VDO/VCD Rental System for Circle Co., Ltd.

by

Ms. Supaporn Sukhumpraisan

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   VDO/VCD Rental System for Circle Co., Ltd.

Name   Ms. Supaporn Sukhumpraisan

Project Advisor   Assoc.Prof.Dr. Suphamit Chittayasothorn

Academic Year   July 21, 2002

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.
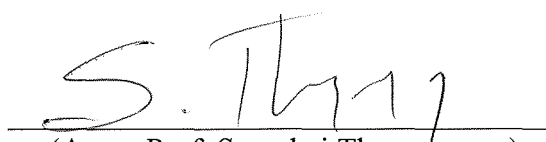
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_____   _____
(Assoc.Prof.Dr. Suphamit Chittayasothorn)   (Prof.Dr. Srisakdi Charmonman)
Advisor   Chairman

_____   _____
(Air Marshal Dr. Chulit Meesajjee)   (Asst.Prof.Dr. Vichit Avatchanakorn)
Dean and Co-advisor   Member

_____
(Assoc.Prof. Somchai Thayarnyong)
MUA Representative

July 21, 2002

ABSTRACT

Circle Co., Ltd. is one of the retail businesses in Thailand. Their business is about entertainment business selling music tapes, compact discs, video and video compact disc.

Circle Co., Ltd. has just extended their business in rental business. It is the franchise business, which the software system provided from franchiser. Though, the rental system is computerized system, but the hardware and software for such system are limited.

The new proposed system will be developed separately to the existing sales system, to replace the existing rental system, but the same data needed for rental system will be connected from the sales system. This system not only involves rental process and reports, it is also related to the existing sales system and existing head office system.

This will help to reduce the problems of software and hardware limitation of existing rental system.

ACKNOWLEDGEMENTS

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

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She extends her sincere thanks to Mr. Nicolas Lim, Managing Director, Circle Co., Ltd. for his timely assistance and information provided to her while carrying out the data collection required for this project.

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1.1 Background of the Project

Rental system is not much like the retail system or point of sales system. Those renting products in one store are circulated. The good rental system is to provide much detail and transaction to the users accurately and efficiently, which could cover all rental operations.

1.2 Objectives of the Project

The project objectives of rental system are as follows:

(1) To solve the existing problem of software limitation.

(2) To solve the existing problem of hardware limitation.

(3) To implement the new rental system adapted with the existing head office systems.

(4) To reduce the redundant information and utilizing existing database of existing sales system.

(5) To reduce cost and time in operation.

(6) To enhance the company growth in terms of utilized system.

1.3 Scope of the Project

The project scope covers studying the existing rental system and work flow, and also studying the existing sales system and head office system which means that utilizing the existing database is needed. This new system will control the rental shop with the connection of the sales system. A consideration for cost and budget is needed according to the shop's revenue.

The project scopes cover the following:

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(1) To analyze and design an appropriate computerized system which covers existing hardware and software limitation..

(2) To share the existing database of the sales system.

1.4 Deliverable

The deliverables of this project shall be employed with:

(a) Input Screens

(b) Project works, which contain the following contents

    (1) Project Overview

    (2) Data Flow Diagram

    (3) Entity-Relationship Diagram (ER-Diagram)

    (4) Input-Output

    (5) System Flowchart

    (6) Context Diagram

    (7) Inspection and test plan, including their results

    (8) Conclusion and recommendations

1.5 Project Plan

The plan starts from the first week of October 2001, and is completed in the fourth week of January 2002. The schedule of the rental system project plan is as follows:

No.	Task Name	October					November				December				January			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	I. Analizing existing system	←				→												
1	Define the objective and scope	■																
2	Study the Existing System		■															
3	Identify the Existing Problems			■														
4	Study the Existing Computer System			■														
5	Develop Context Diagram				■													
6	Develop Data Flow Diagram					■												
7	Cost and Benefit Analysis						■											
	II. Analysis and Design of new system							←	→									
8	Report Design							■										
9	Database Design							■	■									
10	Network Design							■	■									
11	Program Design							■										
	III. Implementation of the new System										←							→
12	Coding											■	■	■				
13	Testing														■	■		
14	Hardware Installation											■	■					
15	Software Installation																■	
16	Conversion																	■

Figure 1.1. Project Plan of Rental System for Circle Co., Ltd.

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II. THE EXISTING SYSTEM

2.1 Background of the Organization

Circle Co., Ltd. was established in 1996. Their business is about entertainment business selling music tapes, compact discs, video and video compact disc. Now, they have two branches in Bangkok.

In 2000, they started the new franchise business on video and video compact disc (VCD) rental. Now they have 2 branches, each branch adjacent to existing entertainment shop. Besides their existing sales system in entertainment shop and head office systems, they also have the rental system, which was purchased from their franchiser.

2.2 Existing Business Functions

Circle Co., Ltd. has 30 employees including shops' employees, and is divided into 6 departments as:

(1) Product and Marketing Department

Product and Marketing Department is responsible for all products ordering and selling, licensed supplier negotiation and advertisement.

(2) Operation Department

Operation Department is responsible for controlling and managing shops including shop's employees, and managing human resources.

(3) Computer Department

Computer Department is responsible for polling the data, generating the reports and maintaining the systems both head office and shops.

(4)   Financial and Accounting Department

Financial and Accounting Department is undertaking company's financial, revenues and budgets, and is also responsible for the payroll system.

(5)   Administration Department

Administration Department is responsible for purchasing and managing both head office and shops' automation and equipment.

(6)   Distribution Department

Distribution Department is undertaking the stock of the tapes, compact disc, video and video compact disc, and delivery process.
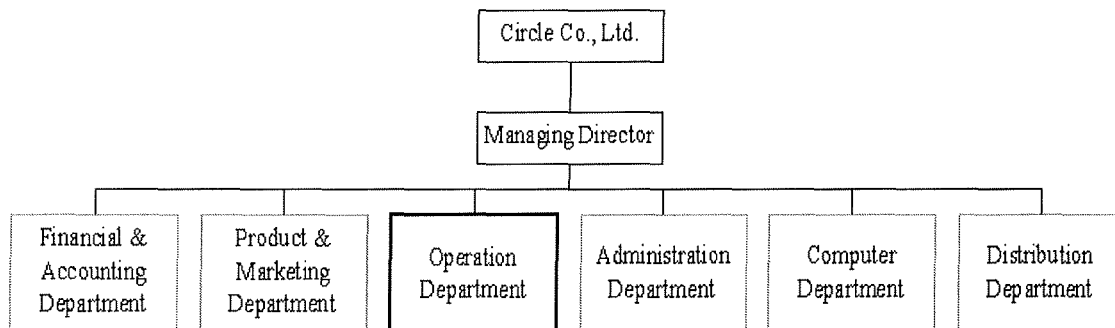
Figure 2.1.   Organization Chart of Circle Co., Ltd.

2.3   Current Problem and Areas for Improvement

The existing system is a manual system. Therefore, there are many problems that occur in Circle Co., Ltd. The following problems are always found during the process:

Current Problem

(1)   Software Limitation

The existing rental system is the software package operated on OpenVMS operating system. The problems of this limitation are the system supporter is less skilled, and the connection between sales system and rental system is not possible. Not only the connection of two systems, but also the connection between head office and rental system is not practical. At the head office, they need to connect to rental system by direct connection via modem and download the text-style report to be imported into database program before generating reports. The modification of the system is also not possible due to the software package is licensed and cost expenses.

(2)   Hardware Limitation

The main hardware specification of the existing rental system are DEC Alpha Station server. The workstations are terminals connected via DEC Server 90 +L which acts as a hub. There is lack of system engineer to support these kinds of hardware and network. Those hardware equipments are used, which were also purchased and brought from abroad. The problem also occurs in the hardware maintenance, as there is lack of hardware dealer in Thailand and also causes much repair expenses.

(3)   Redundancy information and work process

The users of rental and sales shop have to key in the same product data into each system separately. The head office users need to download the data from each system separately. These are the causes of the redundancy problem.

(4) Incorrect data

The same data that is used in rental and sales shop may be incorrect due to human error. Therefore this causes many problems to the data importer at the head office to generate reports for management.

Areas for Improvement

The new rental system will not be limited in terms of hardware and software. Microsoft windows operating system will be applied and the database program can be able to run on it. The database of rental, sales and head office system can be connected via LAN and dial-up network. The redundancy problem will be eliminated. The hardware and software maintenance will be easier, and there are also more skilled technical supporters in Thailand. These solutions will solve all existing problems.

III. THE PROPOSED SYSTEM

The proposed system is designed to replace the existing system, in terms of hardware and software limitation.

3.1 System Specification

The proposed system is a new system that is created to solve some problems of the existing system. The key functions need to be analyzed are hardware and software limitation, redundant information and incorrect data. Besides the existing sales system of the company, rental system uses only the product database from the sales system. Furthermore, the proposed system also covers additional functions that enhance the higher capability of the company. The system specifications are as follows:

(1) To utilize the product database of the existing computerized sales system.

(2) To create a new computerized database system that links the existing computerized sales system.

(3) To reduce data redundancy among rental, sales and head office system.

(4) To provide user-friendly interfaces with windows based program.

(5) To reduce the time in importing data from two system.

(6) To reduce cost of system, software and maintenance supporters.

(7) To reduce the number of human errors.

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

3.2 System Design

The system design categories are divided into the following sections:

(1) Design of Input Screen

The input screen provides the convenience for user to key in the data to the form. The input screen should be simpler, user graphic interface, easy

to key in and ensure that the new system could cover all functions of existing system.   The input screen is the user interface designs for the proposed system and is attached in Appendix A.

(2)   Design of Output Screen

It is the same to input screen that the output screen will display the data for all reports, which could cover those reports in the existing system. The output screen is shown in Appendix B.

(3)   Database Design

Beside the connection of product data from sales system, the needed database will be re-designed.   This method shall be designed to increase working process efficiency that can also reduce redundant information and covers all existing data structure. The database design is shown in Appendix C.

Member
Menber_ID (PK)
Name
Surname
Address1
Address2
Postcode
Telephone
Sex
Birthdate
Status_code
Regis_date

Status
Status_code (PK)
Status_desc

Promotion
Promotion_ID (PK)
Description
Start_date
End_date
Qty_rent
Discount
Free_product_ID
Free_Otv

Inv_receive_detail
Rcv_no (PK)
- Receive_no
- Product_ID
Quantity

Inv_receive
Receive_no (PK)
Receive_date

Rental
Receipt_no (PK)
Receipt_date
Member_ID
Promotion_ID
VAT
Total

Product_rent
Product_ID (PK)
Rent_code
Product_qty

Inv-adjust_detail
Adj_no (PK)
- Adjust_no
- Product_ID
- Copy
Reason_code

Inv_adjust
Adjust_no (PK)
Adjust_date

Inv_adjust_reason
Reason_code (PK)
Reason_desc
Minus

User
User_ID (PK)
Name
Surname
Password
Autho_level
Position

Rental_detail
Rent_no (PK)
- Receipt_no
- Product_ID
- Copy
Rent_date
Return_date
Late_status
Return_no

Rent_type
Rent_code (PK)
Rent_rate
Rent_day
Late_fee

Inv_transfer_detail
Tran_no (PK)
- Transfer_no
- Product_ID
- Copy

Inv_transfer
Transfer_no (PK)
Transfer_date

Return_detail
Return_no (PK)
Receipt_no (PK)

Figure 3.1. Entity Relationship Diagram (ERD).

(4)   Process Specification

The process of the new rental system will be much alike to the existing system. The process specification represents an overview of the Rental System. The process specification is shown in Appendix D.

Process 1.0 Update Member

(1)   To add new member.

(2)   To update member

(3)   To generate report

Process 2.0 Update User

(1)   To add new user.

(1)   To update user.

(2)   To generate report

Process 3.0 Update Inventory

(1)   To receive inventory .

(2)   To transfer inventory.

(3)   To adjust inventory.

(4)   To calculate copy.

(5)   To print tape cover.

(6)   To prepare inventory.

(7)   To input physical inventory.

(8)   To compare inventory quantity

(9)   To adjust quantity.

Process 4.0 Update Price

(1)   To add new rent type.

(2)   To update rent type.

(3)   To update product rent type.

(4)   To generate product rent type report.

(5)   To add new promotion.

(6)   To update promotion.

(7)   To delete promotion.

(8)   To generate promotion report.

Process 5.0 Rent Tape

(1)   To check out tape.

(2)   To check in tape.

(3)   To generate sales report.
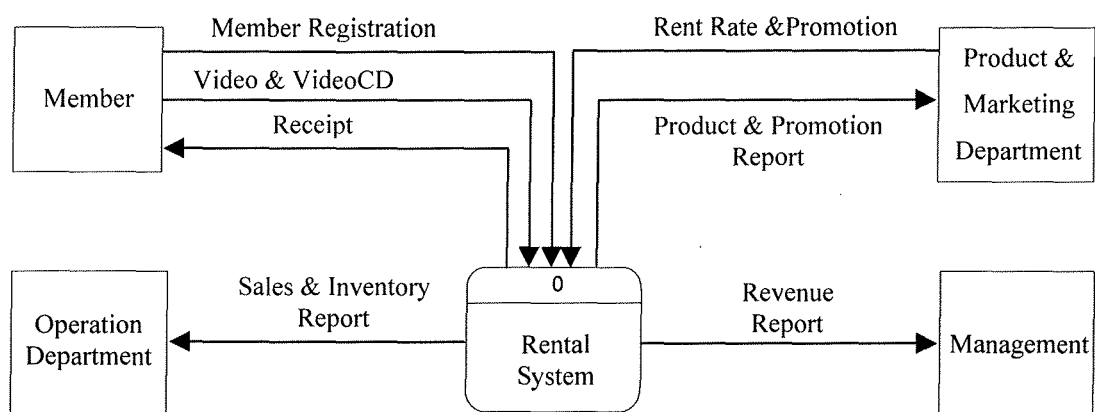
Figure 3.2. Context Diagram of Proposed System.

