-1,534,419	-2,141,790	-2,738,584	-3,323,838
Benefits derived from operation of new system:	0	875,000	1,150,000	1,250,000	1,415,000	1,575,000
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefit (current of present value):	0	781,375	916,550	890,000	899,940	893,025
Cumulative time-adjusted benefits over lifetime:	0	781,375	1,697,925	2,587,925	3,487,865	4,380,890
	0	1	2	3	4	5
Cumulative lifetime time-adjusted costs + benefits:	-286,780	-134,970	163,507	446,135	749,281	1,057,052

Table D.5. The Payback Period for the Candidate2, baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-412,780					
Operation & maintenance cost:		-728,500	-801,350	-881,485	-969,634	-1,066,603
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted costs (adjusted to present value):	-412,780	-650,551	-638,676	-627,617	-616,687	-604,764
Cumulative time-adjusted costs over lifetime:	-412,780	-1,063,331	-1,702,006	-2,329,624	-2,946,311	-3,551,075
Benefits derived from operation of new system:	0	875,000	1,150,000	1,250,000	1,415,000	1,575,000
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefit (current of present value):	0	781,375	916,550	890,000	899,940	893,025
Cumulative time-adjusted benefits over lifetime:	0	781,375	1,697,925	2,587,925	3,487,865	4,380,890
	0	1	2	3	4	5
Cumulative lifetime time-adjusted costs + benefits:	-412,780	-281,956	-4,081	258,301	541,554	829,815

Table D.6. The Payback Period for the Candidate3, baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-463,780					
Operation & maintenance cost:		-754,500	-829,950	-912,945	-1,004,240	-1,104,669
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted costs (adjusted to present value):	-463,780	-673,769	-661,470	-650,017	-638,697	-626,347
Cumulative time-adjusted costs over lifetime:	-463,780	-1,137,549	-1,799,019	-2,449,035	-3,087,732	-3,714,079
Benefits derived from operation of new system:	0	875,000	1,150,000	1,250,000	1,415,000	1,575,000
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefit (current of present value):	0	781,375	916,550	890,000	899,940	893,025
Cumulative time-adjusted benefits over lifetime:	0	781,375	1,697,925	2,587,925	3,487,865	4,380,890
	0	1	2	3	4	5
Cumulative lifetime time-adjusted costs + benefits:	-463,780	-356,174	-101,094	138,890	400,133	666,811

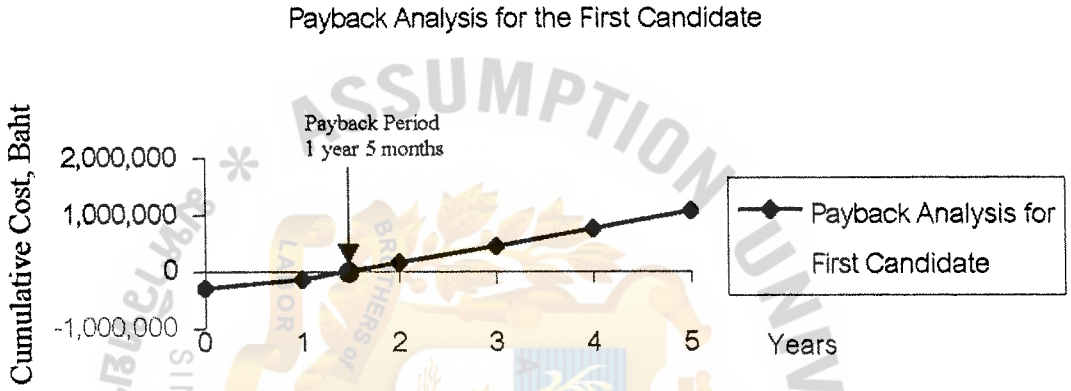


Figure D.1. Payback Period for Candidate 1.

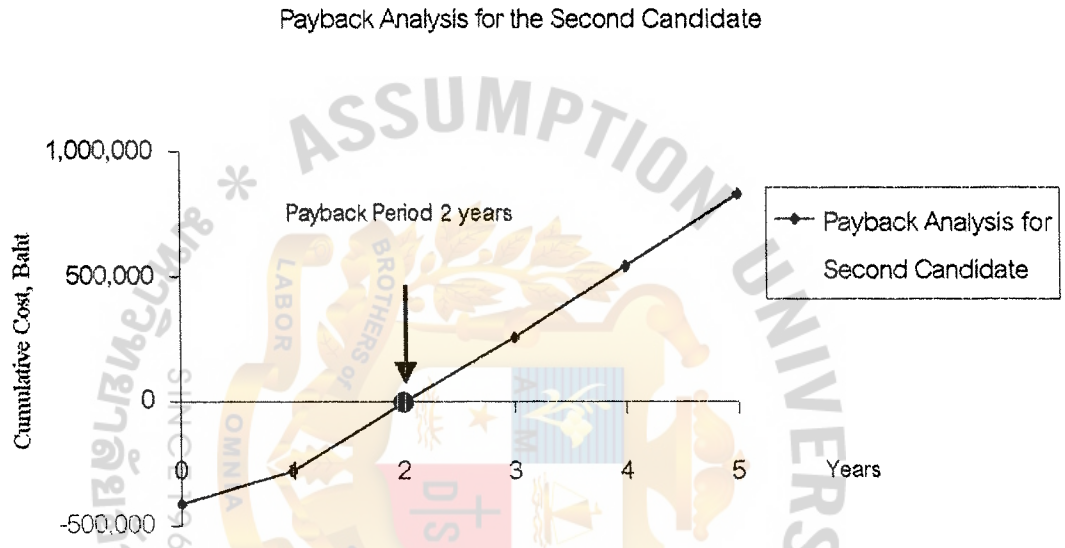


Figure D.2. Payback Period for Candidate 2.

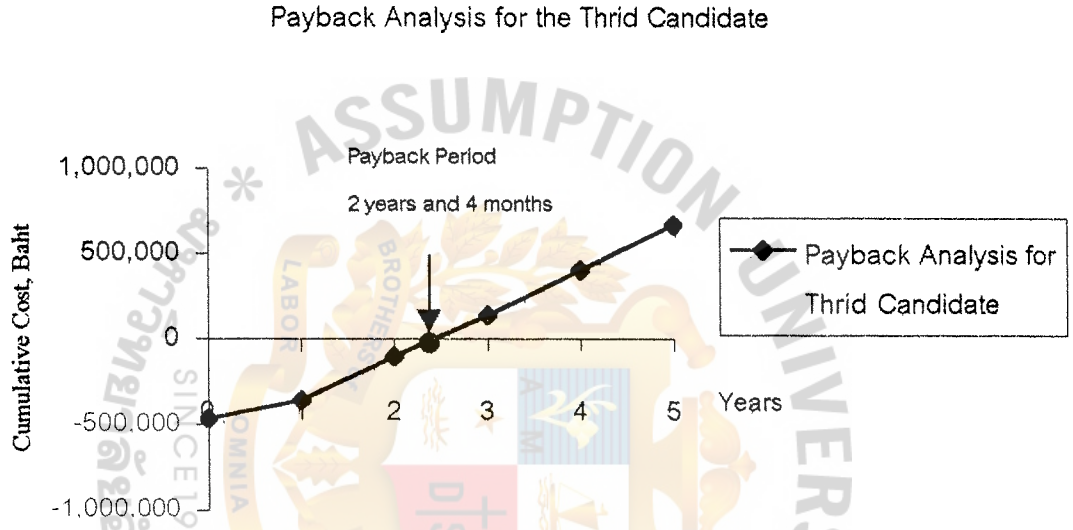


Figure D.3. Payback Period for Candidate 3.

Table D.7. Net Present Value for the Candidate1, baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Development cost:	-286,780						
Operation & maintenance cost:		-705,000	-775,500	-853,050	-938,355	-1,032,195	
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567	
Present value of annual costs:	-286,780	-629,565	-618,074	-607,372	-596,794	-585,255	
Total present value of lifetime costs:							-3,323,838
Benefits derived from operation of new system:	0	875,000	1,150,000	1,250,000	1,415,000	1,575,000	
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567	
Present value of annual benefits:	0	781,375	916,550	890,000	899,940	893,025	
Total present value of lifetime benefits:							4,380,890
NET PRESENT VALUE OF THIS ALTERNATIVE:							1,057,052

Table D.8. Net Present Value for the Candidate2, baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Development cost:	-412,780						
Operation & maintenance cost:		-728,500	-801,350	-881,485	-969,634	-1,066,603	
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567	
Present value of annual costs:	-412,780	-650,551	-638,676	-627,617	-616,687	-604,764	
Total present value of lifetime costs:							-3,551,075
Benefits derived from operation of new system:	0	875,000	1,150,000	1,250,000	1,415,000	1,575,000	
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567	
Present value of annual benefits:	0	781,375	916,550	890,000	899,940	893,025	
Total present value of lifetime benefits:							4,380,890
NET PRESENT VALUE OF THIS ALTERNATIVE:							829,815

Table D.9. Net Present Value for the Candidate3, baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Development cost:	-463,780						
Operation & maintenance cost:		-754,500	-829,950	-912,945	-1,004,240	-1,104,669	
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567	
Present value of annual costs:	-463,780	-673,769	-661,470	-650,017	-638,697	-626,347	
Total present value of lifetime costs:							-3,714,079
Benefits derived from operation of new system:	0	875,000	1,150,000	1,250,000	1,415,000	1,575,000	
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567	
Present value of annual benefits:	0	781,375	916,550	890,000	899,940	893,025	
Total present value of lifetime benefits:							4,380,890
NET PRESENT VALUE OF THIS ALTERNATIVE:							666,811

APPENDIX E

USER INTERFACE DESIGN

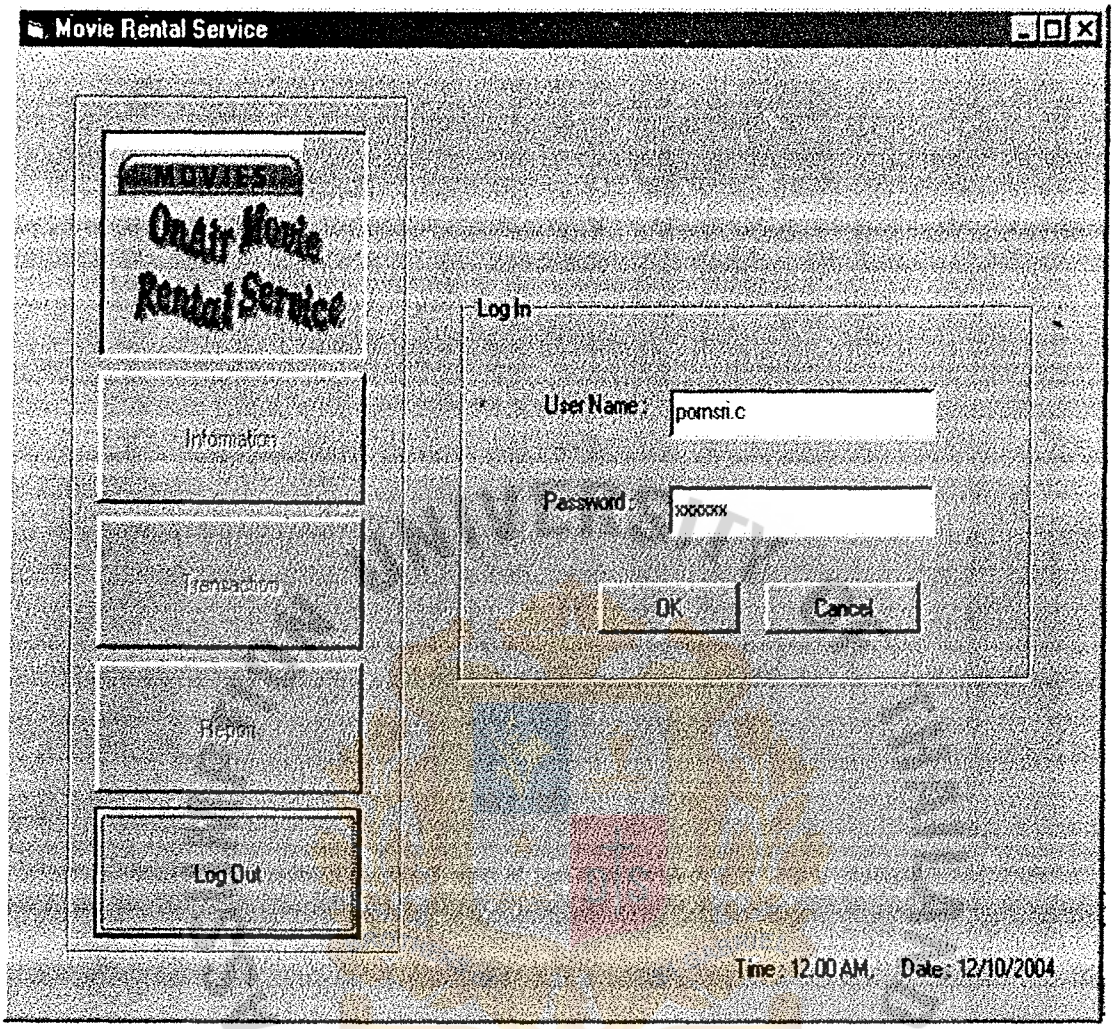


Figure E.1. Interface Design for Log-in Screen.