Figure 3.3. DFD Level 0.
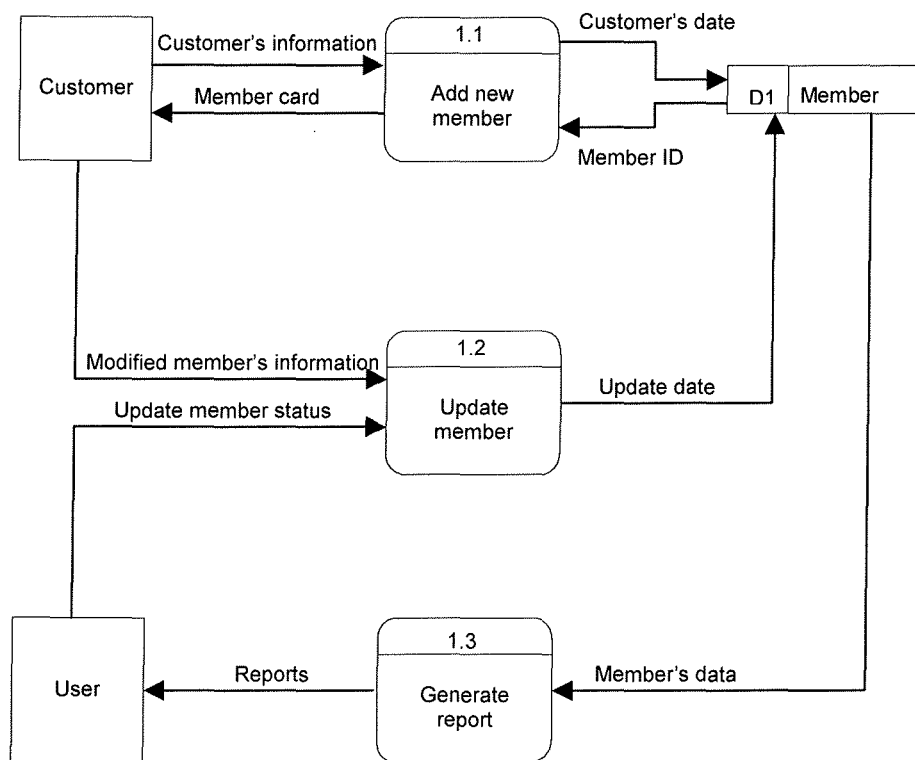
Figure 3.4.   DFD Process 1.0 Level 1.0.
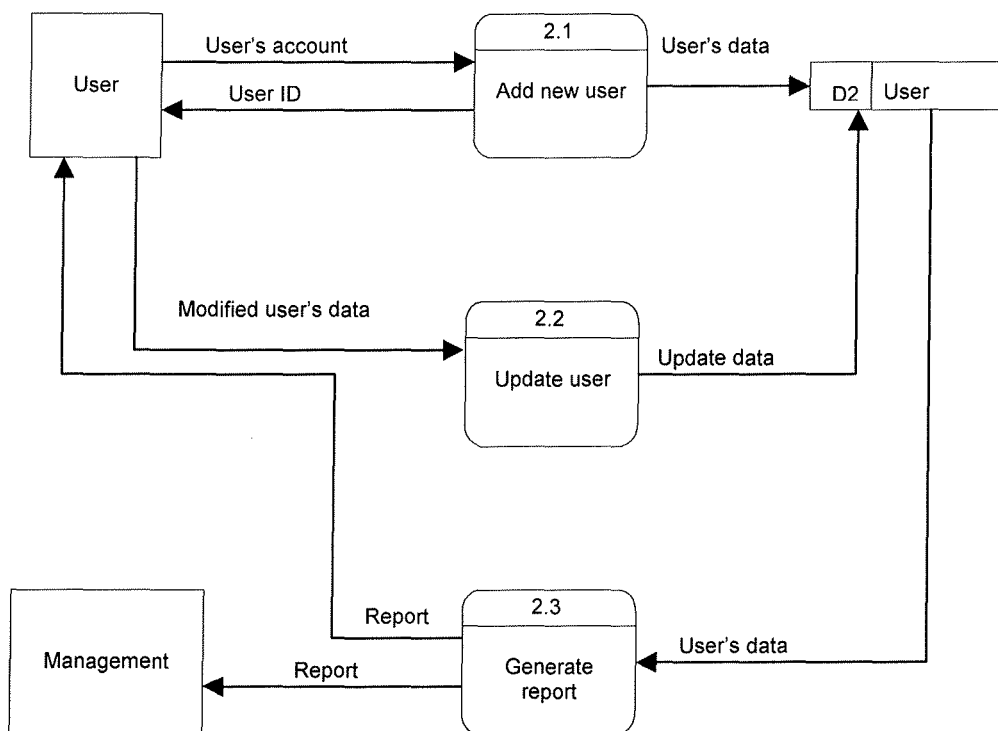
Figure 3.5. DFD Process 2.0 Level 1.0.
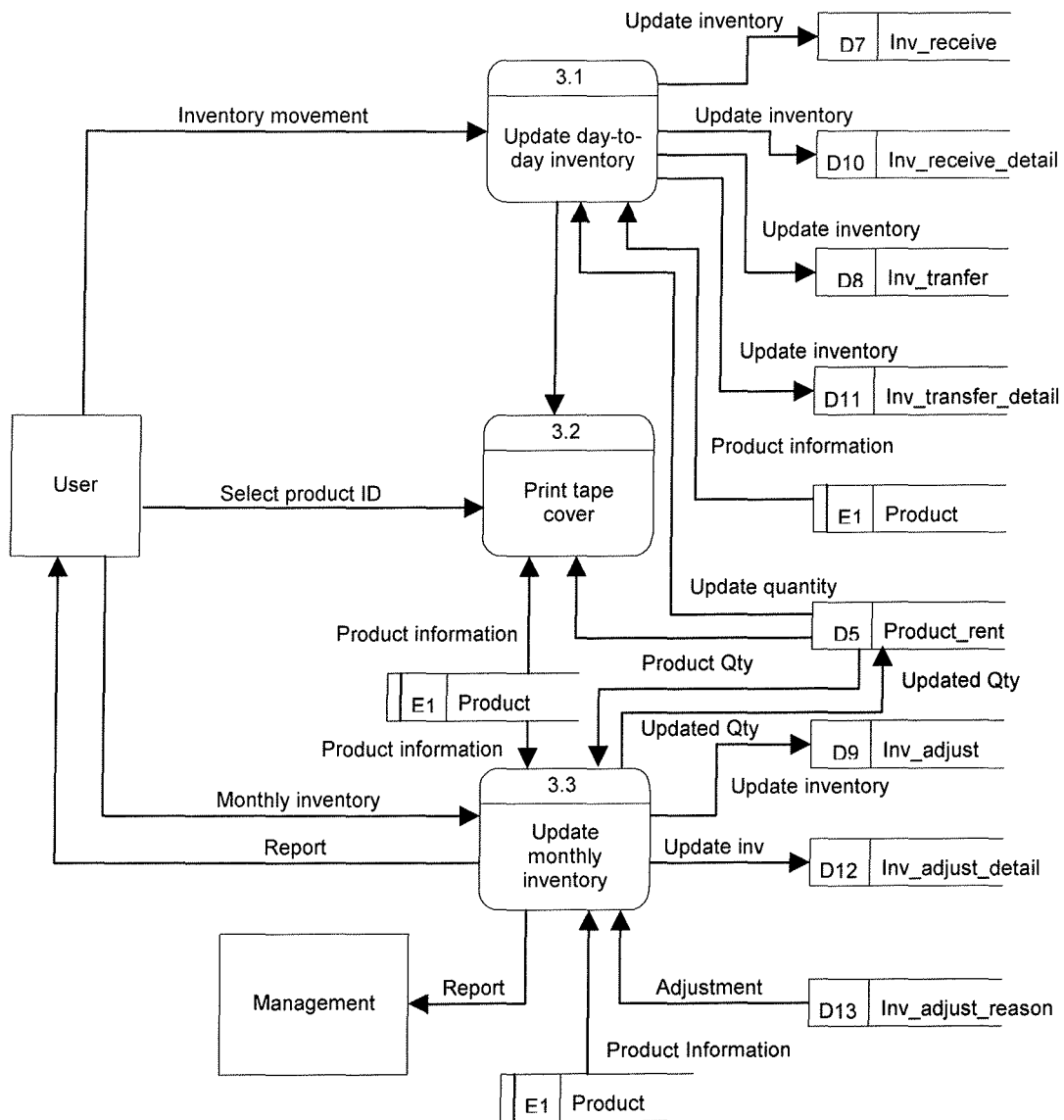
Figure 3.6.   DFD Process 3.0 Level 1.0.
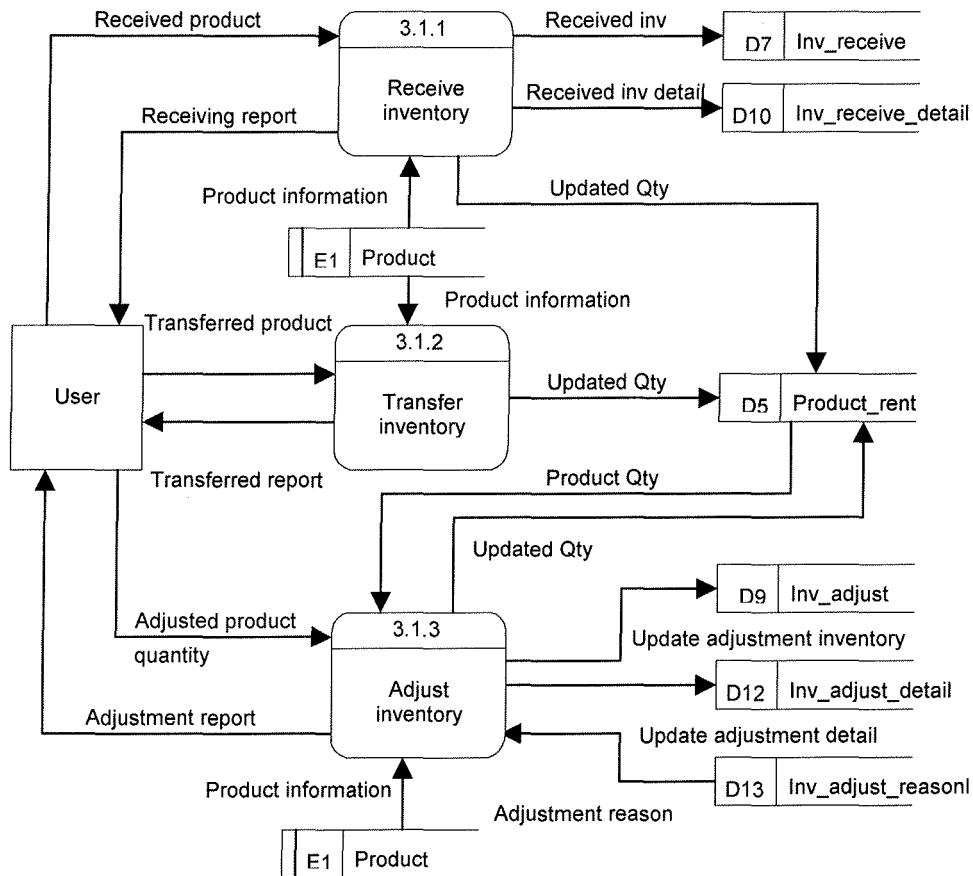
Figure 3.7. DFD Process 3.0 Level 2.0.