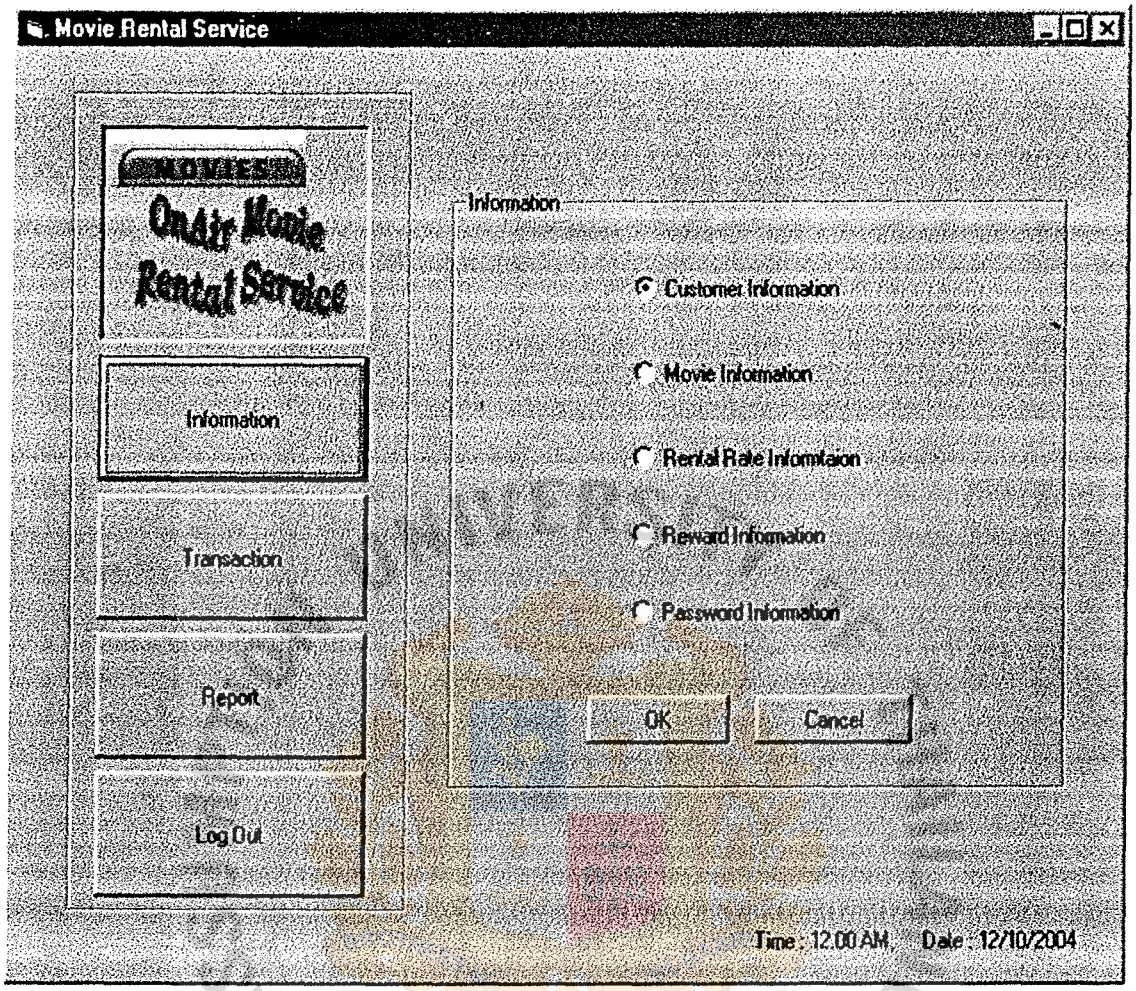


Figure E.2. Interface Design for Information Screen.

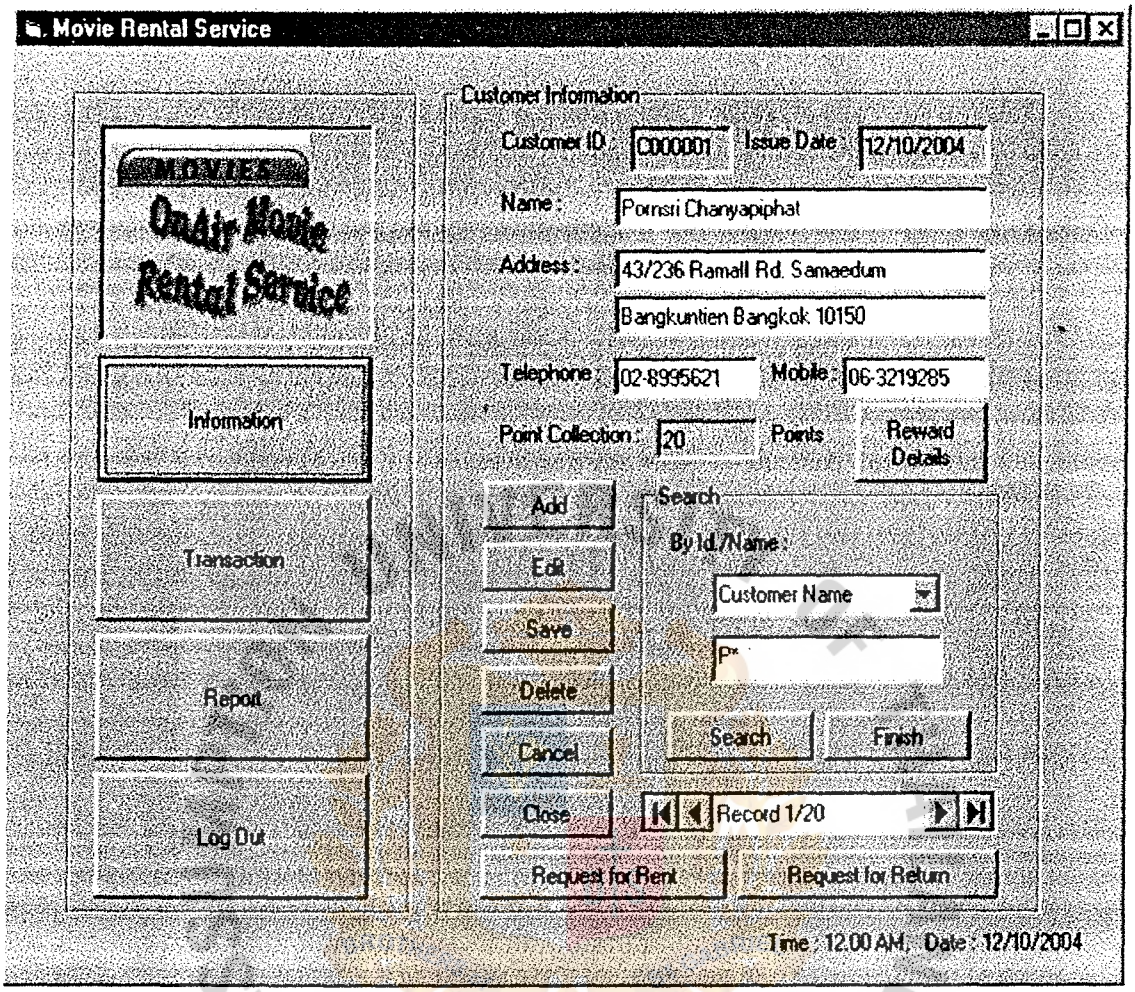


Figure E.3. Interface Design for Customer Information Screen.

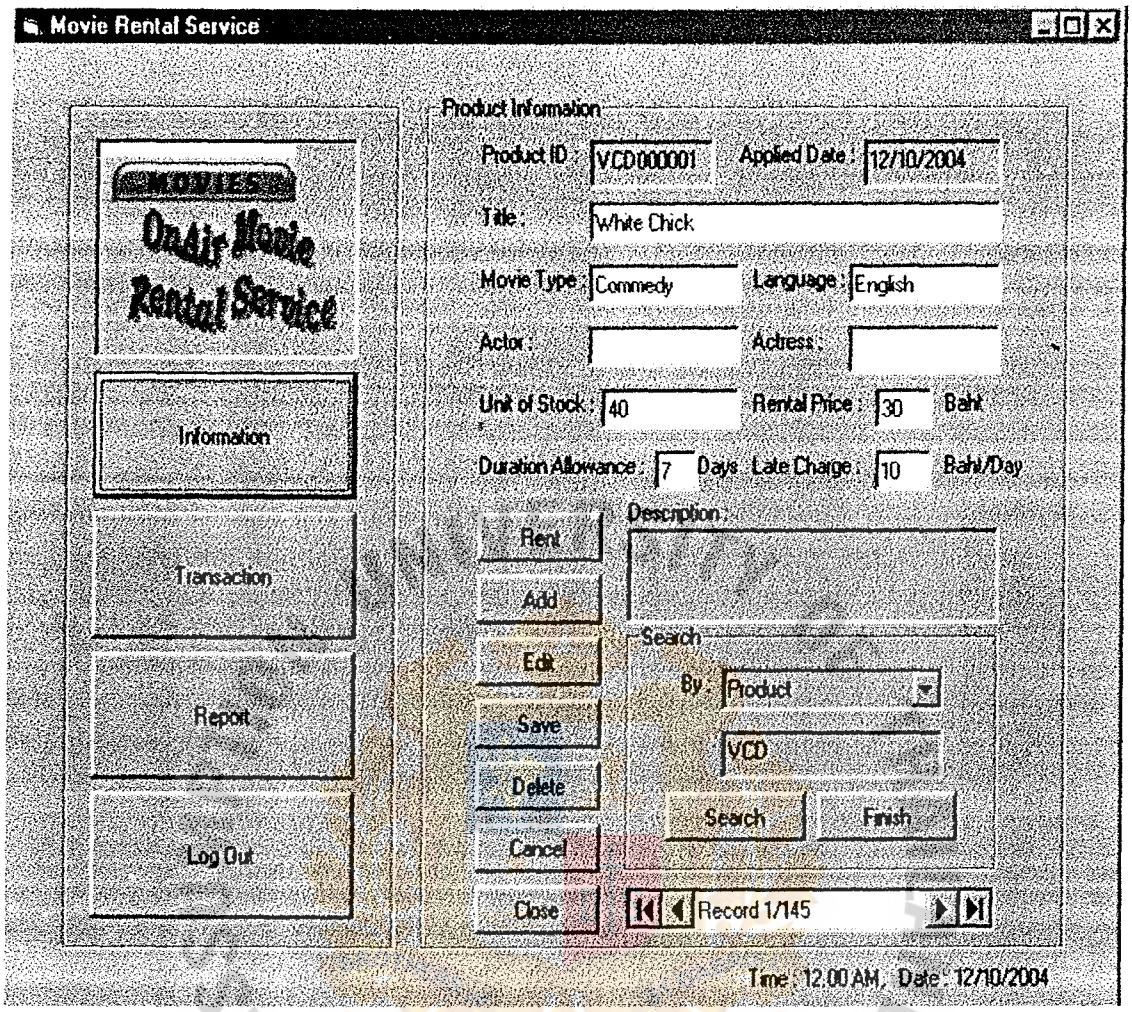


Figure E.4. Interface Design for Movie Information Screen.