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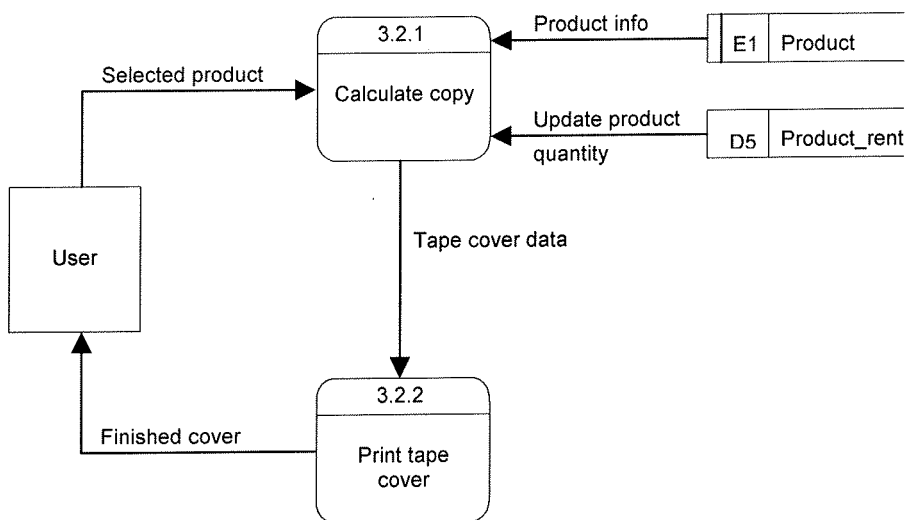
Figure 3.8.   DFD Process 3.0 Level 2.0.
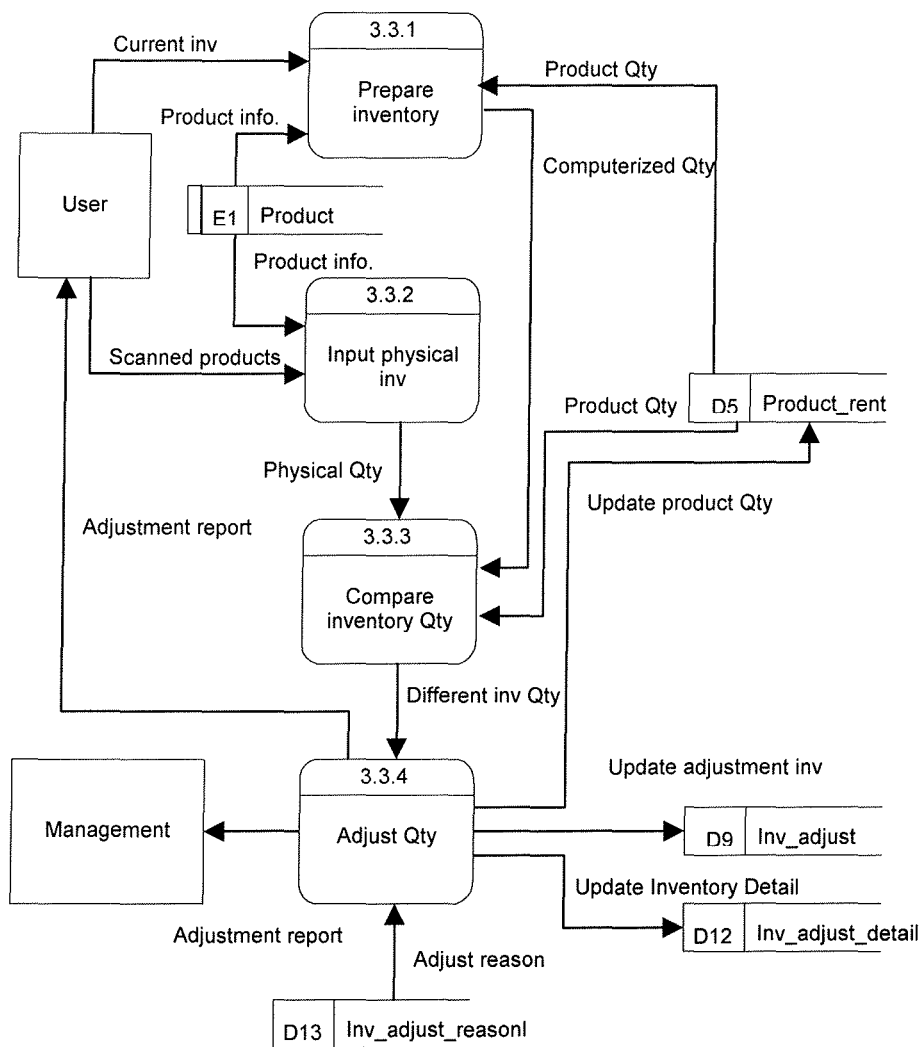
Figure 3.9. DFD Process 3.0 Level 2.0.
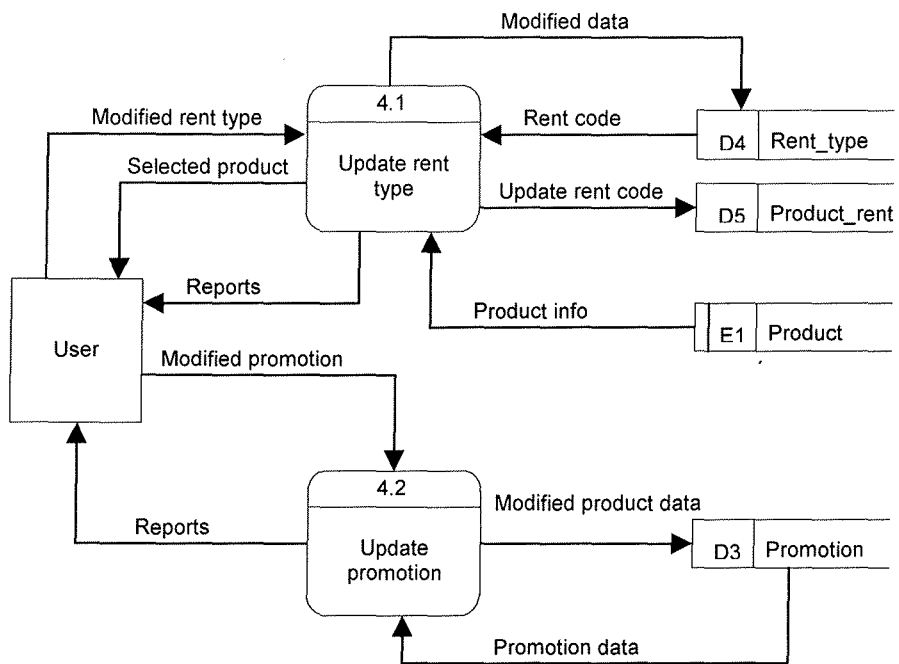
Figure 3.10.   DFD Process 4.0 Level 1.0.
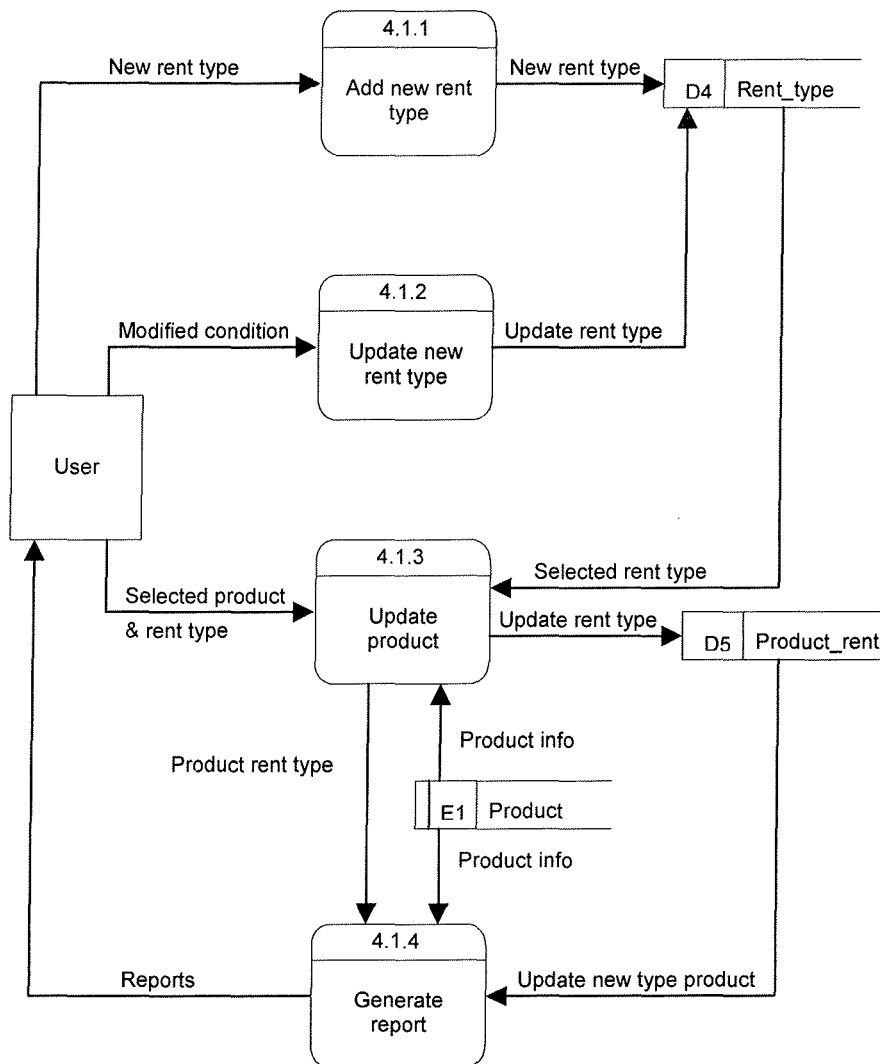
Figure 3.11.   DFD Process 4.0 Level 2.0.
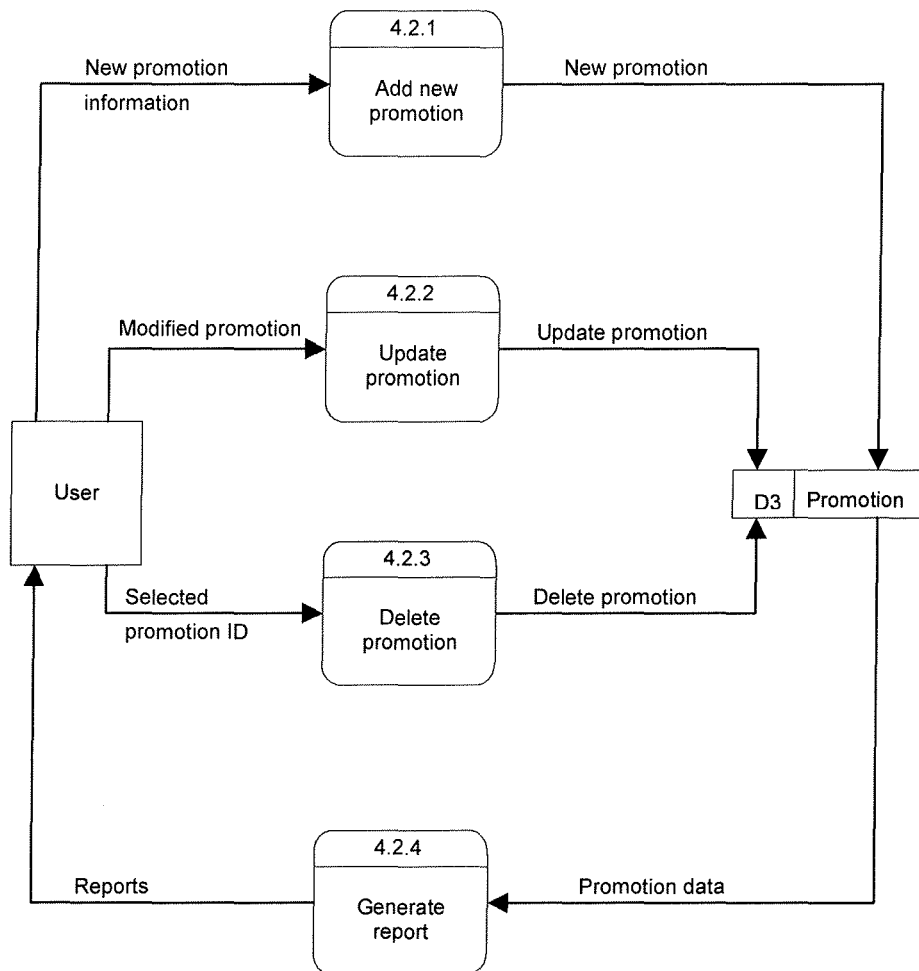
Figure 3.12.   DFD Process 4.0 Level 2.0.
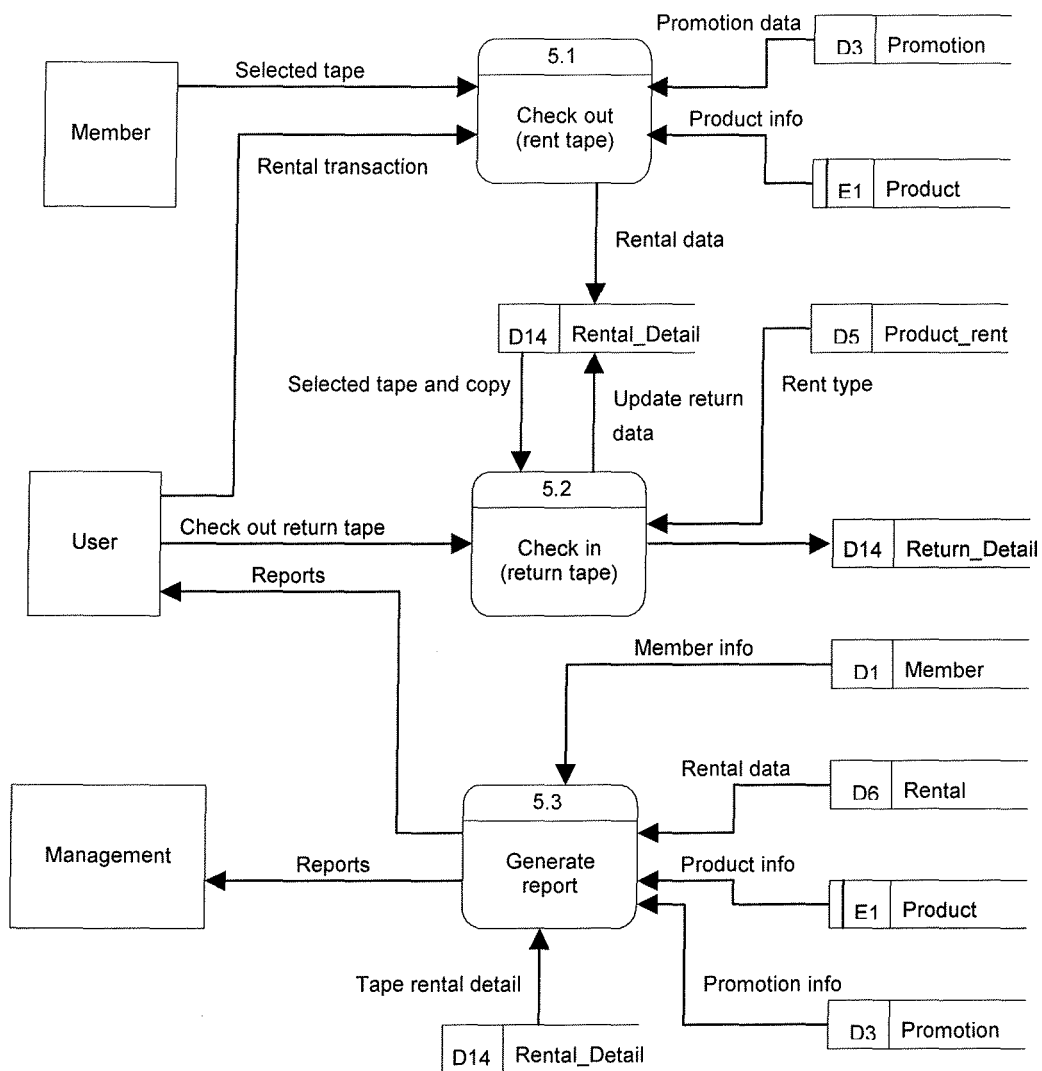
Figure 3.13. DFD Process 5.0 Level 1.0.