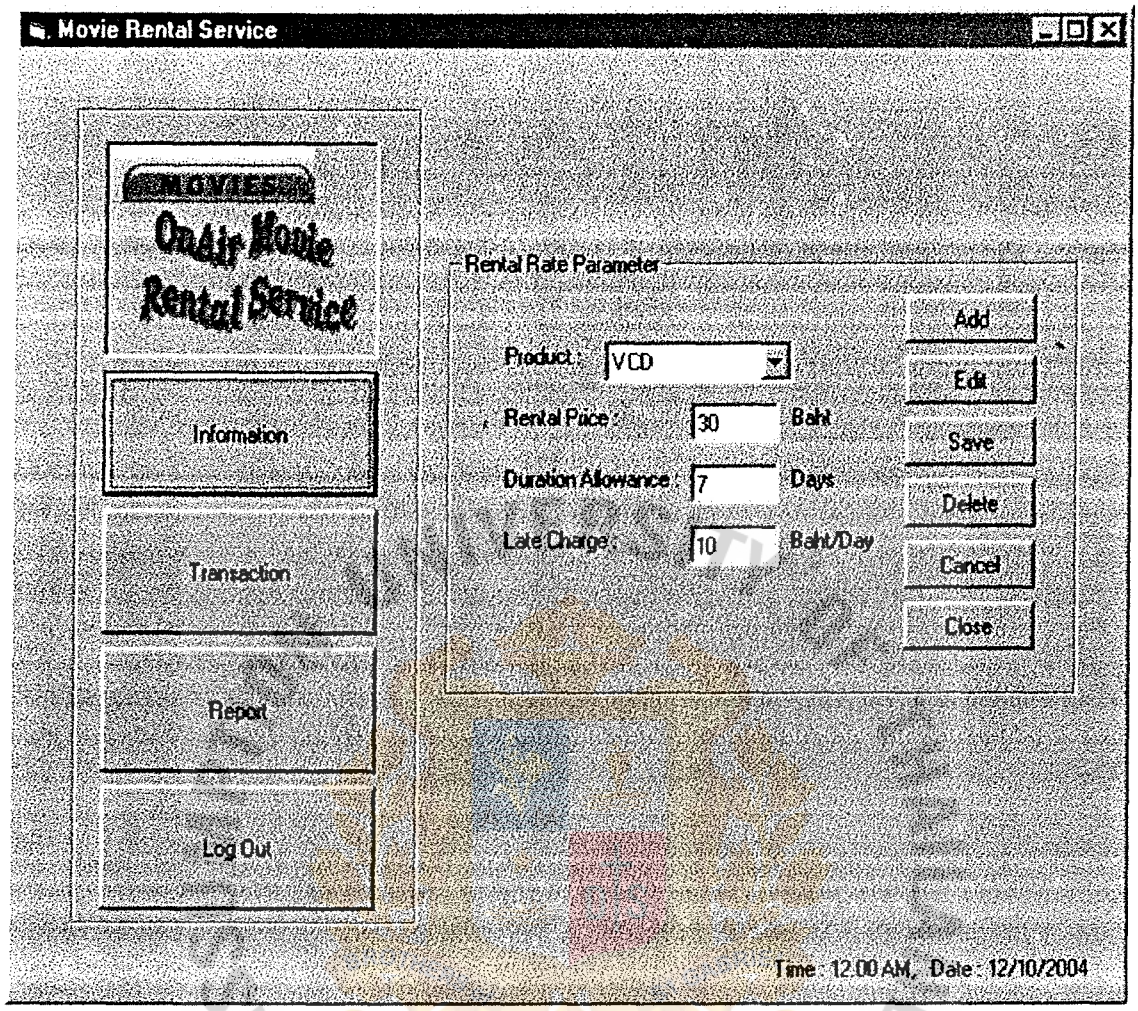


Figure E.5. Interface Design for Rental Rate Information Screen.

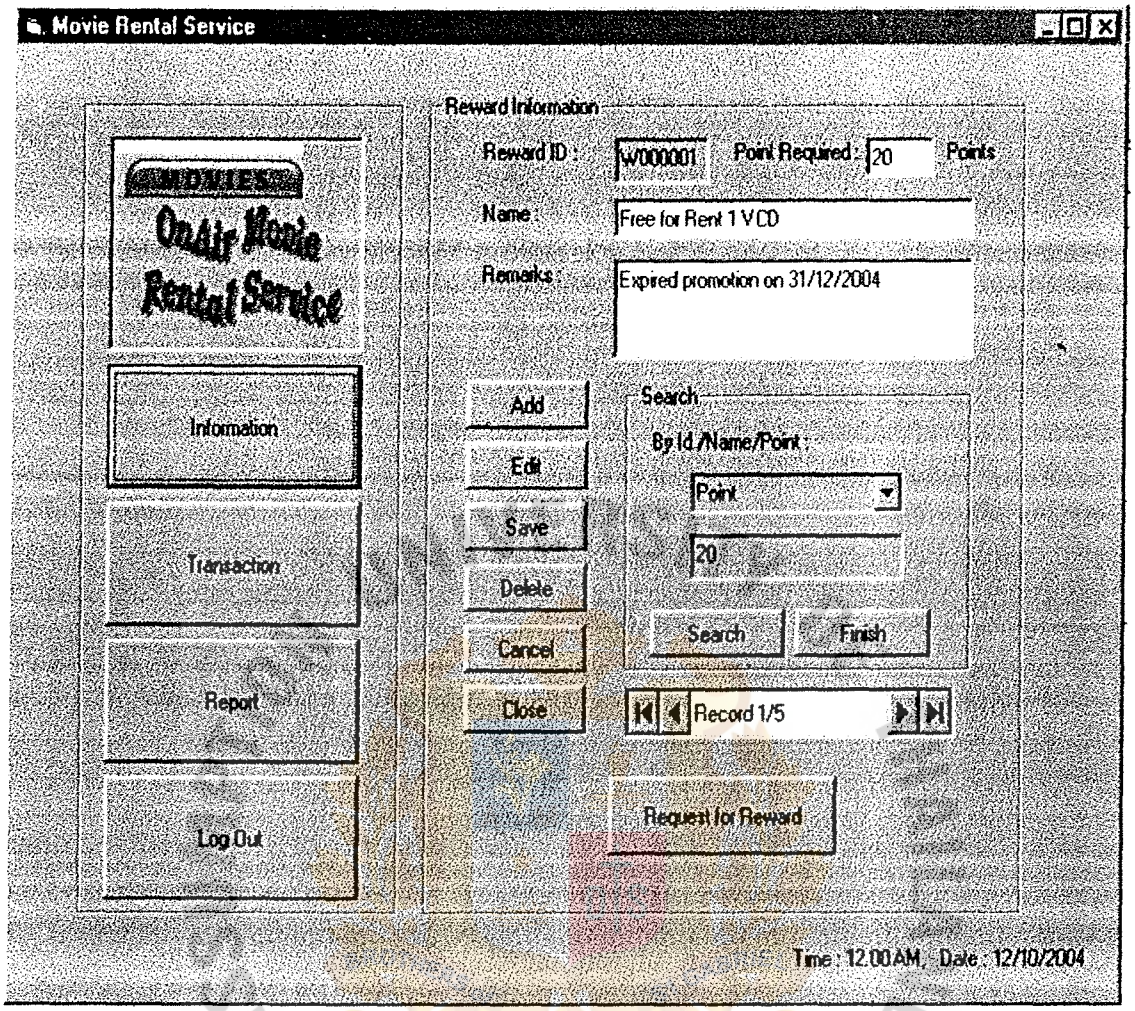


Figure E.6. Interface Design for Reward Information Screen.

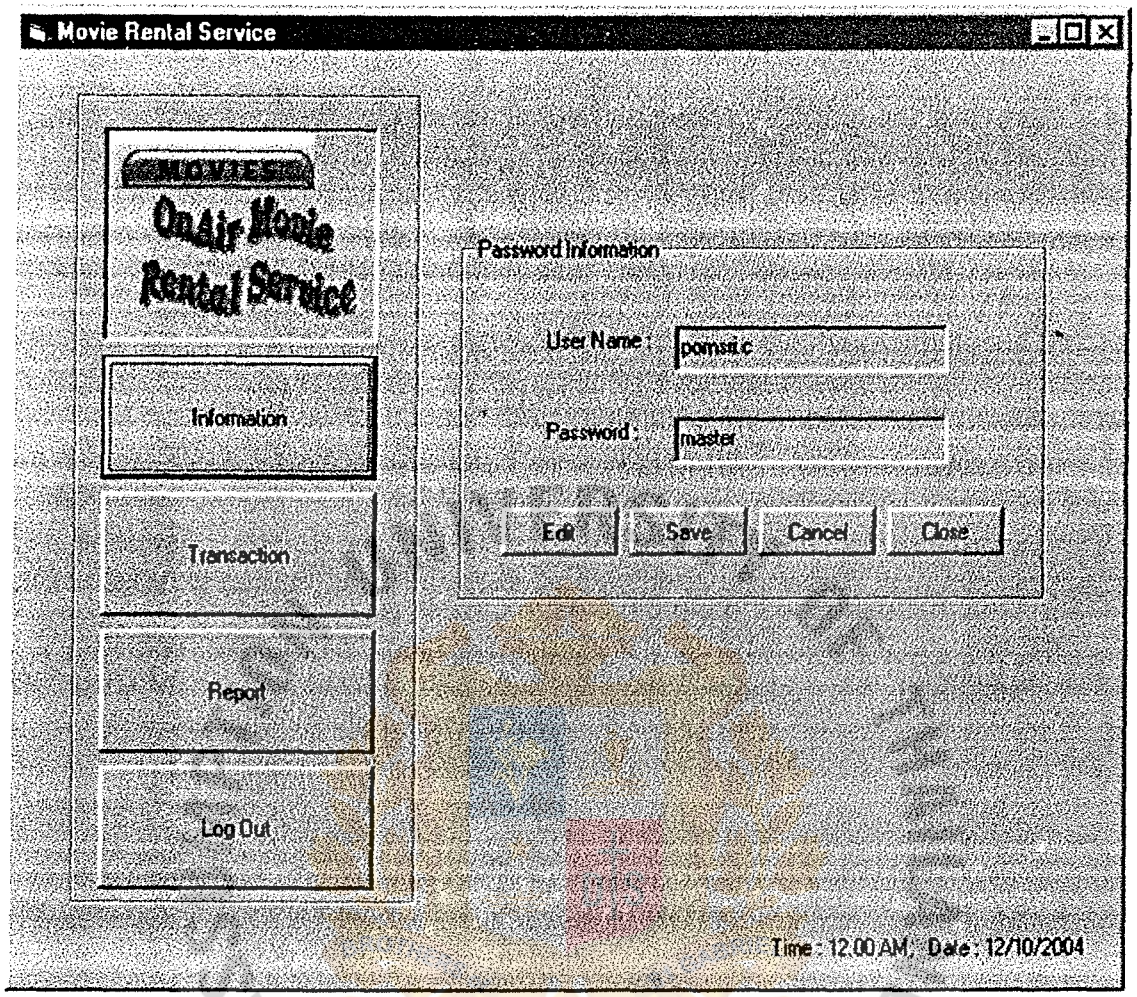


Figure E.7. Interface Design for Password Information Screen.