24
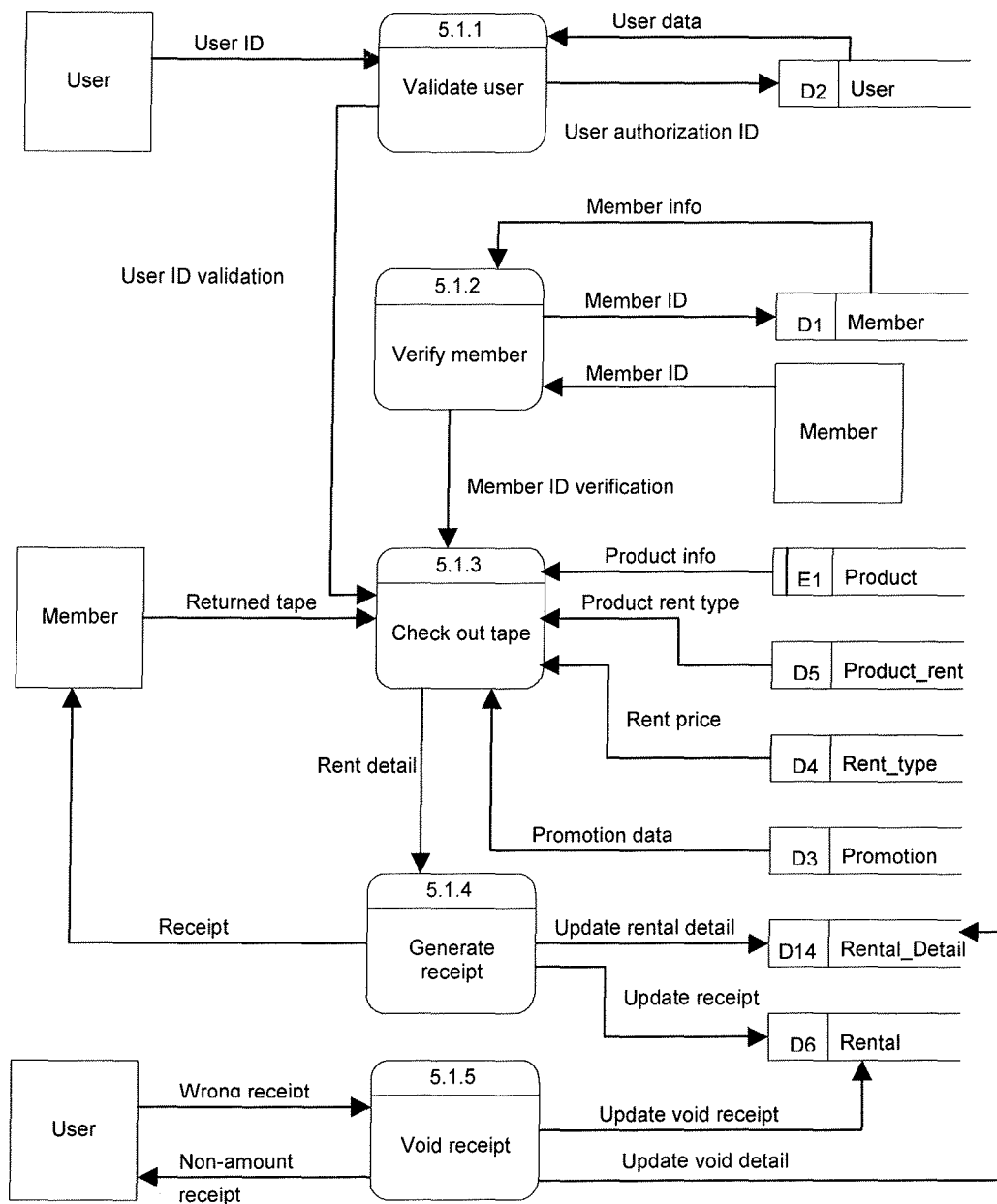
Figure 3.14. DFD Process 5.0 Level 2.0.

25
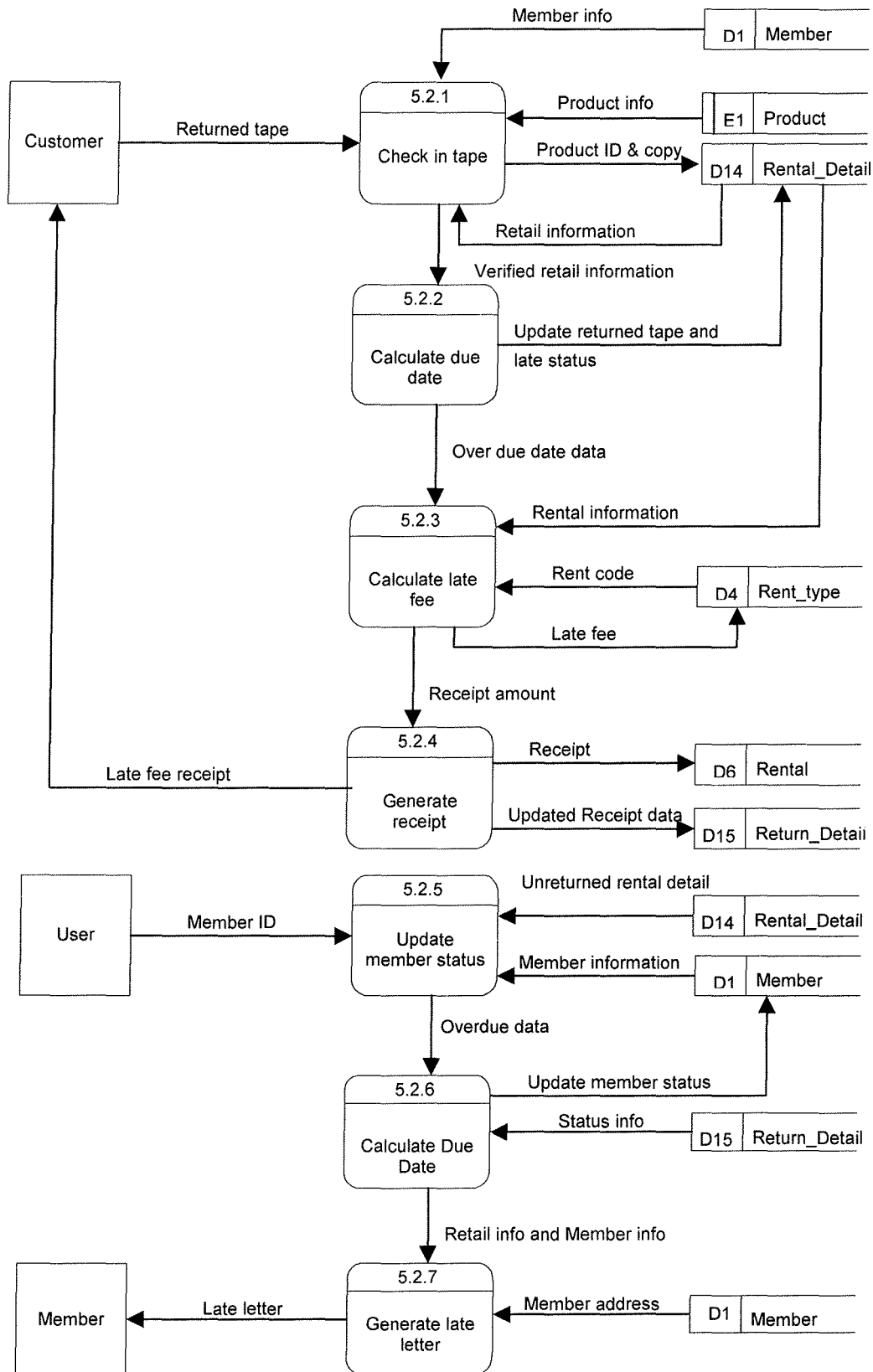
Figure 3.15. DFD Process 5.0 Level 2.0.

3.3 Hardware and Software Requirement

The server must support Microsoft Window 2000 and Microsoft Office 2000 application, and also support multi-users' operation.

The client machines must have capacity high enough to run database application, Microsoft Access 2000. For the Operating System will be Microsoft Window 98. The hardware & software specifications for each client machine are shown in the Tables 3.2 and 3.4.

    (1)   Hardware Requirement

        The required hardware specification for this proposed system is composed of 1 server, 2 clients, 1 laser printer, 1 modem, 2 cash drawers, 2 barcode scanners, 2 receipt printer network peripherals, and cabling, each specification is stated below:

Table 3.1.   The Hardware Specification for the Server.

Hardware	Specification
Processor	Multi-Processor Dual Processor Pentium III 750 MHz or higher
Memory	Min. 256 MB
CPU Cache	256 KB or higher
Hard Disk	Min. 20 GB

Table 3.1.   The Hardware Specification for the Server (Continued).

Hardware	Specification
Display Adapter	SVGA card
Network Card	10/100 Base-T PCI
I/O Port	2 Serial, 1 Parallel
CD-Rom	16X CDROM Drive or higher
Monitor	15 " SVGA
Keyboard	104 or Windows 95 PS/2 Thai Version.
Mouse	PS/2 Style- 2 Button
Floppy Disk	1.44 MB Internal

Table 3.2.   The Hardware Specification for Each Client Machine.

Hardware	Specification
Processor	Processor Cerelon 700 MHz
Memory	Min. 64 MB
CPU Cache	256 K
Hard Disk	Min 10 GB IDE.
Display Adapter	SVGA card
Network Card	10/100 Base-T PCI
I/O Port	2 Serial, 1 Parallel
Monitor	15 " SVGA
Keyboard	104 or Windows 95 PS/2 Thai Version.
Mouse	PS/2 Style- 2 Button
Floppy Disk	1.44 MB Internal

Printer

  Lexmark Laser 4500

Modem

  US Robotics 56K

Cash Drawer

  Indianna Cash Drawer

Barcode Scanner

  1545 Laser Scanner

UPS

  UPS Leonic Green II- 1000 VA

Network Peripherals

  COM Super Stack II (Hub) 8 ports

Cabling

  UTP Cable

  RJ-45 Connector

(2) Software Requirement

The Rental System needs the database application that is practical in terms of business use and is appropriate with the designed system. The software specification for the server is stated below:

Table 3.3. The Software Specification for the Server.

Software	Specification
Operating System	Microsoft Windows 2000 (Server)
Database Server	Microsoft Access 2000

Table 3.4.   The Software Specification for Each Client Machine.

Software	Specification
Operating System	Microsoft Windows 98 SE

(3)   Data Communication and Network

Those 2 clients are interconnected with the server in one domain via TCP/IP.   The server needs hub as the switching hardware for communicating data with more than 1 client.   The laser printer connected through the server is shared via Microsoft Network.   There is also modem connected to the server to communicate between shop and head office.
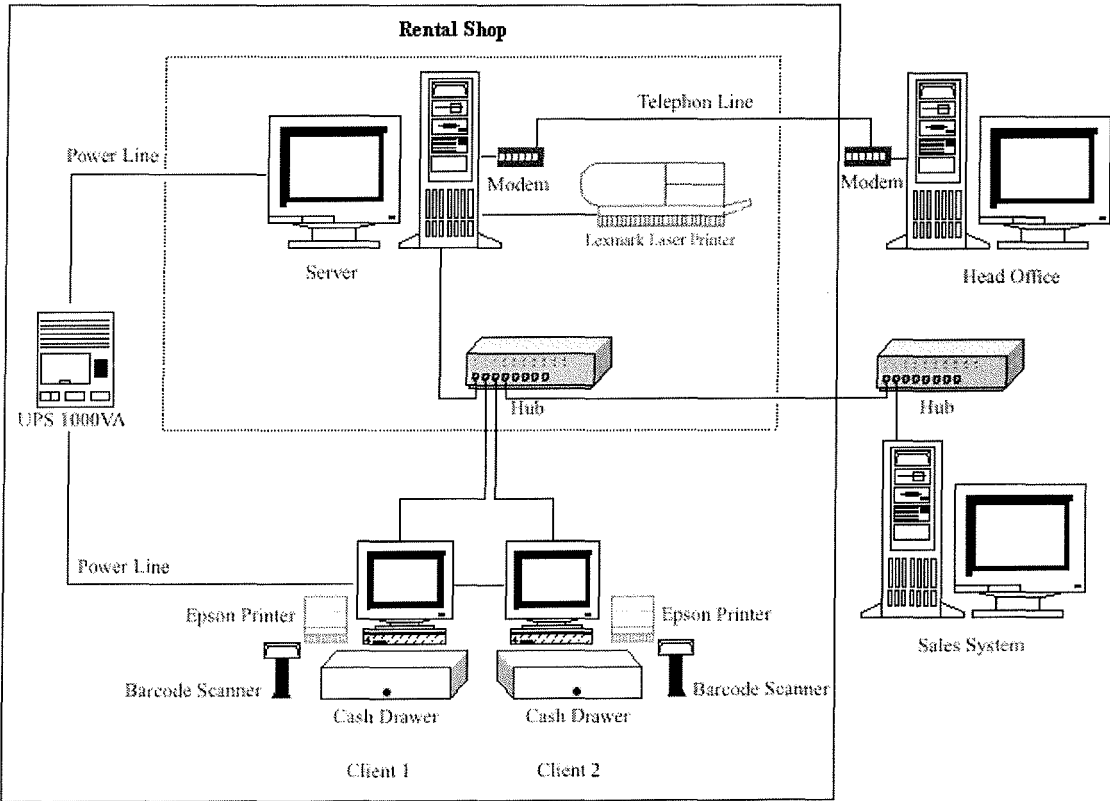
Figure 3.16.   The Hardware Configuration.

3.4 Security and Control

Security and control plan is one of the most important controls a company can implement. The only change from the existing system is only the operating system. Therefore the security will be a little differed.

For the proposed system, the security policy is set up for controlling the access of the user as follows:

(1) At the domain network security, the system asks for user name and password for each user to login to the domain network. The users are asked to enter the user name and the password. After checking if the user is authorized, they could enter the network system to use the application and share the server printer. At the server, Microsoft Windows 2000 provides the administrator to check the user performance via the system log, event log and application log, which can be viewed from event viewer.

(2) At the application security, the rental system will ask user to enter ID and password at the main menu of the program. Not only that, the system also controls each menu of appending, editing and deleting with the authorized ID according to the position level which is set in the database.

(3) In each menu, the system will logoff to the main menu after the idle time of 5 minutes. Therefore, the user needs to log on again at the main menu.

(4) The user must change the password every 30 days and must keep his/her password confidential.

(4) Authorized persons should be instructed to sign source document.

(5) The hardware must be checked for maintenance every 3 months for preventing the damage for external factor.

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3.5 Cost and Benefit Analysis

(1) Costs of Existing System

The cost of existing system is mainly hardware and software maintenance cost.

Table 3.5. Existing System Cost Analysis, Baht.

Cost Items	Years				
	1	2	3	4	5
Fixed Cost					
Hardware Cost:					
Computer Server	20,000.00	20,000.00	20,000.00	20,000.00	20,000.00
Workstation	8,000.00	8,000.00	8,000.00	8,000.00	8,000.00
Printer	14,000.00	14,000.00	14,000.00	14,000.00	14,000.00
UPS 1000VA	2,000.00	2,000.00	2,000.00	2,000.00	2,000.00
Cash Drawer	4,000.00	4,000.00	4,000.00	4,000.00	4,000.00
Barcode Scanner	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00
Network Peripherals	8,000.00	8,000.00	8,000.00	8,000.00	8,000.00
Cabling	2,000.00	2,000.00	2,000.00	2,000.00	2,000.00
Hardware Maintenance	15,000.00	16,500.00	18,150.00	19,965.00	21,961.50
Software Cost:					
Software Package	20,000.00	20,000.00	20,000.00	20,000.00	20,000.00
Software Support	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
Total Fixed Cost	109,000.00	110,500.00	112,150.00	113,965.00	115,961.50
Operating Cost					
Manager 1@30,000	360,000.00	396,000.00	435,600.00	479,160.00	527,076.00
System & Software Supporter 1@20,000	240,000.00	264,000.00	290,400.00	319,440.00	351,384.00
Programmer 1@15,000	180,000.00	198,000.00	217,800.00	239,580.00	263,538.00
Technical Supporter 1@15,000	180,000.00	198,000.00	217,800.00	239,580.00	263,538.00
Total Annual Salary Cost	960,000.00	1,056,000.00	1,161,600.00	1,277,760.00	1,405,536.00
Office Supplies & Miscellaneous Cost:					
Stationary Per Annual	20,000.00	22,000.00	24,200.00	26,620.00	29,282.00
Paper Per Annual	20,000.00	22,000.00	24,200.00	26,620.00	29,282.00
Utility Per Annual	110,000.00	121,000.00	133,100.00	146,410.00	161,051.00
Miscellaneous Per Annual	10,000.00	11,000.00	12,100.00	13,310.00	14,641.00
Total Office Supplies & Miscellaneous Cost	160,000.00	176,000.00	193,600.00	212,960.00	234,256.00
Total Operating Cost	1,120,000.00	1,232,000.00	1,355,200.00	1,490,720.00	1,639,792.00
Total Existing System Cost	1,229,000.00	1,342,500.00	1,467,350.00	1,604,685.00	1,755,753.50

Table 3.6.   Five Years Accumulated Existing System Cost, Baht.

Year	Total Existing System Cost	Accumulated Cost
1	1,229,000.00	1,229,000.00
2	1,342,500.00	2,571,500.00
3	1,467,350.00	4,038,850.00
4	1,604,685.00	5,643,535.00
5	1,755,753.50	7,399,288.50
Total	7,399,288.50	-

(2) Costs of Proposed System

Table 3.7. Proposed System Cost Analysis, Baht.

Cost Items	Years				
	1	2	3	4	5
Fixed Cost					
Hardware Cost:					
Computer Server	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00
Workstation	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
Printer	14,000.00	14,000.00	14,000.00	14,000.00	14,000.00
UPS 1000VA	2,000.00	2,000.00	2,000.00	2,000.00	2,000.00
Cash Drawer	4,000.00	4,000.00	4,000.00	4,000.00	4,000.00
Barcode Scanner	4,000.00	4,000.00	4,000.00	4,000.00	4,000.00
Network Peripherals	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00
Cabling	400.00	400.00	400.00	400.00	400.00
Software Cost:					
Operating Software	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
Application Software	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00
Software Maintenance Agreement	20,000.00	18,000.00	16,200.00	14,580.00	13,122.00
Total Hardware and Software Cost	63,200.00	63,200.00	63,200.00	63,200.00	63,200.00
Implementation Cost:					
System Personal	900,000.00	-	-	-	-
Training Cost	20,000.00	-	-	-	-
Setup Cost	20,000.00	-	-	-	-
Total Implementation Cost	940,000.00	-	-	-	-
Total Fixed Cost	1,003,200.00	63,200.00	63,200.00	63,200.00	63,200.00
Operating Cost					
Manager 1@30,000	360,000.00	396,000.00	435,600.00	479,160.00	527,076.00
Programmer 1@15,000	180,000.00	198,000.00	217,800.00	239,580.00	263,538.00
Technical Support 1@15,000	180,000.00	198,000.00	217,800.00	239,580.00	263,538.00
Total Annual Salary Cost	540,000.00	594,000.00	653,400.00	718,740.00	790,614.00
Office Supplies & Miscellaneous Cost:					
Stationary Per Annual	20,000.00	22,000.00	24,200.00	26,620.00	29,282.00
Paper Per Annual	20,000.00	22,000.00	24,200.00	26,620.00	29,282.00
Utility Per Annual	100,000.00	110,000.00	121,000.00	133,100.00	146,410.00
Miscellaneous Per Annual	10,000.00	11,000.00	12,100.00	13,310.00	14,641.00
Total Office Supplies & Miscellaneous Cost	150,000.00	165,000.00	181,500.00	199,650.00	219,615.00
Total Operating Cost	690,000.00	759,000.00	834,900.00	918,390.00	1,010,229.00
Total Proposed System Cost	1,713,200.00	840,200.00	914,300.00	996,170.00	1,086,551.00

Table 3.8. Five Years Accumulated Proposed System Cost, Baht.

Year	Total Proposed System Cost	Accumulated Cost
1	1,693,200.00	1,693,200.00
2	840,200.00	2,553,400.00
3	914,300.00	3,467,700.00
4	996,170.00	4,463,870.00
5	1,086,551.00	5,550,421.00
Total	5,550,421.00	-

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

Table 3.9. The Comparison of the System Costs, Baht.

Year	Accumulated Exitsting Cost	Accumulated Proposed Cost
1	1,229,000.00	1,693,200.00
2	2,571,500.00	2,553,400.00
3	4,038,850.00	3,467,700.00
4	5,643,535.00	4,463,870.00
5	7,399,288.50	5,550,421.00

(4)   Breakeven Analysis

Breakeven analysis determines the point at which the cost of the proposed system equals the cost of the current system, or the cost of a new system equals its benefits. After determining the break even point, the analyst subjectively evaluates conditions evidenced in the project to assess its acceptability. The comparison of the system costs between computerized cost and manual cost is shown in Table 3.9. Breakeven point between current system and proposed system in show in Figure 3.17.
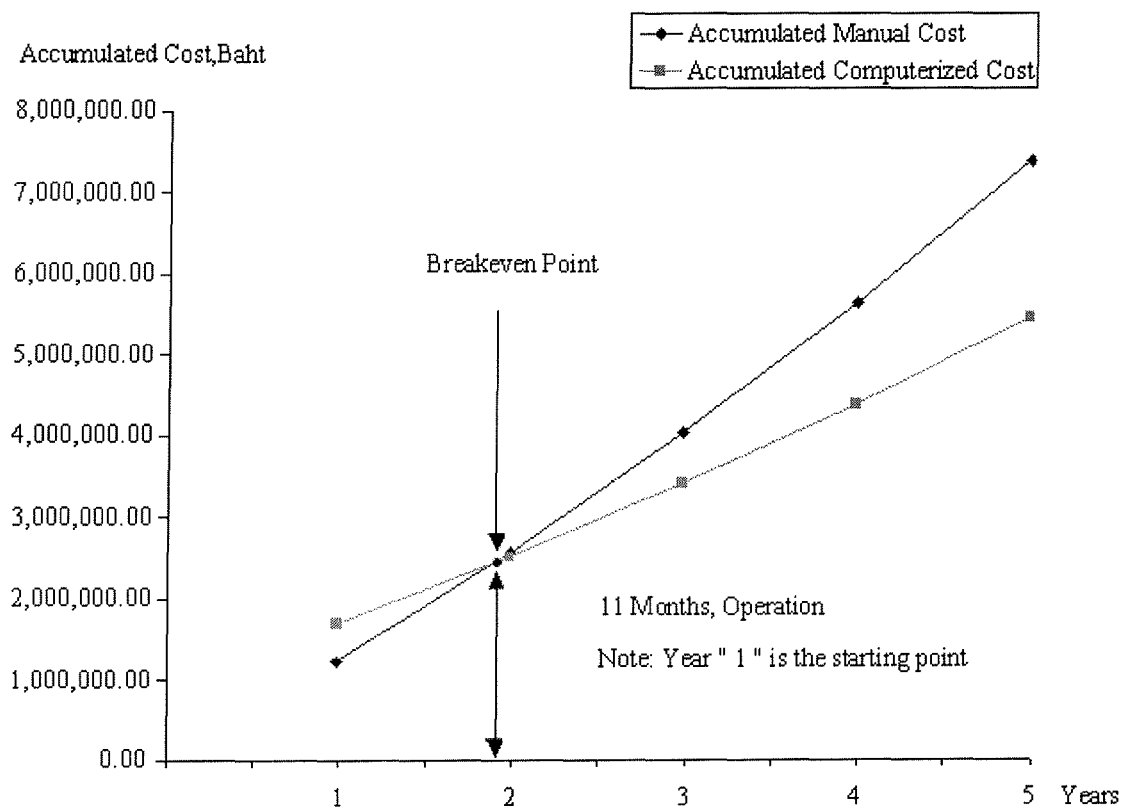
Figure 3.17.   Breakeven Point of the Project.

(5) Benefits Analysis

The benefits of the computerized system over the manual in longer range are as follows:

(a) Tangible benefits are the benefits that can be determined as the monetary value. Implementing the proposed system causes the costs of the current system to be eliminated as follows:

Reduction of utility expenses	10,000 baht
Reduction of human labor	420,000 baht
Reduction of hardware and software support	25,000 baht
Increase of Sales Improvement	360,000 baht
Total Tangible Benefits	815,000 baht

(6) Payback Analysis

The payback period is determined by the number of years required to accumulate earning sufficient to cover the cost of the proposed system.

$$P = i/(1-T)R$$

Where P = Payback Period (Year)

i = Investment Cost

T = Tax rate (12%)

R = Annual Saving realize by investment

P = 1,713,200/ {(1-12)* 815,000}

= 2.38 years

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Table 3.10. Payback Analysis for the Proposed System, Baht.

Cost Items	Years					
	0	1	2	3	4	5
Development cost	-940,000.00	-	-	-	-	-
Operation & maintenance Cost	0	-753,200.00	-822,200.00	-898,100.00	-981,590.00	-1,073,429.00
Discount factors for 12%	1	0.89	0.8	0.71	0.64	0.57
Time-adjusted costs (adjusted to present value)	0	-688,148.00	-672,160.00	-649,153.00	-637,548.80	-619,334.07
Cumulative time-adjusted costs over lifetime	-940,000.00	-1,628,148.00	-2,300,308.00	-2,949,461.00	-3,587,009.80	-4,206,343.87
Benefits derived from operation of new system	0	815,000.00	1,344,750.00	2,218,837.50	2,662,605.00	3,195,126.00
Discount factors for 12%	1	0.89	0.8	0.71	0.64	0.57
Time-adjusted costs (adjusted to present value)	0	725,350.00	1,075,800.00	1,575,374.63	1,704,067.20	1,821,221.82
Cumulative time-adjusted benefits over lifetime	0	725,350.00	1,801,150.00	3,376,524.63	5,080,591.83	6,901,813.65
Cumulative lifetime time-adjusted cost + benefit	-940,000.00	-902,798.00	-499,158.00	427,063.63	1,493,582.03	2,695,469.78

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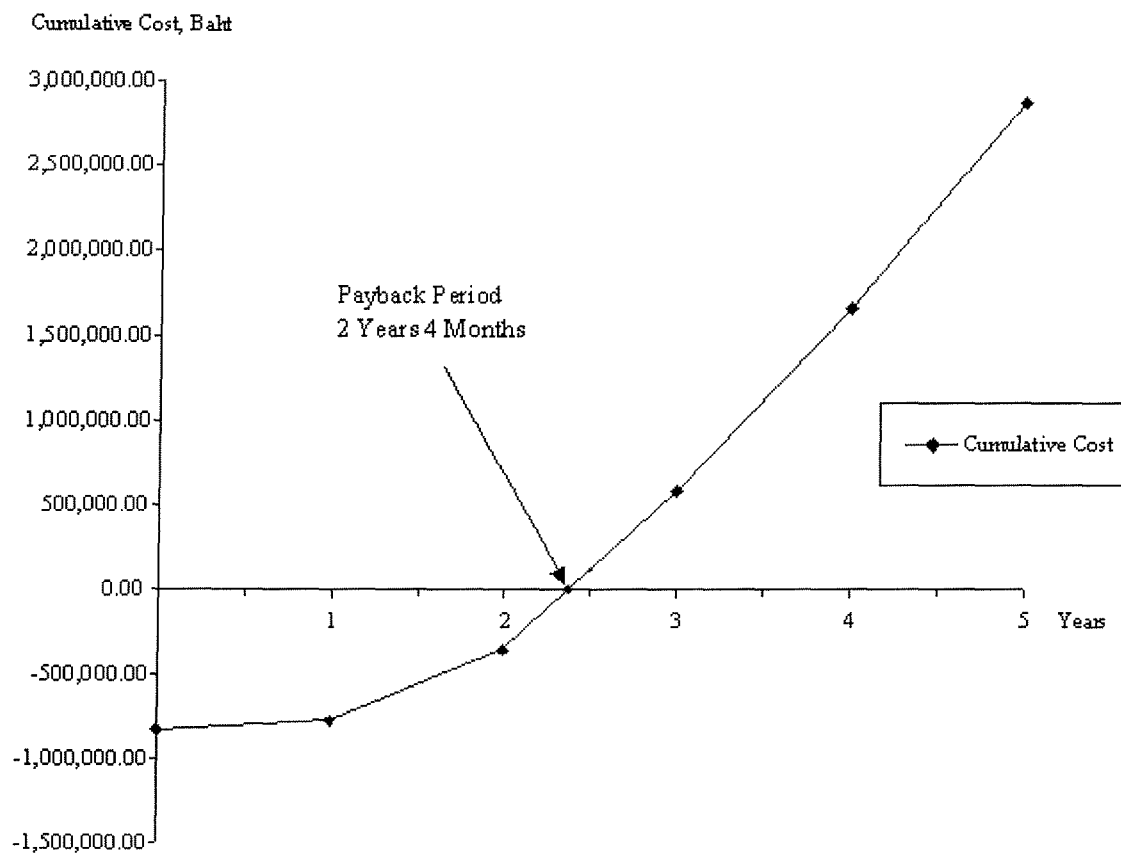
Figure 3.18.　Payback Period.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

The project objective of this implementation plan is to implement for Circle Co., Ltd.