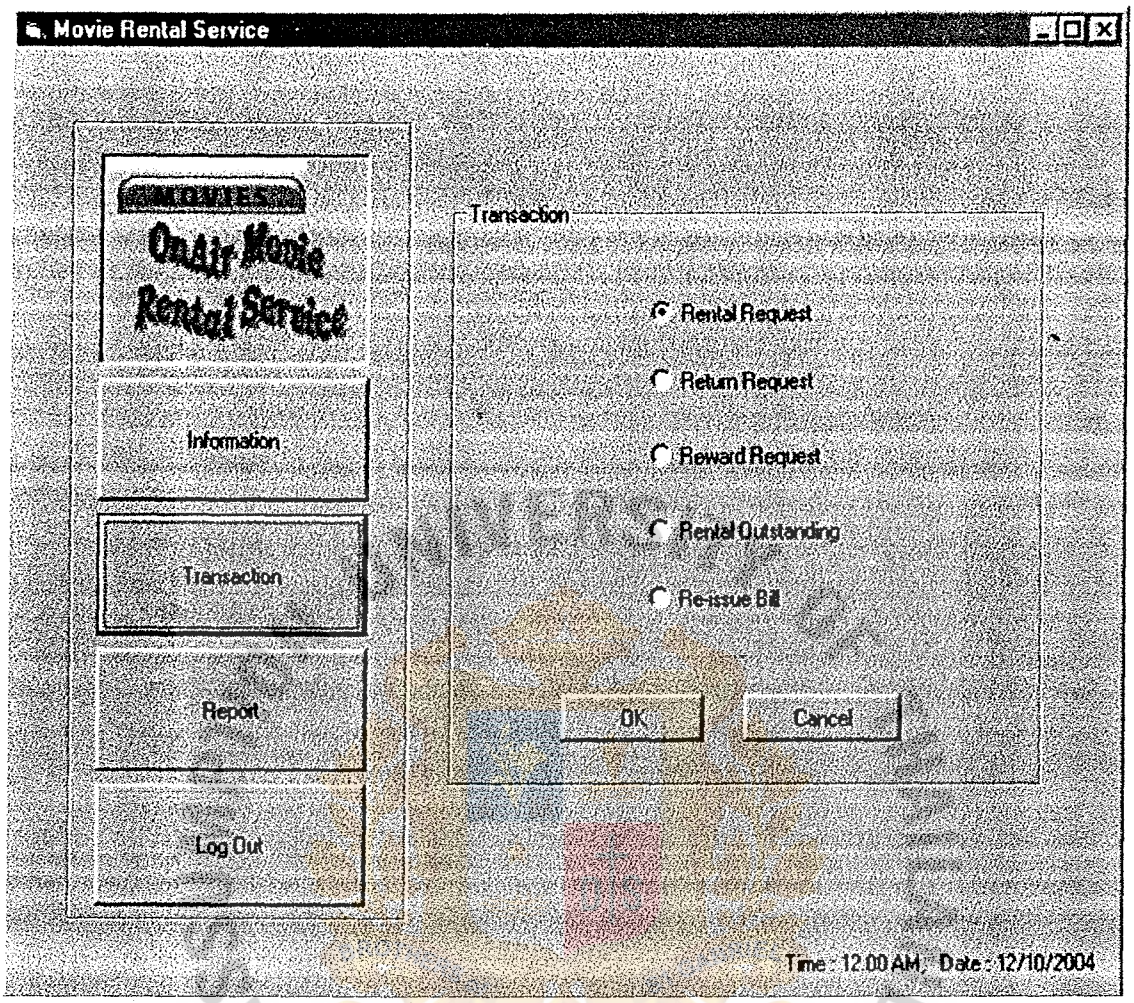


Figure E.8. Interface Design for Transaction Screen.

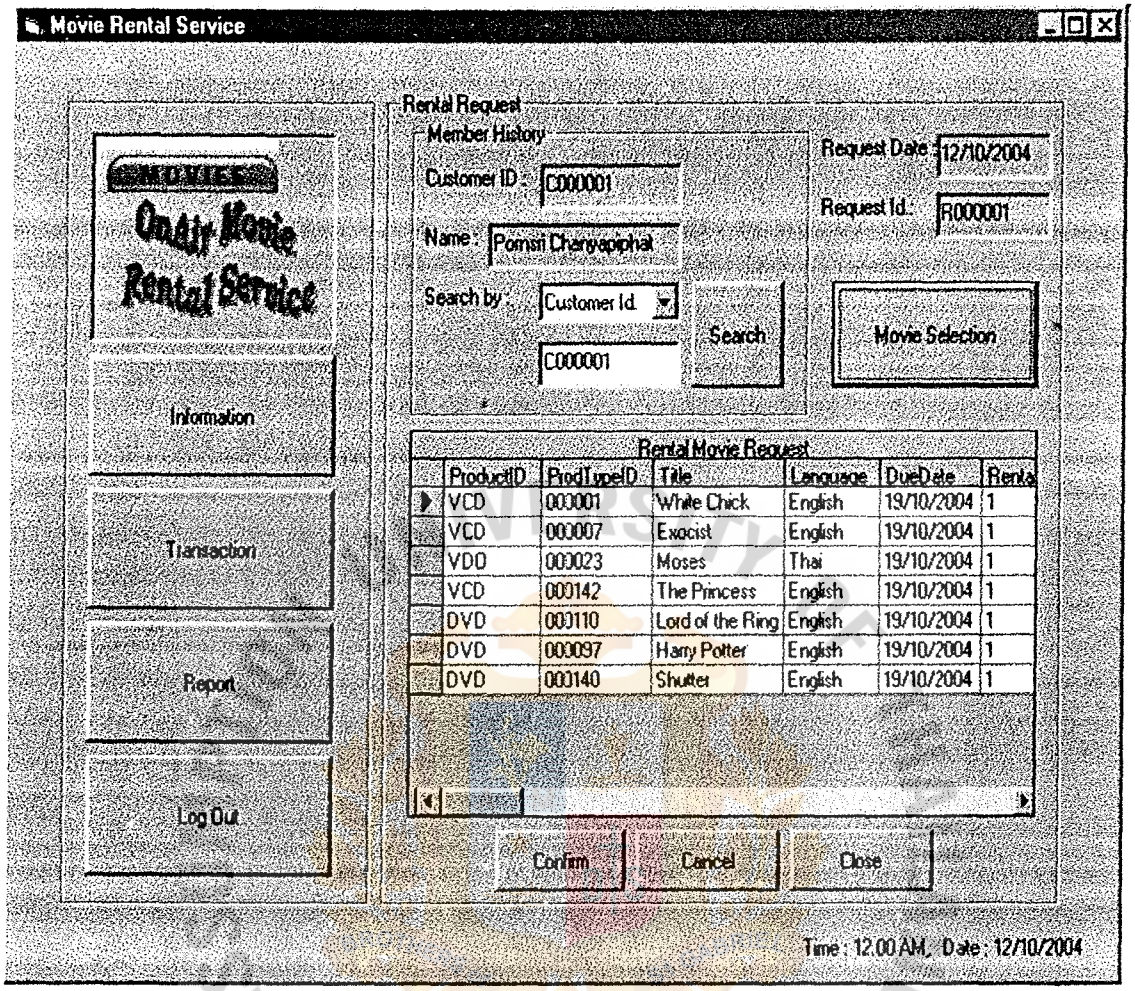


Figure E.9. Interface Design for Rental Request Screen.

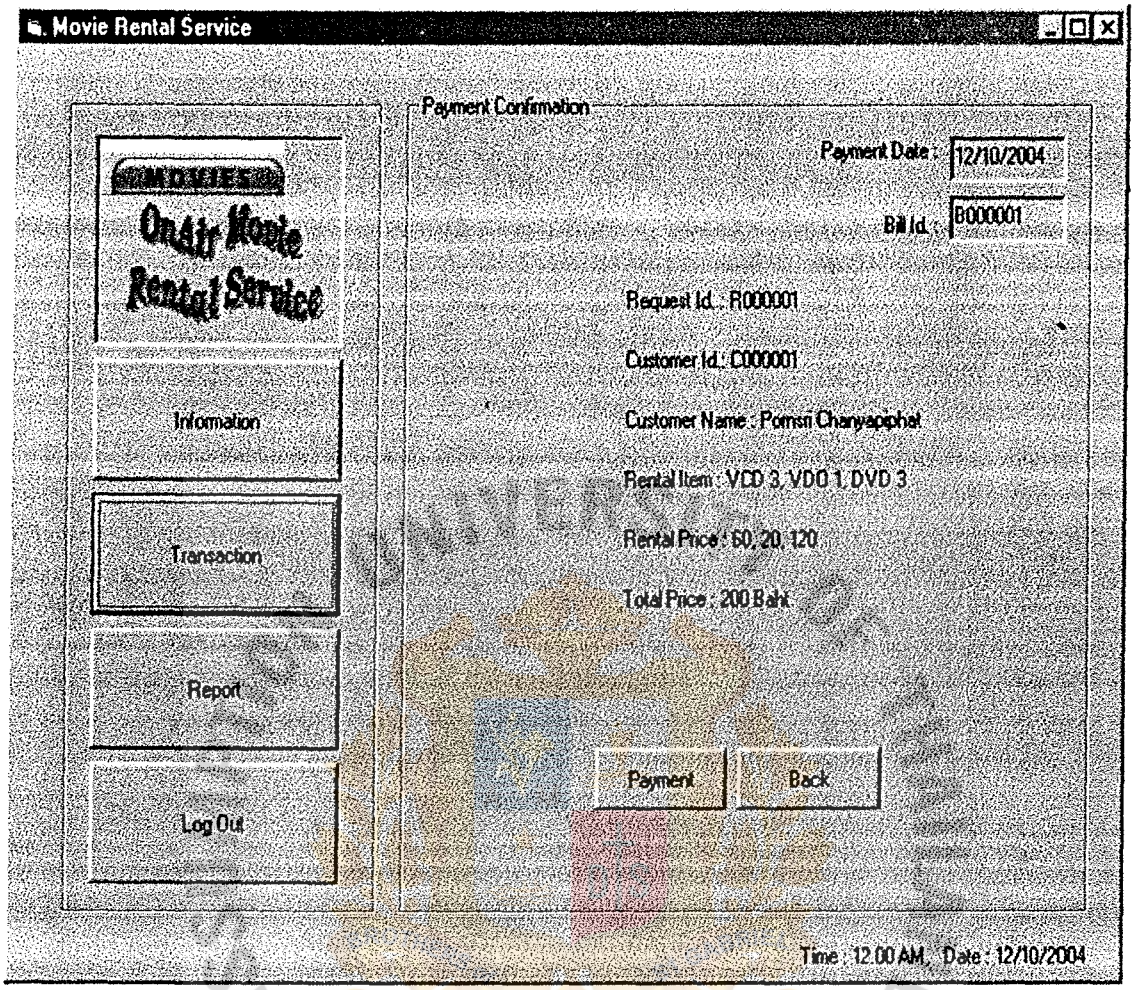


Figure E.10. Interface Design for Bill Payment Screen.