4.2 Testing

The objective of system testing is to ensure that the system performs as promised in the user requirement phase. The testing consists of

(1) Peak load testing determines how the system would perform in periods of high demand of computer execution.

(2) Performance testing determines the length of time required for certain system operation.

(3) Recovery testing examines the ability of the system to recover from a failure.

(4) Storage testing determines the ability of the system to store a maximum amount of data.

(5) Procedure testing provides a basic test of both system and user documentation. System documentation provides directions in a procedure user's manual for operation personnel and user personnel to follow when they encounter the problems.

(6) User procedure testing ensures that the users perform a procedure exactly as shown in the user manual. If these have difficulty with the procedure, the manual needs some revising.

(7) User acceptance testing determines how the system is actually used. The following features are considered: clarity of documentation, ease of use,

how well the system satisfies user information needs, and the opinions of the users about the system.

4.3 Installation

The installation of the proposed system is to combine 2 major processes, software installation and hardware installation.

(1) Software Installation

This proposed system will need to install the database application, Microsoft Access 2000 to the server. There is no client database application as this proposed system will be developed by Visual Basic 6.0 program which will be packed into a set up package. This will be practical and easy to install into client computer. This proposed system will inspected to guarantee the efficiency of the application before installation.

(2) Hardware Installation

There must be only the necessary hardware to install for this system as shown in hardware specification. The hardware installation has to be compatible to the existing requirement and the proposed system.

4.4 Training

For new proposed system, it is needed for the user to have system training. The users must be instructed in how to operate the equipment, how the new system optimized work process and instructed troubleshooting method. The training topics cover all new proposed system process, which will be trained together with the operation process.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The new proposed system will be able to solve all existing problems. The changes to the user will be the new user interface and style that is easier than the existing system. This new system covers all utilizing database, security control, system maintenance and practical interface and process to the users. This new proposed system eliminates the problem of hardware and software limitation and also decreases the cost of maintenance including the support personnel.

Not only will this new system help the company work process, but the hardware will give the image of more high-technology than the existing one. The new proposed system also provides user and member more video tape and video compact disc information with faster service due to the new program and database software on window-based system. This will also strengthen up the member's satisfaction and royalty towards the company in terms of products and services, commitment and membership utilization. This will promote the image of Circle rental shop as a leader of VDO rental industry that has quickly adapted to the new technology.

Table 5.1 shows the time performance on each process of the proposed system compared with the existing system. It shows that the process of the proposed system perform less time than the process of the existing system due to the hardware, software and network replacement, and difference in database management. Therefore, it can be concluded that the proposed system is more efficient and effective than the existing system. Examples of cycle time reduction in various processes are as follows:

Table 5.1.   Degree of the Achievement of the Proposed System.

Process	Existing System	Proposed System
Rental Inquiry	5 minutes	2 minutes
Inventory Inquiry	5 minutes	2 minutes
Inventory Process	3 hours	2 hours
Generate Report Process	15 minutes	5 minutes

Table 5.1 shows that the rental inquiry of the proposed system takes less time than the existing system as the proposed system provides the product inquiry, member inquiry and history inquiry, which are taken directly from the database, differed from the existing system.

The proposed system can provide the company to reduce time in the inventory inquiry of the transfer, receive and adjust process from 5 to be only 2 minutes. The proposed system also helps in the Inventory process which is the month-end process in preparing inventory, comparing computerized quantity to physical quantity and adjusting the confirmed quantity, this takes only 2 hours compared to 3 hours of manual system.

Finally the proposed system will also help the company's management for generating analysis report within 5 minutes.

5.2   Recommendations

This proposed Rental System could be installed to other extended branch of rental shop in the future. The hardware, software and network function and technology will be compatible to others for several years. The company could also keep the standard process an operation of this proposed system to apply to other similar business.

The extension of the system to larger business is possible due to the compatible developing program in this new proposed system. Therefore, The head office system can manage and develop more functions and modules to centralize the rental and sales system of the shops, which means that the centralized system will keep the standard of work operation and process, and this will help optimizing work flow of the company.

It is also possible to implement the web application to apply with this proposed system in terms of Intranet and Internet. This will bring the company to be in the e-commerce business.

APPENDIX   A

DESIGN OF INPUT SCREEN

DESIGN OF INPUT SCREEN

Design of input screen shows examples of input screen of Rental system that consists of:

(1)   Member Maintenance Screen

(2)   User Maintenance Screen

(3)   Rent Type Maintenance Screen

(4)   Product Rent Type Maintenance Screen

(5)   Promotion Maintenance Screen

(6)   Inventory Receive Screen

(7)   Inventory Transfer Screen

(8)   Inventory Adjustment Screen

(9)   Monthly Inventory Screen

(10) Rental Screen

Figure A.1.   Member Maintenance Screen.

Figure A.2.   User Maintenance Screen.

Figure A.3.   Rent Type Maintenance Screen.

Figure A.4. Product Rent Type Maintenance Screen.

Figure A.5. Promotion Maintenance Screen.

Figure A.6.   Inventory Receive Screen.

Figure A.7.   Inventory Transfer Screen.

Figure A.8.   Inventory Adjust Screen.

Figure A.9. Monthly Inventory Screen.

Figure A.10.　Rental Screen.

APPENDIX   B

DESIGN OF OUTPUT SCREEN

DESIGN OF OUTPUT SCREEN

Design of input screen shows examples of input screen of financial accounting information system that consists of:

(1)   Member Status Report

(2)   User Report

(3)   Product Rent Type Report

(4)   Inventory Receive Report

(5)   Inventory Transfer Report

(6)   Inventory Adjust Report

(7)   Rental Receipt

(8)   Daily Sales Report

(9)   Tax Summary Report

(10)   Product Revenue Analysis Report

(11)   Product Frequency Report

(12)   Member Visit Analysis Report

สถานะสมาชิก				Page 1 of 1
				27 พฤษภาคม 2545
รหัสสมาชิก 34512 - 34513				22:08 น.

รหัสสมาชิก	ชื่อ		วันที่สมัคร	เช่าครั้งสุดท้าย	สถานะสมาชิก
34512	ทนงศักดิ์	วรนุจินดา	15/03/2002	08/05/2002	ปกติ
34513	ทวีชัย	สุนทรวงศ์	15/03/2002	12/05/2002	ค้างชำระเงิน
34514	นุจรีย์	พรหมพร	15/03/2002	15/05/2002	ค้างเทปคืน

Figure B.1.   Member Status Report.

ข้อมูลผู้ใช้			Page 1 of 1
			27 พฤษภาคม 2545
รหัสผู้ใช้	34021 - 34400		23:00 น.
รหัสผู้ใช้	ชื่อ	ระดับสิทธิ์	ตำแหน่ง
34021	วิชิต โอสากุล	4	ผู้จัดการร้าน
34132	นรงค์ โพสาปาน	3	ผู้ช่วยผู้จัดการร้าน
34343	นิพัฒน์ โสติกุล	1	Staff
34356	วรรณภา สกุลกิตติ	1	Staff

Figure B.2.   User Report.

รหัสสินค้า	ชื่อเรื่อง	วันที่เข้า	รหัสอัตราเช่า	ระยะเวลาเช่า		ค่าเช่า	ค่าปรับ/คืน

อัตราการเช่าของสินค้า

27 พฤษภาคม 2545

รหัสสินค้า   090340 - 090349   20:32 น.

รหัสสินค้า	ชื่อเรื่อง	วันที่เข้า	รหัสอัตราเช่า	ระยะเวลาเช่า		ค่าเช่า	ค่าปรับ/คืน
090343	Green mile	27/2/44	C	5	คืน	30.00	10.00
090345	Behind the enimy line	27/2/44	A	1	คืน	30.00	10.00
090347	The one	27/2/44	B	3	คืน	30.00	10.00

Figure B.3.   Product Rent Type Report.

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ใบรับสินค้า

27 พฤษภาคม 2545

วันที่ 27 พฤษภาคม 2545

12:25 น.

เลขที่ใบรับสินค้า R4500342

รหัสสินค้า	เรื่อง	ประเภท	ชนิด	จำนวน
090343	Green mile	Drama	Tape	20
090345	Behind the enimy line	Action	CD	30
090347	The one	Action	CD	30

Figure B.4.   Inventory Receive Report.

ใบโอนสินค้าออก

22 มิถุนายน

23:15

วันที่ 27 พฤษภาคม 2545

เลขที่โอนรับสินค้า T4500214

รหัสสินค้า	สำเนาที่	เรื่อง	ประเภท	ชนิด
090343	006	Green mile	Drama	Tape
090343	008	Green mile	Drama	Tape
090343	009	Green mile	Drama	Tape
090343	011	Green mile	Drama	Tape
090343	013	Green mile	Drama	Tape
090347	009	The one	Action	CD
090347	021	The one	Action	CD

Figure B.5.   Inventory Transfer Report.

ใบรายงานการปรับปรุงสต๊อก

วันที่ 26 พฤษภาคม 2545

21:09 น.

เลขที่การปรับปรุงสต๊อก 44909

รหัสสินค้า	สำเนาที่	เรื่อง	ชนิด	เหตุผล
090343	007	Green mile	Tape	เทปเสีย

Figure B.6.   Inventory Adjust Report.

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Figure B.7.   Rental Receipt.

รายงานยอดเช่าประจำวัน					Page 1 of 1
01/05/02 - 31/05/02					27 May 2545
					17:03 น.

วันที่	จำนวนเทป ที่เช่า	ยอดเช่า	ยอดค่าปรับ	ยอดส่วนลดโปรโมชั่น	ยอดเช่าสุทธิ
05/01/2002	350	฿10,500.00	฿750.00	฿2,000.00	฿9,250.00
รวม	฿350.00	฿10,500.00	฿750.00	฿2,000.00	฿9,250.00

Figure B.8.   Daily Sales Report.

เลขที่เครื่อง	ยอดขาย	ภาษี	หักภาษี	วันที่

ใบรายงานภาษี

เลขที่เครื่อง	ยอดขาย	ภาษี	หักภาษี	วันที่
M749-051	2,100.00	137.38	1,962.62	27/05/2002
M749-052	3,000.00	196.26	2,803.74	27/05/2002

Figure B.9.   Tax Summary Report.

รายงานรายได้สินค้า

ยอดขายถึงวันที่ 26 พฤษภาคม 2545

ลำดับรายได้ จาก มาก ไป น้อย

27 พฤษภาคม 2545

18:03 น.

รหัส	วันที่เข้า	ชื่อ	ทั้งหมด	ยอดเช่ารวม	รายได้ต่อสำเนา	สัปดาห์ที่ 1-4		
						ยอดเช่า	จำนวนครั้ง	เฉลี่ย
001002	20/4/2002	สุริโยทัย	60	42,500.00	708.33	22,500.00	800	28.13
052125	21/4/2002	A.I.	60	38,900.00	648.33	21,000.00	730	28.77
012545	28/3/2002	KNIGHT'S TALE, A	40	15,000.00	375.00	7,500.00	260	28.85
012568	15/3/2002	PRINCESS DIARIES, THE	40	14,500.00	362.50	7,000.00	240	29.17
021542	16/3/2002	FAST AND THE FURIOUS, TI	40	12,500.00	312.50	6,000.00	210	28.57

Figure B.10.   Product Revenue Analysis Report.

รหัสสินค้า	ชนิด	ชื่อไทย	ชื่ออังกฤษ	ทั้งหมด	จำนวนครั้งที่เช่า	บนชั้น
025154	เทป	มนุษย์ไร้เงา	Hollow Man	15	52	5
001002	เทป	สุริโยทัย		30	100	15
052125	เทป	หุ่นยนต์อัจฉริยะ	A.I.	25	80	20

รายงานความถี่ในการเช่าสินค้า

01/05/02 - 26/05/02

27 May 2545

17:03 น.

Figure B.11.   Product Frequency Report.

รายงานประวัติการเยี่ยมของสมาชิก						Page 1 of 1	
29/05/02 – 26/06/02						27 May 2545	
จำนวนสมาชิก : 450 คน						17:03 น.	
สัปดาห์ที่	วันจันทร์	วันอังคาร	วันพุธ	วันพฤหัสบดี	วันศุกร์	วันเสาร์	วันอาทิตย์
18	9.90%	14.53%	12.55%	13.11%	17.35%	19.31%	13.25%

Figure B.12.   Member Visit Analysis Report.