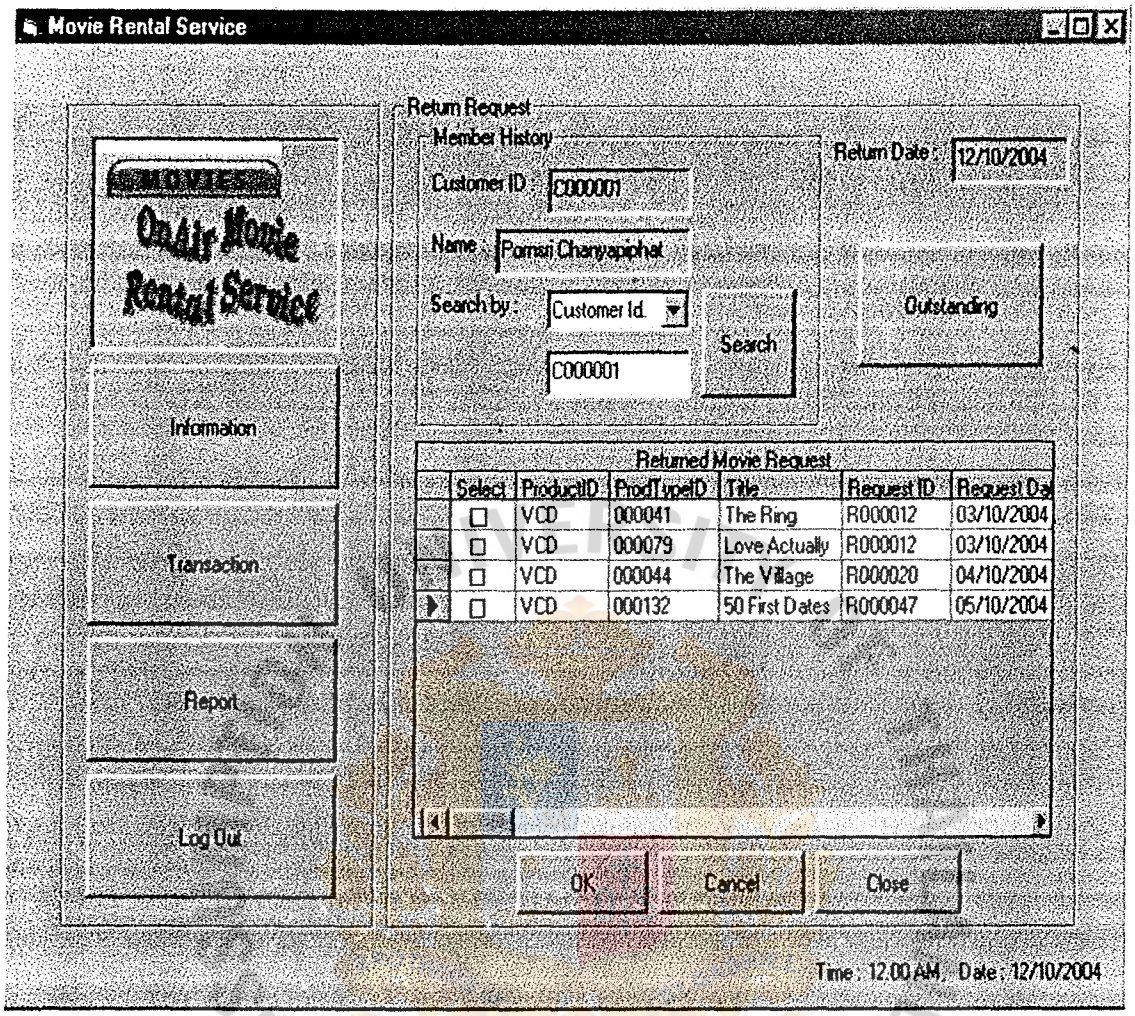


Figure E.11. Interface Design for Return Request Screen.

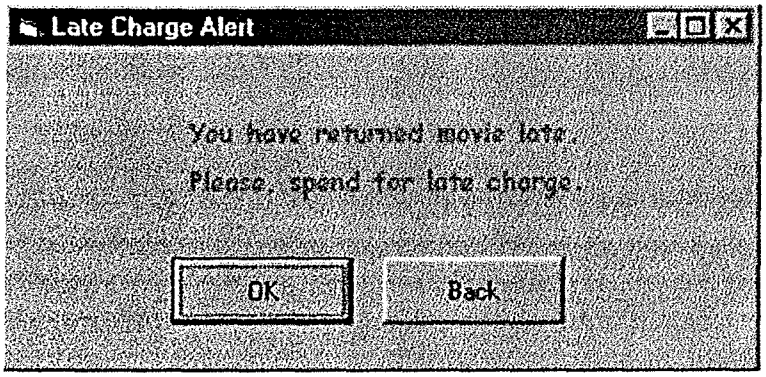


Figure E.12. Interface Design for Late Charge Alert.

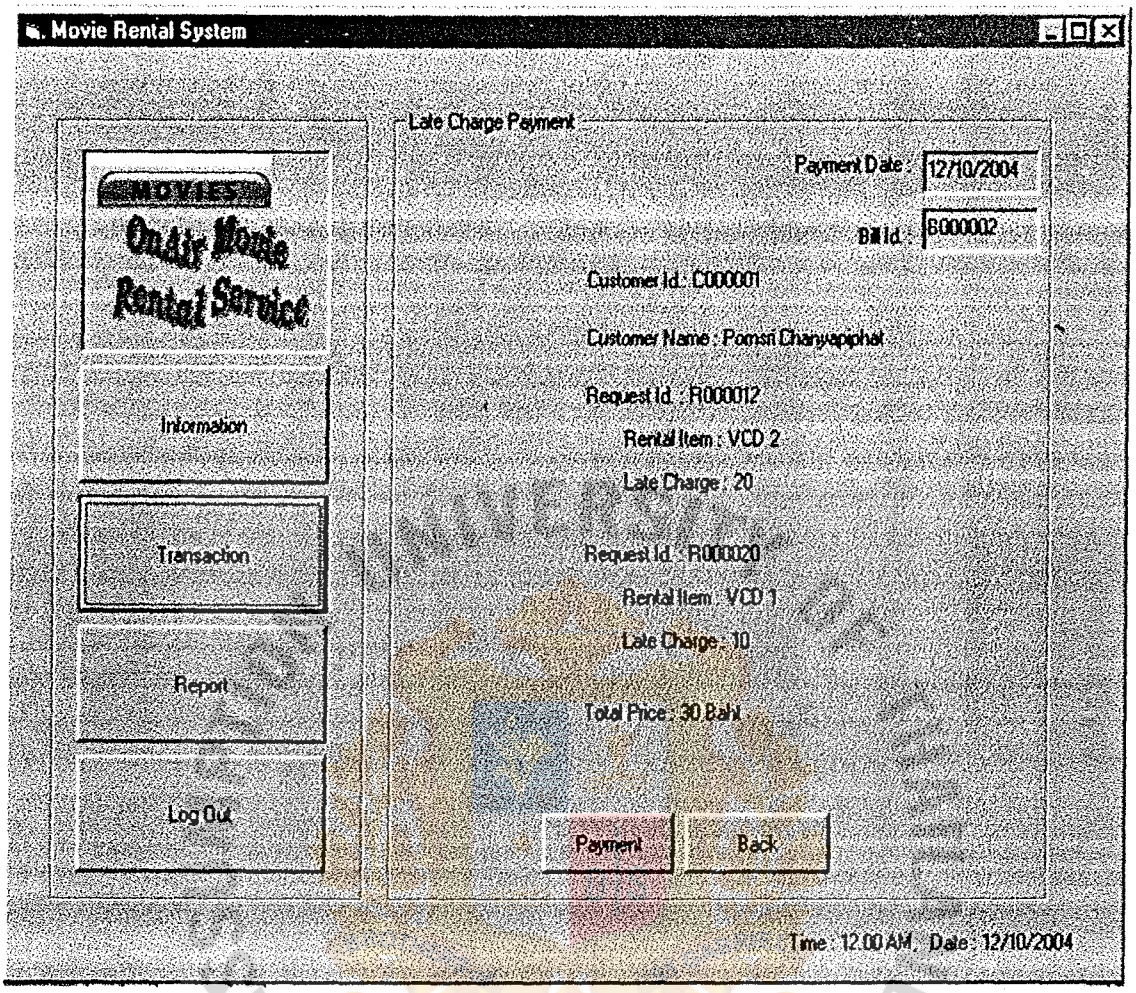


Figure E.13. Interface Design for Late Charge Payment Screen.

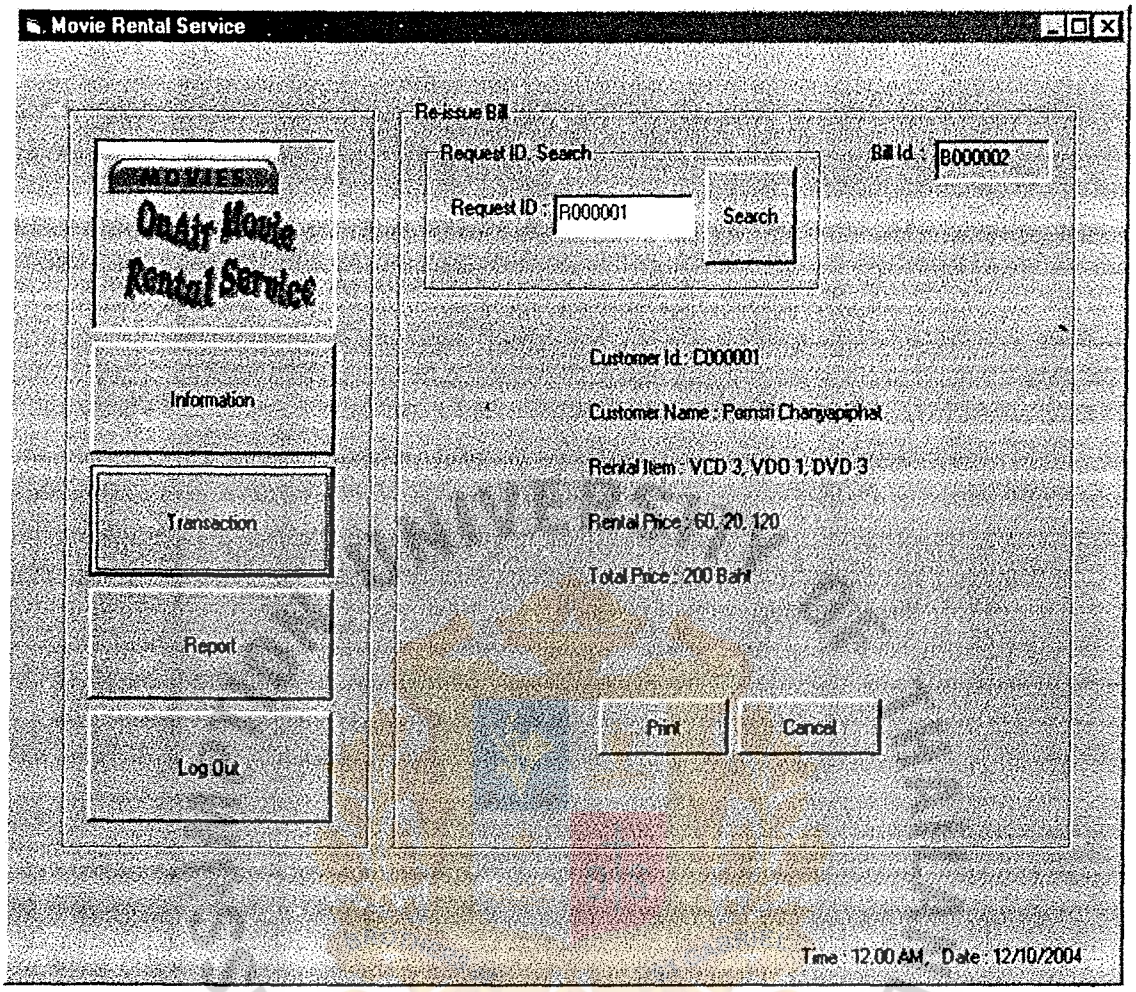


Figure E.14. Interface Design for Re-issue Bill Screen.

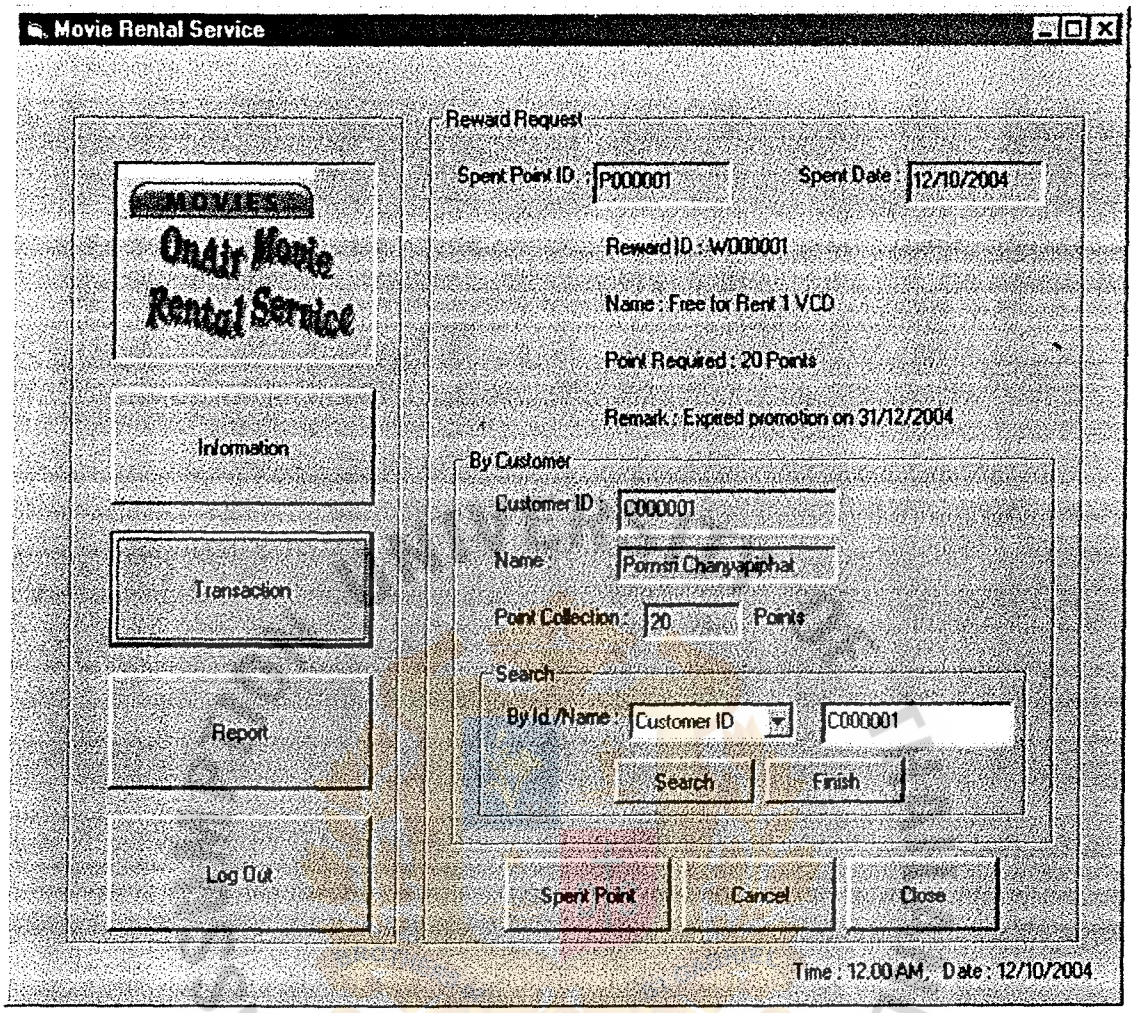


Figure E.15. Interface Design for Reward Request Screen.

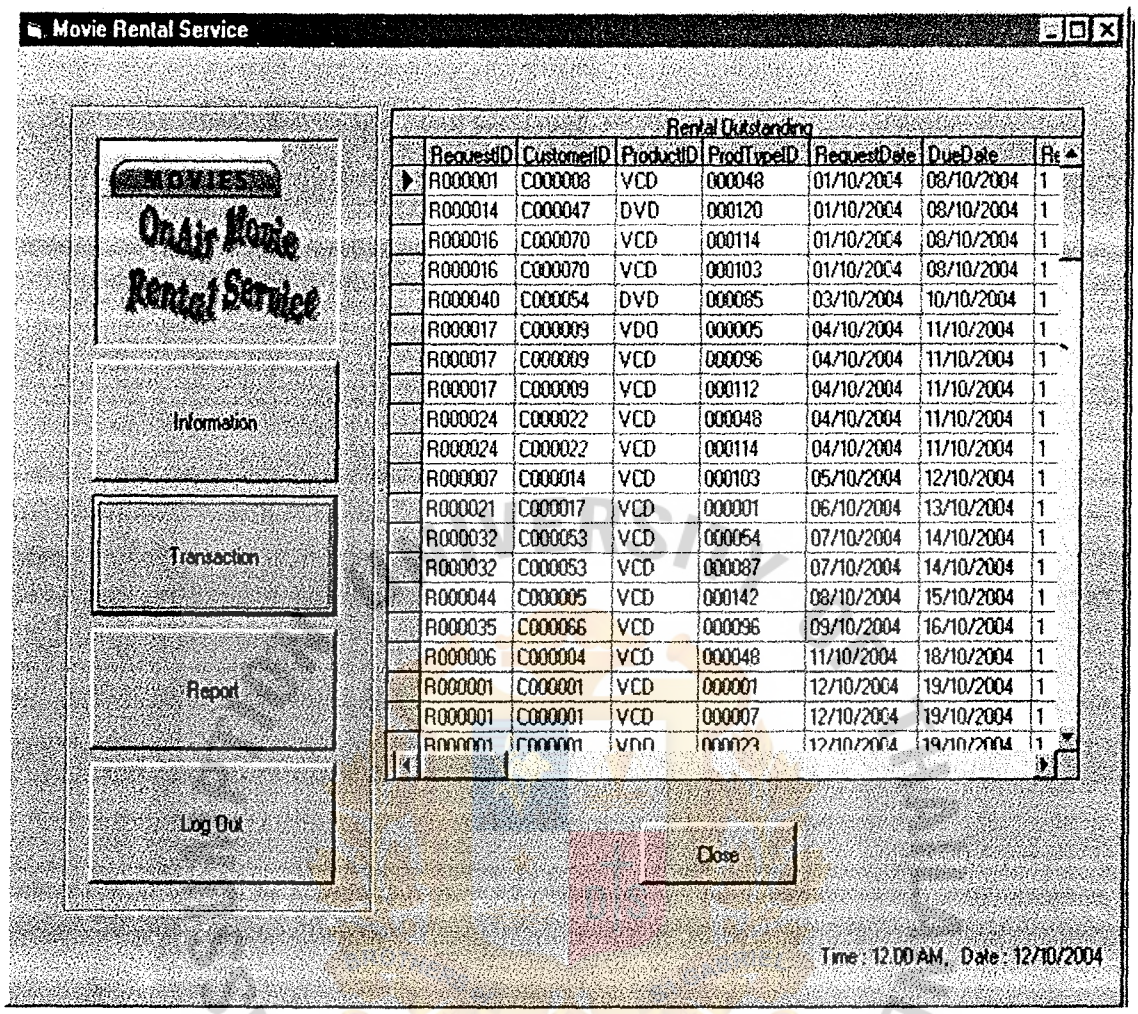


Figure E.16. Interface Design for Rental Outstanding Screen.

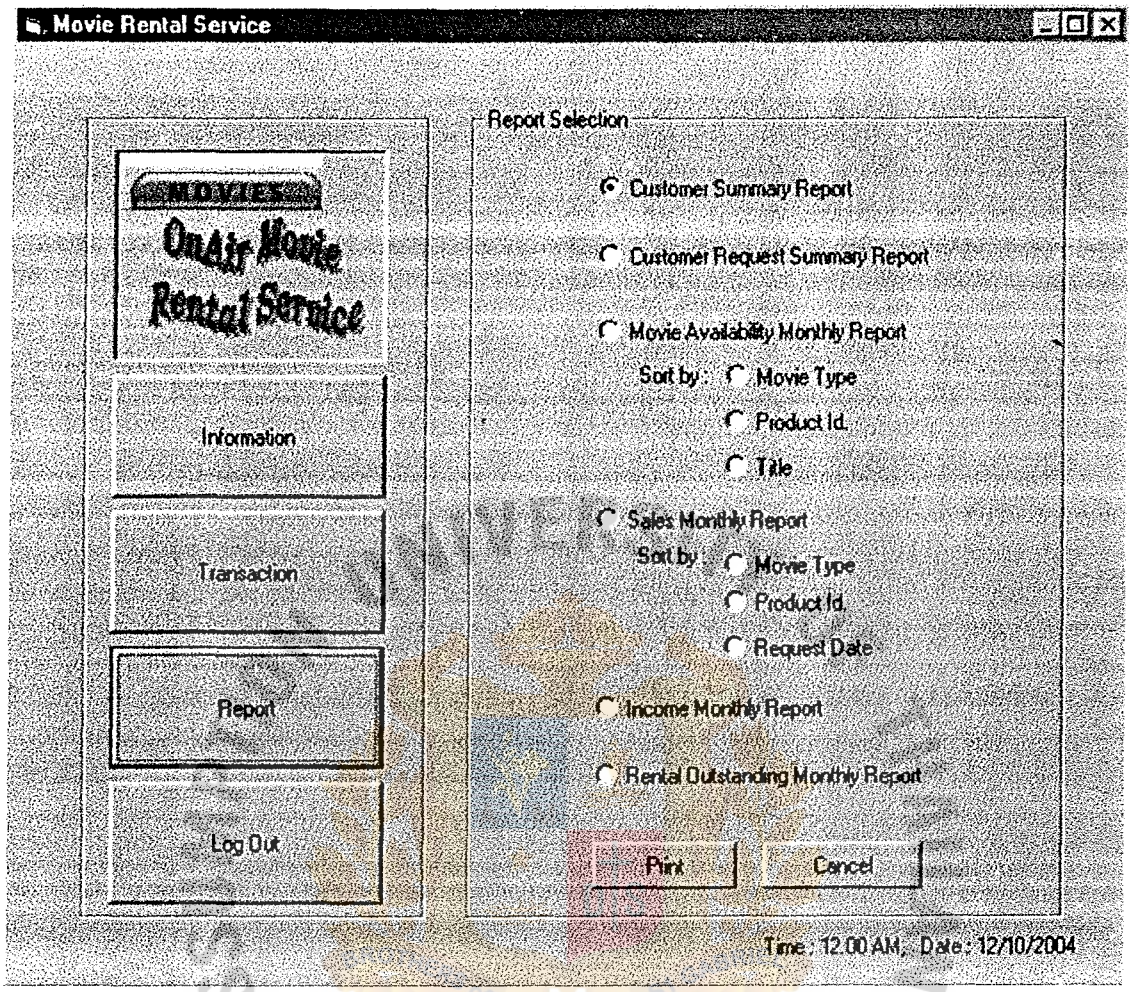


Figure E.17. Interface Design for Report Selection Screen.