APPENDIX   C

DESIGN OF DATABASE

DESIGN OF DATABASE

Design of database shows table of database of Rental system that consists of:

(1)   MEMBER Table

(2)   USER Table

(3)   PROMOTION Table

(4)   RENT_TYPE Table

(5)   PRODUCT_RENT Table

(6)   RENTAL Table

(7)   INV_RECEIVE Table

(8)   INV_TRANSFER Table

(9)   INV_ADJUST Table

(10)   INV_RECEIVE_DETAIL Table

(11)   INV_TRANSFER_DETAIL Table

(12)   INV_ADJUST_DETAIL Table

(13)   INV_ADJUST_REASON Table

(14)   RENTAL_DETAIL Table

(15)   RETURN_DETAIL Table

(16)   STATUS Table

Table C.1.   MEMBER Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	MEMBER_ID	INT	5	Y		RENTAL	Primary key
2	NAME	CHAR	20				Attribute
3	SURNAME	CHAR	20				Attribute
4	ADDRESS1	CHAR	40				Attribute
5	ADDRESS2	CHAR	40		Y		Attribute
6	POSTCODE	CHAR	5				Attribute
7	TELEPHONE	CHAR	10		Y		Attribute
8	SEX	CHAR	1				Attribute
9	BIRTHDATE	DATE					Attribute
10	STATUS	CHAR	1				Attribute
11	REGIS_DATE	DATE					Attribute
12	COMMENT	CHAR	200		Y		Attribute

Table C.2.   USER Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	USER_ID	INT	4	Y		RENTAL	Primary Key
2	NAME	CHAR	20				Attribute
3	SURNAME	CHAR	20				Attribute
4	PASSWORD	CHAR	4				Attribute
5	AUTHO_LEVEL	CHAR	1				Attribute
6	POSITION	CHAR	20				Attribute

Table C.3. PROMOTION Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	PROMOTION_ID	INT	2	Y		RENTAL	Primary Key
2	DESCRIPTION	CHAR	30				Attribute
3	START_DATE	DATE					Attribute
4	END_DATE	DATE					Attribute
5	QTY_RENT	INT	4				Attribute
6	DISCOUNT	DECIMAL	10		Y		Attribute
7	FREE_PRODUCT_ID	INT	6		Y		Attribute
8	FREE_QTY	INT	4		Y		Attribute

Table C.4. RENT_TYPE Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	RENT_CODE	INT	2	Y		PRODUCT_RENT	Primary key
2	RENT_RATE	DECIMAL	10				Attribute
3	RENT_DAY	INT	2				Attribute
4	LATE_FEE	DECIMAL	10				Attribute

Table C.5. PRODUCT_RENT Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	PRODUCT_ID	INT	6	Y			Primary Key
2	RENT_CODE	INT	2			RENT_TYPE	
3	PRODUCT_QTY	INT	4				

Table C.6. RENTAL Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	RECEIPT_NO	INT	6	Y		RENTAL_DETAIL	Primary key
2	RECEIPT_DATE	DATE					Attribute
3	MEMBER_ID	INT	5			MEMBER	Attribute
4	USER_ID	INT	4		Y	USER	Attribute
5	PRODUCT_ID	INT	2			PRODUCT_RENT	Attribute
6	VAT	INT	2				Attribute
7	TOTAL	DECIMAL	10		Y		Attribute

Table C.7. INV_RECEIVE Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	RECEIVE_NO	CHAR	8	Y		INV_RECEIVE DETAIL	Primary key
2	RECEIVE_DATE	DATE		Y			Attribute

Table C.8. INV_TRANSFER Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	TRANSFER_NO	CHAR	8	Y		INV_TRANSFER_DETAIL	Primary key
2	TRANSFER_DATE	DATE		Y			Attribute

Table C.9. INV_ADJUST Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	ADJUST_NO	CHAR	8	Y		INV_ADJUST_DETAIL	Primary key
2	ADJUST_DATE	DATE					Attribute

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Table C.10. INV_RECEIVE_DETAIL Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	RCV_NO	CHAR	8	Y			Primary key
2	RECEIVE_NO	CHAR	8			RECEIVE	Attribute
3	PRODUCT_ID	INT	6			PRODUCT	Attribute
4	RECEIVE_QTY	INT	4				Attribute

Table C.11. INV_TRANSFER_DETAIL Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	TRAN_NO	CHAR	8	Y			Primary key
2	TRANSFER_NO	CHAR	8			INV_TRANSFER	Attribute
3	PRODUCT_ID	INT	6			PRODUCT	Attribute
4	COPY	INT	2				Attribute

Table C.12. INV_ADJUST_DETAIL Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	ADJ_NO	CHAR	8	Y			Primary Key
2	ADJUST_NO	CHAR	8			INV_ADJUST	Attribute
3	PRODDUCT_ID	INT	6			PRODUCT	Attribute
4	COPY	INT	2				Attribute
5	REASON_CODE	INT	2			INV_ADJUST_REASON	Attribute

Table C.13. INV_ADJUST_REASON Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	REASON_CODE	INT	2	Y		INV_ADJUST_DETAIL	Primary Key
2	REASON_DESC	CHAR	50				Attribute
3	MINUS	BOOLEAN					Attribute

Table C.14.　RENTAL_DETAIL Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	RENT_NO	CHAR	8	Y			Primary Key
2	RECEIPT_NO	CHAR	8			RENTAL	Attribute
3	PRODUCT_ID	INT	6			PRODUCT	Attribute
4	COPY	INT	2				Attribute
5	RENT_DATE	DATE					Attribute
6	RETURN_DATE	DATE			Y		Attribute
7	LATE_STATUS	BOOLEAN					Attribute
8	RETURN_NO	CHAR	8		Y	RETURN_DETAIL	Attribute

Table C.15.　RETURN_DETAIL Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	RETURN_NO	CHAR	8	Y			Primary Key
2	RECIEPT_NO	CHAR	8				Attribute

Table C.16.　STATUS Table.

No.	Field Name	Field Type	Field Size	Index	Nullable	Foreign Key to Table	Key Type
1	STATUS_CODE	CHAR	2	Y		MEMBER	Primary Key
2	STATUS_DESC	CHAR	50				Attribute

APPENDIX   D

PROCESS SPECIFICATION

PROCESS SPECIFICATION

Process Specification shows table of database of financial accounting information system that consists of:

(1)	Add New member	(2)	Update Member
(3)	Generate Member Report	(4)	Add New User
(5)	Update User	(6)	Generate User Report
(7)	Receive Inventory	(8)	Transfer Inventory
(9)	Adjust Inventory	(10)	Print Tape Cover
(11)	Prepare Inventory	(12)	Input Physical Inventory
(13)	Compare Inventory Quantity	(14)	Adjust Quantity
(15)	Add New Rent Type	(16)	Update Rent Type
(17)	Update Product	(18)	Generate Rent Type Report
(19)	Add New Promotion	(20)	Update Promotion
(21)	Delete Promotion	(22)	Generate Promotion Report
(23)	Validate User	(24)	Verify Member
(25)	Check Out Tape	(26)	Generate Receipt
(27)	Void Receipt	(28)	Check In Tape
(29)	Calculate Due Date	(30)	Calculate Late Fee
(31)	Generate Late Fee Receipt	(32)	Update Member Status
(33)	Calculate Overdue Date	(34)	Generate Late Letter
(35)	Generate Analysis Report		

PROCESS SPECIFICATION

Table D.1.   Process Specification of Process 1.1.

Items	Descriptions
Process Name:	Add New Member
Data In:	Member Information
Data Out:	Member Record
Process:	(1) Get necessary customer data, name, address, phone number, etc. (2) Record the customer data into Member database (3) Get Member ID from database

Table D.2.   Process Specification of Process 1.2.

Items	Descriptions
Process Name:	Update Member
Data In:	Member ID
Data Out:	Member Record
Process:	(1) Key in Member ID to search member data the database (2) Change member information (3) Update modified member information

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Table D.3. Process Specification of Process 1.3.

Items	Descriptions
Process Name:	Generate Member Report
Data In:	Member Information
Data Out:	Member Report
Process:	(1) Select Member or select all member with criteria (2) Print out Member Report

Table D.4. Process Specification of Process 2.1.

Items	Descriptions
Process Name:	Add New User
Data In:	User Information
Data Out:	User Record
Process:	(1) Get user name, position and password (2) Assign user account, and set up Authorization level (3) Record user data into User database

Table D.5. Process Specification of Process 2.2.

Items	Descriptions
Process Name:	Update User
Data In:	User ID
Data Out:	User Record
Process:	(1) Key in User ID to search user data from the database (2) Change user data (3) Update modified user data

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Table D.6. Process Specification of Process 2.3.

Items	Descriptions
Process Name:	Generate User Report
Data In:	User Information
Data Out:	User Report
Process:	(1) Select user or select all users (2) Print out User Report

Table D.7. Process Specification of Process 3.1.1.

Items	Descriptions
Process Name:	Receive Inventory
Data In:	Product Information Received Product
Data Out:	Receiving Report
Process:	(1) Key in Product ID to search product information from database (2) Key in the quantity of the received product (3) Record into Inventory database (4) Print out Receiving Report

Table D.8. Process Specification of Process 3.1.2

Items	Descriptions
Process Name:	Transfer Inventory
Data In:	Product Information Transferred Product
Data Out:	Transfer Report
Process:	(1) Key in Product ID to search product information from database (2) Key in the quantity of the transferred product (3) Record into Inventory database (4) Print out Transfer Report

Table D.9. Process Specification of Process 3.1.3.

Items	Descriptions
Process Name:	Adjustment Inventory
Data In:	Product Information Adjusted Product
Data Out:	Transfer Report
Process:	(1) Key in Product ID to search product information from database (2) Key in the quantity of the adjusted product (3) Record into Inventory database (4) Print out Adjustment Report

Table D.10. Process Specification of Process 3.2.

Items	Descriptions
Process Name:	Print Tape Cover
Data In:	Product Information Product Quantity
Data Out:	Tape and Video Compact Disc Cover
Process:	(1) Key in Product ID to search product information from database (2) Specify quantity of cover to print (3) Tape and Video Compact Disc Cover

Table D.11. Process Specification of Process 3.3.1.

Items	Descriptions
Process Name:	Prepare Inventory
Data In:	Product Information Current Product Inventory Quantity
Data Out:	Computerized Inventory Quantity
Process:	(1) Select Product ID to search product information from database or all product from database (2) Prepare Product Inventory Quantity

Table D.12. Process Specification of Process 3.3.2.

Items	Descriptions
Process Name:	Input Physical Inventory
Data In:	Product ID Inventory Quantity
Data Out:	Physical Inventory Quantity
Process:	(1) Select Product ID to search product information from database or all product from database (2) Prepare Physical Inventory Quantity

Table D.13. Process Specification of Process 3.3.3.

Items	Descriptions
Process Name:	Compare Inventory Quantity
Data In:	Product Information Computerized Inventory Quantity Physical Inventory Quantity
Data Out:	Different Inventory Quantity
Process:	(1) Compare Computerized Inventory Quantity and Physical Inventory Quantity (2) Prepare Different Inventory Quantity

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Table D14.   Process Specification of Process 3.3.4.

Items	Descriptions
Process Name:	Adjust Inventory Quantity
Data In:	Product Information Different Inventory Quantity
Data Out:	Adjustment Report
Process:	(1) Select Product ID from database (2) Adjust different quantity (3) Confirm quantity adjustment (4) Print out Adjustment Reports

Table D.15.   Process Specification of Process 4.1.1.

Items	Descriptions
Process Name:	Add New Rent Type
Data In:	Rent Type Price
Data Out:	Rent Type Record
Process:	(1) Add new rent code, price, rent day and late fee (2) Record the rent type data into rent type Database

Table D.16.   Process Specification of Process 4.1.2.

Items	Descriptions
Process Name:	Update Rent Type
Data In:	Rent Code
Data Out:	Rent Type Record
Process:	(1) Key in Rent Code to search Rent Type data from the database (2) Change Rent Type data (3) Update modified Rent Type data

Table D.17. Process Specification of Process 4.1.3.

Items	Descriptions
Process Name:	Update Product
Data In:	Product ID Rent Code
Data Out:	Product Rent Record
Process:	(1) Key in Product ID to search Product data from the database (2) Key in Rent Code to search Rent Type from the database (3) Set Rent Code to Product Rent record (4) Update Product Rent record

Table D.18. Process Specification of Process 4.1.4.

Items	Descriptions
Process Name:	Generate Rent Type Report
Data In:	Rent Type Product Rent Product Information
Data Out:	Rent Type Report
Process:	1) Key in Rent Code to search Rent Type data from the database 2) Get Rent Type and Product information 3) Update modified Rent Type data

Table D.19.   Process Specification of Process 4.2.1.

Items	Descriptions
Process Name:	Add New Promotion
Data In:	Promotion Information
Data Out:	Promotion Record
Process:	1) Add new promotion data, promotion period, quantity rent, discount, free quantity and free product 2) Record the promotion data into Promotion database 3) Get Promotion ID from database

Table D.20.   Process Specification of Process 4.2.2.

Items	Descriptions
Process Name:	Update Promotion
Data In:	Promotion ID
Data Out:	Promotion Record
Process:	(1) Key in Promotion ID to search Promotion data from the database (2) Modify Promotion (3) Update Promotion record

Table D.21.　Process Specification of Process 4.2.3.

Items	Descriptions
Process Name:	Delete Promotion
Data In:	Promotion ID
Data Out:	Promotion Record
Process:	(1) Key in Promotion ID to search Promotion data from the database (2) Delete expired promotion record (3) Update Promotion record

Table D.22.　Process Specification of Process 4.2.4.

Items	Descriptions
Process Name:	Generate Promotion Report
Data In:	Promotion ID
Data Out:	Promotion Report
Process:	(1) Select Promotion ID or all records from Promotion database (2) Select period and criteria (3) Print out Promotion Report

Table D.23.　Process Specification of Process 5.1.1.

Items	Descriptions
Process Name:	Validate User
Data In:	User ID
Data Out:	Valid
Process:	(1) Key in User ID to search User data from the database (2) Key in password to validate authorization (3) Get valid authorization and start to make rental

Table D.24. Process Specification of Process 5.1.2.

Items	Descriptions
Process Name:	Verify Member
Data In:	Member ID
Data Out:	Valid
Process:	(1) Key in Member ID to search Member data from the database (2) Verify Member and check member status (3) Get valid customer status and start to rent tape

Table D.25. Process Specification of Process 5.1.3.

Items	Descriptions
Process Name:	Check Out Tape
Data In:	Product ID Product Copy Product Information
Data Out:	Rental Detail
Process:	(1) Key in Product ID and copy to search Product data from the database (2) Calculate the rent price (3) Prepare rental detail

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Table D.26.   Process Specification of Process 5.1.4.

Items	Descriptions
Process Name:	Generate Receipt
Data In:	Rental Detail
Data Out:	Receipt
Process:	(1) Get all rental detail and calculated total price (2) Print out Receipt (3) Update Rental record and Rental Detail record

Table D.27.   Process Specification of Process 5.1.5.

Items	Descriptions
Process Name:	Void Receipt
Data In:	User ID Member ID Product Information
Data Out:	Non-amount Receipt
Process:	(1) Key in User ID to search User data from the database (2) Key in Member ID to search Member data from the database (3) Select Void transaction (4) Key in Product ID to be void (5) Update rental detail record (6) Calculate price (7) Print out Non-amount Receipt

Table D.28.　Process Specification of Process 5.2.1.

Items	Descriptions
Process Name:	Check In Tape
Data In:	Product ID Product Copy
Data Out:	Rental Detail Verification
Process:	(1)　Key in Product ID and copy to search Product data from the database (2)　Verify Rental Detail record

Table D.29.　Process Specification of Process 5.2.2.

Items	Descriptions
Process Name:	Calculate Due Date
Data In:	Rental Detail Verification
Data Out:	Overdue date data
Process:	(1)　Get Rental Detail Verification (2)　Calculate due date (3)　Calculate over due date (4)　Prepare overdue date data

Table D.30.　Process Specification of Process 5.2.3.