APPENDIX F

REPORT DESIGN

Customer Summary Report

Date : 01/08/2004 to 28/08/2004

Print Date : 12/10/2004

Customer Id.	Customer name	Telephone	Mobile	Issued Date	Reward Point
C000001	Pomsri Chanyapiphat	02-8995621	06-3219285	02/08/2004	28
C000002	Alongkorn Chunjittra	02-8945285	01-6584569	09/08/2004	40
C000003	Tanakool Vanisomkul	02-2241989	06-3219350	09/08/2004	48
C000004	Methin Krailertrat	02-2915847	01-6217683	10/08/2004	70
C000005	Supreeya Thaitawat	02-7584562	01-8425698	12/08/2004	80
C000006	Chuthanat Iamkased	02-2547836	01-5742258	12/08/2004	65
C000007	Boonrit Sriruang	02-2485274	01-5236475	12/08/2004	68
C000008	Ratirat Vanisormkul	02-6290337	01-7293256	13/08/2004	25
C000009	Kusol Pholjaroen	02-6655233	06-5247523	14/08/2004	72
C000010	Chompoonuch Sae-U	02-2224565	05-5621425	15/08/2004	124
C000011	Rungrat Sripreg	02-6254147	01-3652145	15/08/2004	110
C000012	Thanyalak Srisang	02-7852145	01-6521453	16/08/2004	51
C000013	Nuntawan Chanyapet	02-4158416	01-4125362	17/08/2004	42
C000014	Monchai Medtra	02-4156514	01-3038782	19/08/2004	85
C000015	Sudawan Sukjai	02-2221023	01-9586324	21/08/2004	20
C000016	Jennifer Deelert	02-3321452	01-5632145	22/08/2004	40
C000017	Nunthiya Saenaner	02-6254123	01-8412547	24/08/2004	32
C000018	Mana Kangwan	02-4412563	06-8563288	26/08/2004	12
C000019	Nuntaka Chumhawan	02-8972563	01-9586321	26/08/2004	28
C000020	Manop Rakdee	02-2125412	07-2563147	27/08/2004	21
C000021	Nunwan Deefar	02-4152365	01-5632536	27/08/2004	25
C000022	Kunnika Srisawang	02-6292563	01-2536985	28/08/2004	12

Figure F.1. Customer Summary Report.

Customer Request Summary Report

Date : 12/10/2004 to 12/10/2004

Print Date : 12/10/2004

Request Date	Customer Id.	Request Id.	Product Id.	Rental Item	Rental Price
12/10/2004	C000001	R000001	VCD000001	1	30
			VCD000007	1	30
12/10/2004	C000012	R000002	VDO000023	1	20
			DVD000097	1	40
			DVD000110	1	40
			DVD000140	1	40
12/10/2004	C000020	R000003	VCD000142	1	30
			DVD000014	1	40
			DVD000050	1	40
			DVD000011	1	40
			DVD000025	1	40
12/10/2004	C000004	R000004	VCD000001	1	30
			VCD000007	1	30
12/10/2004	C000015	R000005	VDO000023	1	20
			DVD000097	1	40
			DVD000110	1	40
12/10/2004	C000022	R000006	VCD000142	1	30
			DVD000014	1	40
			DVD000050	1	40
			DVD000011	1	40
			Total	20	700

Figure F.2. Customer Request Summary Report.

Movie Availability Monthly Report

Month : October, 2004

Print Date : 31/10/2004

Product Id.	Movie Type	Product Type Id.	Title	Unit of Stock
VCD	Action	000001	xxxxxxxxxxxxxxxxxxxx	54
		000004	xxxxxxxxxxxxxxxxxxxx	32
		000008	xxxxxxxxxxxxxxxxxxxx	12
		000009	xxxxxxxxxxxxxxxxxxxx	10
		000011	xxxxxxxxxxxxxxxxxxxx	29
		000024	xxxxxxxxxxxxxxxxxxxx	14
		000025	xxxxxxxxxxxxxxxxxxxx	25
		000031	xxxxxxxxxxxxxxxxxxxx	40
VCD	Cartoon	000003	xxxxxxxxxxxxxxxxxxxx	39
		000005	xxxxxxxxxxxxxxxxxxxx	39
		000007	xxxxxxxxxxxxxxxxxxxx	39
		000010	xxxxxxxxxxxxxxxxxxxx	39
		000013	xxxxxxxxxxxxxxxxxxxx	39
		000015	xxxxxxxxxxxxxxxxxxxx	39
		000017	xxxxxxxxxxxxxxxxxxxx	39
VCD	Commedy	000012	xxxxxxxxxxxxxxxxxxxx	54
		000016	xxxxxxxxxxxxxxxxxxxx	39
		000020	xxxxxxxxxxxxxxxxxxxx	39
		000022	xxxxxxxxxxxxxxxxxxxx	39
		000026	xxxxxxxxxxxxxxxxxxxx	39
VDO	Action	000012	xxxxxxxxxxxxxxxxxxxx	54
		000016	xxxxxxxxxxxxxxxxxxxx	39

Figure F.3. Movie Availability Monthly Report.

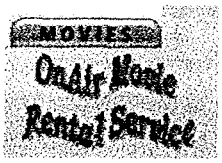
Sales Monthly Report

Month : October, 2004

Print Date : 31/10/2004

Request Date	Product Id.	Movie Type	Title	Rental Item
01/10/2004	VCD000001	Action	xxxxxxxxxxxxxxxxxxx	12
	VCD000040	Cartoon	xxxxxxxxxxxxxxxxxxx	24
	VCD000020	Cartoon	xxxxxxxxxxxxxxxxxxx	25
	VCD000004	Action	xxxxxxxxxxxxxxxxxxx	27
	VCD000022	Comedy	xxxxxxxxxxxxxxxxxxx	15
	VCD000009	Action	xxxxxxxxxxxxxxxxxxx	10
	VCD000033	Action	xxxxxxxxxxxxxxxxxxx	12
	VCD000036	Comedy	xxxxxxxxxxxxxxxxxxx	20
	VDO000026	Action	xxxxxxxxxxxxxxxxxxx	14
	VDO000024	Action	xxxxxxxxxxxxxxxxxxx	12
	VDO000012	Comedy	xxxxxxxxxxxxxxxxxxx	09
	VDO000016	Action	xxxxxxxxxxxxxxxxxxx	08
	DVD000014	Action	xxxxxxxxxxxxxxxxxxx	10
	DVD000039	Action	xxxxxxxxxxxxxxxxxxx	08
	DVD000010	Action	xxxxxxxxxxxxxxxxxxx	06
02/10/2004	VCD000001	Comedy	xxxxxxxxxxxxxxxxxxx	06
	VCD000001	Action	xxxxxxxxxxxxxxxxxxx	12
	VCD000001	Action	xxxxxxxxxxxxxxxxxxx	10
	VDO000001	Comedy	xxxxxxxxxxxxxxxxxxx	09
	VDO000001	Action	xxxxxxxxxxxxxxxxxxx	07
	DVD000001	Action	xxxxxxxxxxxxxxxxxxx	10
	DVD000001	Action	xxxxxxxxxxxxxxxxxxx	21

Figure F.4. Sales Monthly Report.



Income Monthly Report

Month : October, 2004

Print Date : 31/10/2004

Payment Date	Bill Id.	Payment Amount
01/10/2004	B000001	120
	B000002	80
	B000003	110
	B000004	90
	Total	**400**
02/10/2004	B000001	60
	B000002	60
	B000003	40
	B000004	80
	B000005	120
	B000006	40
	B000007	80
	B000008	110
	B000009	60
	Total	**650**
03/10/2004	B000001	90
	B000001	80
	B000001	120
	Total	**290**
04/10/2004	B000001	40
	B000001	80
	B000001	90
	Total	**210**

Figure F.5. Income Monthly Report.

Rental Outstanding Monthly Report

Month : October, 2004

Print Date : 31/10/2004

Request Date	Request Id.	Customer Id.	Product Id.	Title	Due Date	Late Charge
01/10/2004	R000007	C000009	VDC000025	xxxxxxxxxxx	08/10/2004	230
			VDC000124	xxxxxxxxxxx	08/10/2004	230
			DVD000075	xxxxxxxxxxx	08/10/2004	230
			DVD000062	xxxxxxxxxxx	08/10/2004	230
05/10/2004	R000015	C000016	VDC000005	xxxxxxxxxxx	12/10/2004	190
			VDC000009	xxxxxxxxxxx	12/10/2004	190
09/10/2004	R000060	C000020	DVD000015	xxxxxxxxxxx	16/10/2004	150
10/10/2004	R000005	C000012	VDC000005	xxxxxxxxxxx	17/10/2004	140
			VDC000016	xxxxxxxxxxx	17/10/2004	140
			VDO000045	xxxxxxxxxxx	17/10/2004	140
12/10/2004	R000008	C000010	VDC000112	xxxxxxxxxxx	19/10/2004	120
			VDC000008	xxxxxxxxxxx	19/10/2004	120
			VDC000049	xxxxxxxxxxx	19/10/2004	120
			VDC000050	xxxxxxxxxxx	19/10/2004	120
15/10/2004	R000016	C000030	VDC000075	xxxxxxxxxxx	22/10/2004	90
			VDC000142	xxxxxxxxxxx	22/10/2004	90
			VDC000165	xxxxxxxxxxx	22/10/2004	90
			VDC000062	xxxxxxxxxxx	22/10/2004	90
			VDC000085	xxxxxxxxxxx	22/10/2004	90
			VDC000096	xxxxxxxxxxx	22/10/2004	90
27/10/2004	R000024	C000002	VDC000164	xxxxxxxxxxx	03/11/2004	0
			VDC000045	xxxxxxxxxxx	03/11/2004	0
29/10/2004	R000022	C000003	VDC000162	xxxxxxxxxxx	05/11/2004	0

Figure F.6. Rental Outstanding Monthly Report.

Rental Movie Bill

Bill Id. : B000001

Payment Date : 12/10/2004

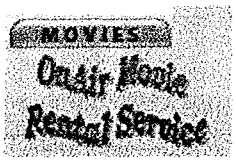
Customer Id. : C000001
Customer Name : Pornsri Chanyapiphat

Request Id. : R000001

Rental Detail :	VCD 3 Items	60 Baht
	VDO 1 Item	20 Baht
	DVD 3 Items	120 Baht
	Total Price :	200 Baht

Thank You

Figure F.7. External Output - Rental Movie Bill.



Late Charge Bill

Bill Id. : B000002

Payment Date : 12/10/2004

Customer Id. : C000001
Customer Name : Pornsri Chanyapiphat

Request Id. : R000012

Rental Detail :	VCD 2 Items	20 Baht

Request Id. : R000020

Rental Detail :	VCD 1 Item	10 Baht

Total Price : 30 Baht

Thank You

Figure F.8. External Output - Late Charge Bill.

APPENDIX G

DATABASE DESIGN

Table G.1. Structure of Customer Table.

Name	Type	Length	Null	Foreign key to table	Check	Key Type
CustomerID	Text	7	Not	Spent Point Table	-	Primary Key
CustomerName	Text	50	Not	-	-	Attribute
Address	Text	70	Not	-	-	Attribute
Telephone	Text	20	Not	-	-	Attribute
Mobile	Text	10	Null	-	-	Attribute
IssueDate	Date	-	Not	-	-	Attribute
RewardPoint	Number	10	Null	-	-	Attribute

Table G.2. Structure of Product Table.

Name	Type	Length	Null	Foreign key to table	Check	Key Type
ProductID	Text	7	Not	-	-	Primary Key
RentalPrice	Text	10	Not	-	-	Attribute
DurationAllowance	Text	3	Not	-	-	Attribute
LateCharge	Text	10	Not	-	-	Attribute

Table G.3. Structure of Product Type Table.

Name	Type	Length	Null	Foreign key to table	Check	Key Type
ProdTypeID	Text	7	Not	-	-	Primary Key
Applied Date	Date	-	Not	-	-	Attribute
Title	Text	50	Not	-	-	Attribute
MovieType	Text	20	Not	-	-	Attribute
Actor	Text	50	Not	-	-	Attribute
Actress	Text	50	Not	-	-	Attribute
Language	Text	10	Not	-	-	Attribute
StockUnit	Text	10	Not	-	-	Attribute
Description	Text	50	Null	-	-	Attribute

Table G.4. Structure of Request Table.

Name	Type	Length	Null	Foreign key to table	Check	Key Type
RequestID	Text	7	Not	Payment Table	-	Primary Key
ProductID	Text	7	Not	-	-	Primary Key
ProductTypeID	Text	7	Not	-	-	Primary Key
CustomerID	Text	7	Not	-	-	Primary Key
RequestDate	Date	-	Not	-	-	Attribute
DueDate	Date	-	Not	-	-	Attribute
RentalItem	Number	10	Not	-	-	Attribute

Table G.4. Structure of Request Table (Continue).

Name	Type	Length	Null	Foreign key to table	Check	Key Type
RentalPrice	Text	10	Not	-	-	Attribute
TotalPrice	Text	10	Not	-	-	Attribute
LateCharge	Text	10	Null	-	-	Attribute

Table G.5. Structure of Payment Table.

Name	Type	Length	Null	Foreign key to table	Check	Key Type
BillID	Text	7	Not	-	-	Primary Key
RequestID	Text	7	Not	-	-	Foreign Key
PaymentDate	Date	-	Not	-	-	Attribute

Table G.6. Structure of Reward Table.

Name	Type	Length	Null	Foreign key to table	Check	Key Type
RewardID	Text	7	Not	Spent Point Table	-	Primary Key
RewardName	Text	50	Not	-	-	Attribute

Table G.6. Structure of Reward Table (Continue).

Name	Type	Length	Null	Foreign key to table	Check	Key Type
PointRequest	Text	5	Not	-	-	Attribute
Remark	Text	50	Null	-	-	Attribute

Table G.7. Structure of Spent Point Table.

Name	Type	Length	Null	Foreign key to table	Check	Key Type
SpentPointID	Text	7	Not	-	-	Primary Key
RewardID	Text	7	Not	-	-	Foreign Key
CustomerID	Text	7	Not	-	-	Foreign Key
SpentDate	Date	-	Not	-	-	Attribute
Remark	Text	50	Null	-	-	Attribute

Table G.8. Structure of Password Table.

Name	Type	Length	Null	Foreign key to table	Check	Key Type
UserName	Text	10	Not	-	-	Attribute
Password	Text	8	Not	-	-	Attribute

APPENDIX H

PROCESS SPECIFICATION

PROCESS SPECIFICATION

Process Specification shows the process of Movie Rental Service Information System that consists of:

(1) Process Check Customer Information

(2) Process Register New Customer

(3) Process Receive Request

(4) Process Make New Request

(5) Process Issue Bill

(6) Process Receive Return Request

(7) Process Check Due Date

(8) Process Update Status

(9) Process Receive Reward Request

(10) Process Check Customer Point

(11) Process Select Reward and Point Spending

(12) Process Request Product

(13) Process Register New Product

(14) Process Product Payment

(15) Process Receive Print Request

(16) Process Distribute Report

Table H.1. Process Specification of Check Customer Information.

Items	Description
Process Name :	Check Customer Information
Data In :	Customer Information
Data Out :	Customer Information Requested Information
Process :	(1) Request customer information from customer (2) Receive customer information (3) Check customer information that there are already exist in the customer records (4) Send customer information to process2

Table H.2. Process Specification of New Customer Registration.

Items	Description
Process Name :	New Customer Registration
Data In :	Customer Information
Data Out :	New Customer Information
Process :	(1) Receive new customer information (2) Send new customer information to the customer records

Table H.3. Process Specification of Receive Request.

Items	Description
Process Name :	Receive Request
Data In :	Requested Service Customer Information Movie Information Movie Availability
Data Out :	Movie Information Request Notification Accepted Request

Table H.3. Process Specification of Receive Request (Continue).

Items	Description
Process :	(1) Receive requested rental service from customer (2) Check customer information then checking movie availability in the product records (3) Send notification of the request to the customer whether there are no available movies that customer needs (4) Send accepted request information to the next process when there are available movie for customer

Table H.4. Process Specification of Make New Request.

Items	Description
Process Name :	Make New Request
Data In :	Accepted Request
Data Out :	New Request Information
Process :	(1) Receive accepted request (2) Send new requested information to the request records

Table H.5. Process Specification of Issue Bill.

Items	Description
Process Name :	Issue Bill
Data In :	Requested Information Payment Bill
Data Out :	Payment Information Rental Movie Bill Movie

Table H.5. Process Specification of Issue Bill (Continue).

Items	Description
Process :	(1) Read requested information from request records (2) Send payment information to payment records (3) Receive bill information from payment records (4) Send rental movie bill to customer with movie that requested

Table H.6. Process Specification of Receive Return Request.

Items	Description
Process Name :	Receive Return Request
Data In :	Movie Return Customer Information
Data Out :	Customer Information Request
Process :	(1) Receive movie returned from customer (2) Read customer information from customer record (3) Send customer information to next process

Table H.7. Process Specification of Check Due Date.

Items	Description
Process Name :	Check Due Date
Data In :	Customer Information Time Reminder Requested Status
Data Out :	Late Charge Request

Table H.7. Process Specification of Check Due Date (Continue).

Items	Description
Process :	(1) Receive requested information which to be remind to customer (2) Receive reminder from timer (3) Read customer information and send requested information to next process whether customer returns product within due date (4) Send late charge request to customer whether time is overdue

Table H.8. Process Specification of Update Status.

Items	Description
Process Name :	Update Status
Data In :	Requested Status Payment
Data Out :	Record Adjustment Payment Information Bill
Process	(1) Read requested status from request records (2) Update requested status to request records (3) Receive late charge payment from customer whether time is overdue (4) Send payment information to payment records (5) Receive bill information from payment records (6) Send late charge bill to the customer

Table H.9. Process Specification of Receive Reward Request.

Items	Description
Process Name :	Receive Reward Request
Data In :	Reward Request
Data Out :	Reward Request

Table H.9. Process Specification of Receive Reward Request (Continue).

Items	Description
Process	(1) Receive reward request from customer (2) Send reward request to next process

Table H.10. Process Specification of Check Customer Point.

Items	Description
Process Name :	Check Customer Point
Data In :	Point Information
Data Out :	Point Information Request Spent Point
Process	(1) Read customer point information from customer records (2) Send spent point to reward records for next process

Table H.11. Process Specification of Select Reward and Point Spending.

Items	Description
Process Name :	Select Reward and Point Spending
Data In :	Reward Request
Data Out :	Reward Confirmation
Process	(1) Read customer point reward from previous process and reward information from reward records for customer to select (2) Send reward confirmation to customer

Table H.12. Process Specification of Request Product.

Items	Description
Process Name :	Request Product
Data In :	Product Information
Data Out :	Product Request

Table H.12. Process Specification of Request Product (Continue).

Items	Description
Process	(1) Read product information from product records (2) Send product request to supplier by manually issue purchase order

Table H.13. Process Specification of Register New Product.

Items	Description
Process Name :	Register New Product
Data In :	Product
Data Out :	Product Information
Process	(1) Receive product from supplier (2) Update product information to product records

Table H.14. Process Specification of Product Payment.

Items	Description
Process Name :	Product Payment
Data In :	Product Information Product Receipt
Data Out :	Payment
Process	(1) Read new product from product records (2) Send payment to supplier (3) Receive product receipt from supplier

Table H.15. Process Specification of Receive Print Request.

Items	Description
Process Name :	Receive Print Request
Data In :	Report Information
Data Out :	Report Information

Table H.15. Process Specification of Receive Print Request (Continue).

Items	Description
Process	(1) Receive requested report from manager (2) Read information from records (3) Send information to next process

Table H.16. Process Specification of Distribute Report.

Items	Description
Process Name :	Distribute Report
Data In :	Report Information Time reminder
Data Out :	Report Information
Process	(1) Receive repot information (2) Receive reminder from timer (3) Distribute report information to manager upon time and request

APPENDIX I

DATA DICTIONARY

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

Name	Type	Description
Account Department	External Entities	Accounting users who are in account department
Bill	Data Flow	Bill information send to customer
Customer	External Entities	Customers who are willing to request service
Customer Information	Data Flow	Information of customer who assigns to be member
Customer Records	Data Store	Store information about customer
Due Date	Data Flow	Time Reminder
Income Report	Data Flow	Report that generated for account department
Income Report Request	Data Flow	Report that requested by account department
Information Request	Data Flow	Information that requests to customer
Late Charge Request	Data Flow	Fee that requests to customer when movie is returned after due date
Manager	External Entities	Person who requests for all the information that needed for decision making
Monthly	Data Flow	Reminder from Time
Monthly Report	Data Flow	Report information that has to be sent to manager every month
Movie Availability	Data Flow	Available movie information in the stock
Movie Information	Data Flow	Movie information for user to review
Movie Information Request	Data Flow	Movie information that is requested by customer
Movie Return Information	Data Flow	Movie information that is recorded for returning from customer
New Request Information	Data Flow	Request information that customer requests for borrowing movie in the shop
One Month after Due Date	Data Flow	Time Reminder
Payment	Data Flow	Information of payment.
Payment Information	Data Flow	Inquiry payment information of each request

Table I.1. Data Dictionary of Data Flow Diagram (Continued).

Name	Type	Description
Payment Records	Data Store	Payment that is recorded for financial analysis and control
Point Information	Data Flow	Point information that customer has collected
Point information Request	Data Flow	Point information that is requested for user to review
Print Reports Process	Process	Process for printing report
Product Information	Data Flow	Product information that shop has kept as product for rent
Product Receipt	Data Flow	Receipt that receive from supplier
Product Records	Data Store	Store information for movie information
Product Request	Data Flow	Movie that customer requests for borrowing
Record Adjustment	Data Flow	Update request records after customer returns movie
Register Customer Process	Process	Process for new customer registration
Register Product Process	Process	Process for new product registration
Rental Movie	Data Flow	Movie that is borrowed by customer
Rental Movie Bill	Data Flow	Bill information send to customer
Rental Request Information	Data Flow	Rental movie information that customer is borrowed
Request Records	Data Store	Store information about request movie
Request Rental Process	Process	Process for requesting movie that customer needs to borrow
Request Reward Process	Process	Process for requesting reward from customer's point that customer has collected
Requested Information	Data Flow	Information that are requested
Return Request Process	Data Flow	Process for returning movie that customer has borrowed
Reward Confirmation	Data Flow	Confirmation to spending point for reward

Table I.1. Data Dictionary of Data Flow Diagram (Continued).

Name	Type	Description
Reward Records	Data Store	Store information about reward
Reward Request Information	Data Flow	Requested reward by customer
Spent Reward	Data Flow	Spend point for reward
Status Request	Data Flow	Request for rental movie status
Supplier	External Entities	Supplier who receives order and send product according to request
Time	External Entities	Time reminder to the system when time is came
Updated Information	Data Flow	Update information as user request to system

Table I.2. Data Dictionary of Database.

Field Name	Meaning
Actor	Name of actor
Actress	Name of actress
Address	Address of customer
AppliedDate	Date that applies for new movie in the stock
BillID	Identification number of Bill
CustomerID	Identification number of customer
CustomerName	Name and Surname of customer
Description	Description about title of movie
DueDate	Date of specific return for the movie
DurationAllowance	Rental duration
IssueDate	Date of issuing customer identification number
Language	Language that is sounded in the movie
LateCharge	Fee of charge for lately returned movie
Mobile	Mobile number of customer
MovieType	Type of movie
PaymentDate	Date of payment
PointRequest	Point value for exchanging the reward
ProdTypeID	Identification number of product type
ProductID	Identification number of product
Remark	Additional message
RentalItem	Amount of borrowing for movie
RentalPrice	Price of each rental movies

Table I.2. Data Dictionary of Database (Continued).

Field Name	Meaning
RequestID	Identification number of request
RequestDate	Date of borrowing the movie
RewardID	Identification number of reward
RewardName	Name of reward
RewardPoint	Total points that customer collects for reward
SpentDate	Date of spending point for reward
SpentPointID	Identification number of point spending
StockUnit	Amount of available movies in the stock
Telephone	Telephone of customer
Title	Name of movie
TotalPrice	Total price of rental movies

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