Items	Descriptions
Process Name:	Calculate Late Fee
Data In:	Overdue Date Data Rent Type Information
Data Out:	Late Fee Amount
Process:	(1)　Get overdue date data (2)　Get rent type late fee rate (3)　Calculate late fee amount

Table D.31.　Process Specification of Process 5.2.4.

Items	Descriptions
Process Name:	Generate Receipt
Data In:	Late Fee Amount Member Information Product Information
Data Out:	Late Fee Receipt
Process:	(1) Get late fee amount (2) Get member information (3) Get product information (4) Print out Late Fee Receipt

Table D.32.　Process Specification of Process 5.2.5.

Items	Descriptions
Process Name:	Update Member Status
Data In:	Rental Detail Member ID Product Information
Data Out:	Unreturned Rental Detail
Process:	(1) Get Rental Detail with overdue return date (2) Get Member Information (3) Get Product Information (4) Prepare Unreturned Rental Detail

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Table D.33. Process Specification of Process 5.2.6.

Items	Descriptions
Process Name:	Calculate Due Date
Data In:	Unreturned Rental Detail
Data Out:	Overdue date data
Process:	(1) Get Unreturned Rental Detail (2) Calculate due date (3) Calculate overdue date (4) Prepare overdue date data

Table D.34. Process Specification of Process 5.2.7.

Items	Descriptions
Process Name:	Generate Late Letter
Data In:	Member Information Product Information Unreturned Rental Detail Overdue date data
Data Out:	Late Letter
Process:	(1) Get member name and address (2) Get unreturned rental detail and product name (3) Print out Late Letter

Table D.35.   Process Specification of Process 5.3.

Items	Descriptions
Process Name:	Generate Analysis Report
Data In:	Member Information Product Information Rental Detail Promotion
Data Out:	Analysis Report
Process:	(1) Select type of analysis report (2) Select analysis criteria (3) Print out Analysis Report

APPENDIX   E

DATA DICTIONARY

DATA DICTIONARY

Table E.1. MEMBER Table.

Field Name	Meaning
MEMBER_ID	Member's ID
NAME	Member's firstname
SURNAME	Member's surname
ADDRESS1	Member's address (house number, road)
ADDRESS2	Member's address (district and province)
POSTCODE	Member's postcode
TELEPHONE	Member's telephone number
SEX	Member's sex
BIRTHDATE	Member's birthdate
STATUS	Member's rental status
REGIS_DATE	Member's register date
COMMENT	Comment for member

Table E.2. USER Table.

Field Name	Meaning
USER_ID	User's ID
NAME	User's firstname
SURNAME	User's surname
PASSWORD	User's password
AUTHO_LEVEL	User's authorization level to use system
POSITION	User's postion in the company

Table E.3. PROMOTION Table.

Field Name	Meaning
PROMOTION_ID	Promotion ID
DESCRIPTION	Promotion description
START_DATE	Promotion start date
END_DATE	Promotion end date
QTY_RENT	Promotion rental quantity
DISCOUNT	Discount given when the condition meet
FREE_PRODUCT_ID	Free premium given when the condition meet
FREE_QTY	Free rental product given when the condition meet

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Table E.4. RENT_TYPE Table.

Field Name	Meaning
RENT_CODE RENT_RATE RENT_DAY LATE_FEE	Rent code Rate for rent Days for rent Fee for late return tape

Table E.5. PRODUCT_RENT Table.

Field Name	Meaning
PRODUCT_ID RENT_CODE PRODUCT_QTY	Product ID Rent code Quantity of product

Table E.6. RENTAL Table

Field Name	Meaning
RECEIPT_NO RECEIPT_DATE MEMBER_ID USER_ID PROMOTION_ID VAT	Receipt number Date of receipt Member's ID User's ID Promotion ID Value added tax

Table E.7. INV_RECEIVE Table.

Field Name	Meaning
RECEIVE_NO RECEIVE_DATE	Inventory receive number Inventory receive date

Table E.8. INV_TRANSFER Table.

Field Name	Meaning
TRANSFER_NO TRANSFER_DATE	Inventory transfer number Inventory transfer date

Table E.9. INV_ADJUST Table.

Field Name	Meaning
ADJUST_NO ADJUST_DATE	Inventory adjustment number Inventory adjustment date

Table E.10. INV_RECEIVE_DETAIL Table.

Field Name	Meaning
RCV_NO RECEIVE_NO PRODUCT_ID RECEIVE_QTY	Automatic number of receive number Receive number Product ID Quantity of receive

Table E.11. INV_TRANSFER_DETAIL Table.

Field Name	Meaning
TRAN_NO TRANSFER_NO PRODUCT_ID COPY	Automatic number of transfer detail number Transfer number Product ID Quantity of copy of Product

Table E.12. INV_ADJUST_DETAIL Table.

Field Name	Meaning
ADJ_NO	Automatic number of adjustment detail number
ADJUST_NO	Adjustment number
PRODDUCT_ID	Product ID
COPY	Quantity of copy of Product
REASON_CODE	Reason code

Table E.13. INV_ADJUST_REASON Table.

Field Name	Meaning
REASON_CODE	Reason code for adjustment
REASON_DESC	Description of reason
MINUS	Indication of the inventory to be subtracted or added

Table E.14. RENTAL_DETAIL Table.

Field Name	Meaning
RENT_NO	Rent number
RECEIPT_NO	Receipt number
PRODUCT_ID	Product ID
COPY	Quantity of copy of Product
RENT_DATE	Rent date
RETURN_DATE	Return date
LATE_STATUS	Status for late return tape
RETURN_NO	Return number

Table E.15. RETURN_DETAIL Table.

Field Name	Meaning
RETURN_NO	Return number
RECIEPT_NO	Receipt number

Table E.16.   STATUS Table.

Field Name	Meaning
STATUS_CODE STATUS_DESC	Status code for member Description of status

APPENDIX   F

STRUCTURE CHART

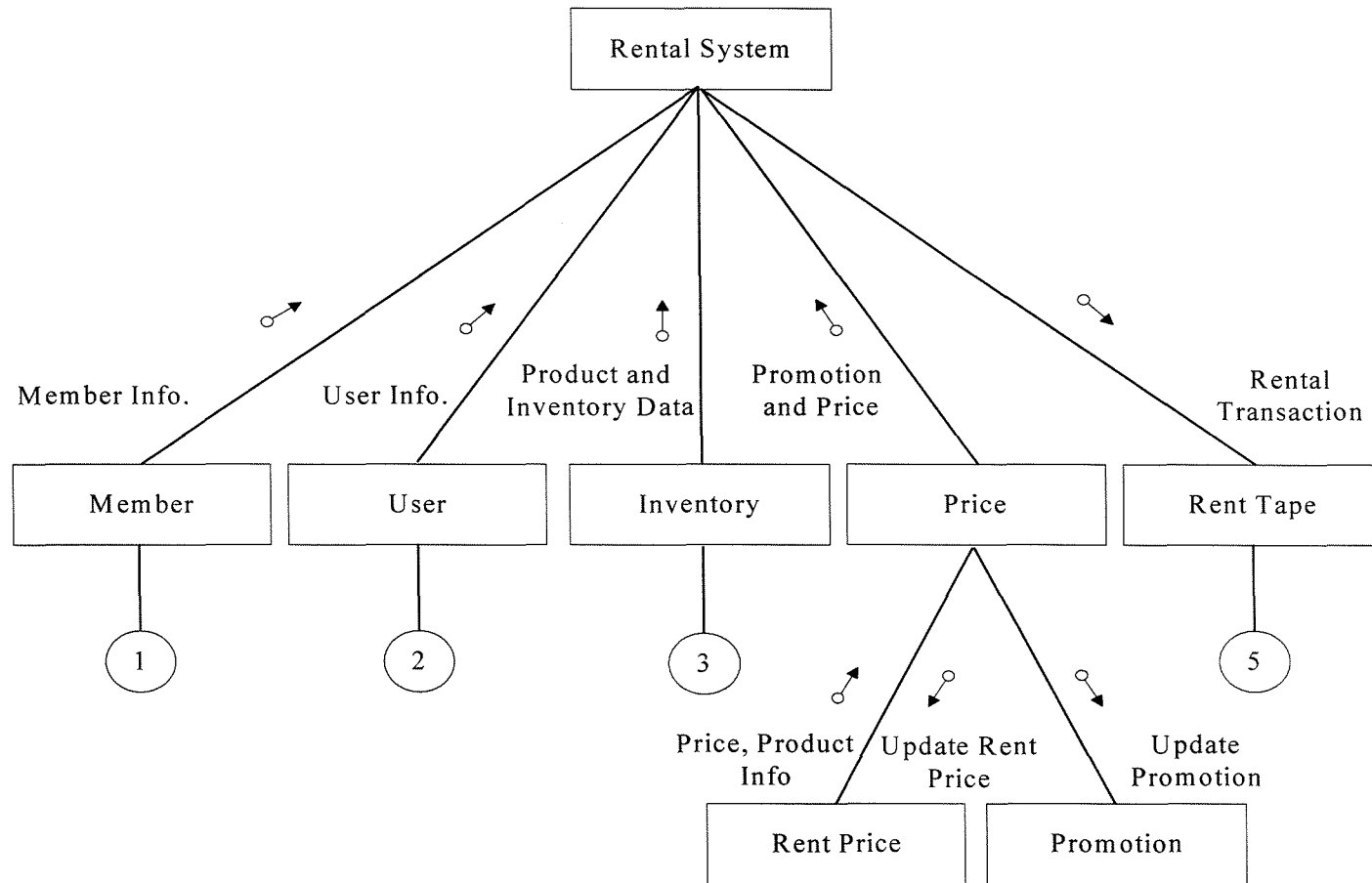Figure F.1.   Structure Chart of Rental System.
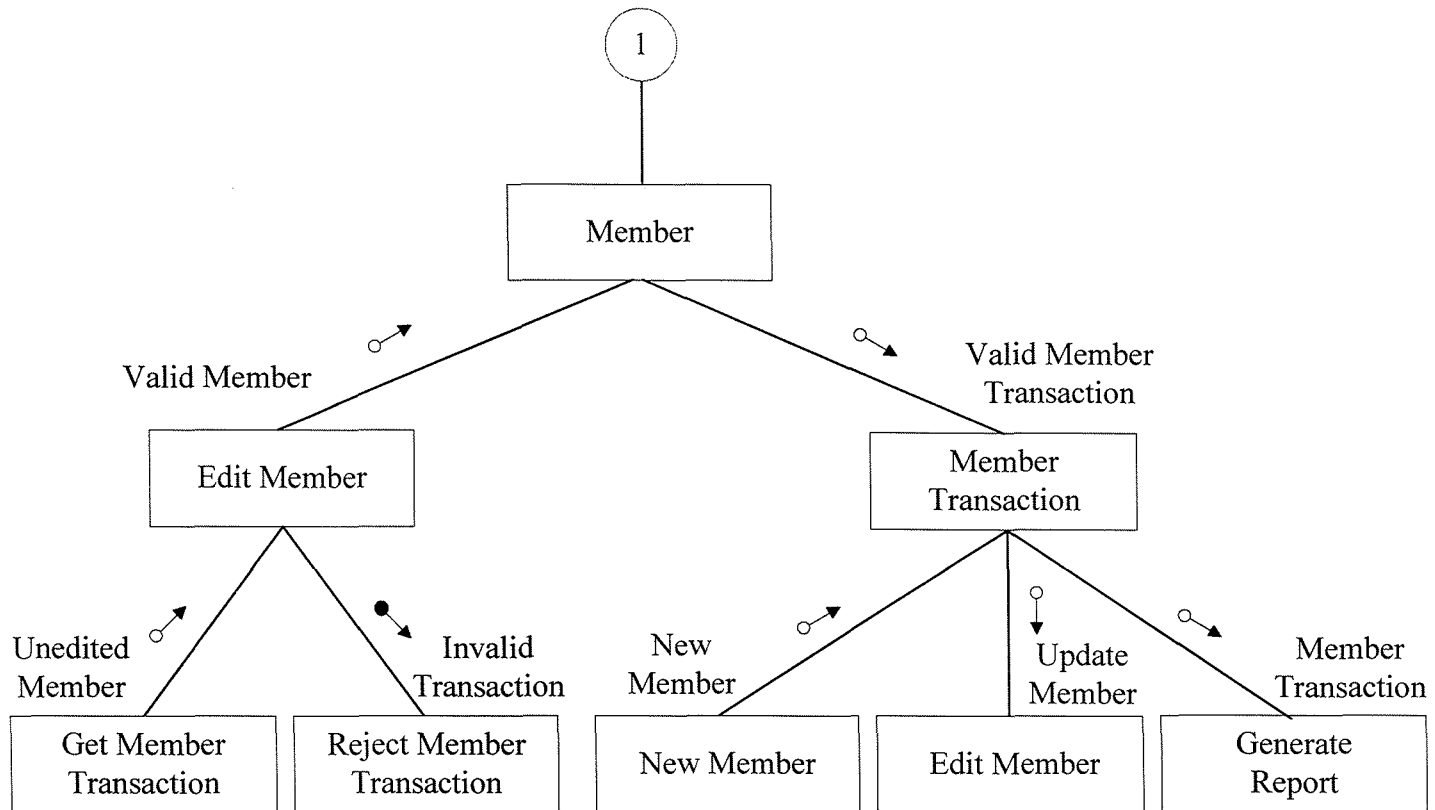
Figure F.2. Structure Chart of Member Process.

```
                                    ( 2 )
                                      |
                              +---------------+
                              |     User      |
                              +---------------+
                             /                 \
                  o→                              o→
             Valid User                      Valid User
                  /                          Transaction
      +---------------+                   +---------------+
      |   Edit User   |                   |     User      |
      +---------------+                   |  Transaction  |
          /        \                      +---------------+
      o→          ●→                      /      |      \
  Unedited      Invalid          o→        o↓         o→
   User        Transaction     New        Update      User
                               User        User      Transaction
+-----------+ +-----------+  +-----------+ +-----------+ +-----------+
| Get User  | |Reject User|  |           | |           | | Generate  |
|Transaction| |Transaction|  | New User  | | Edit User | |  Report   |
+-----------+ +-----------+  +-----------+ +-----------+ +-----------+
```
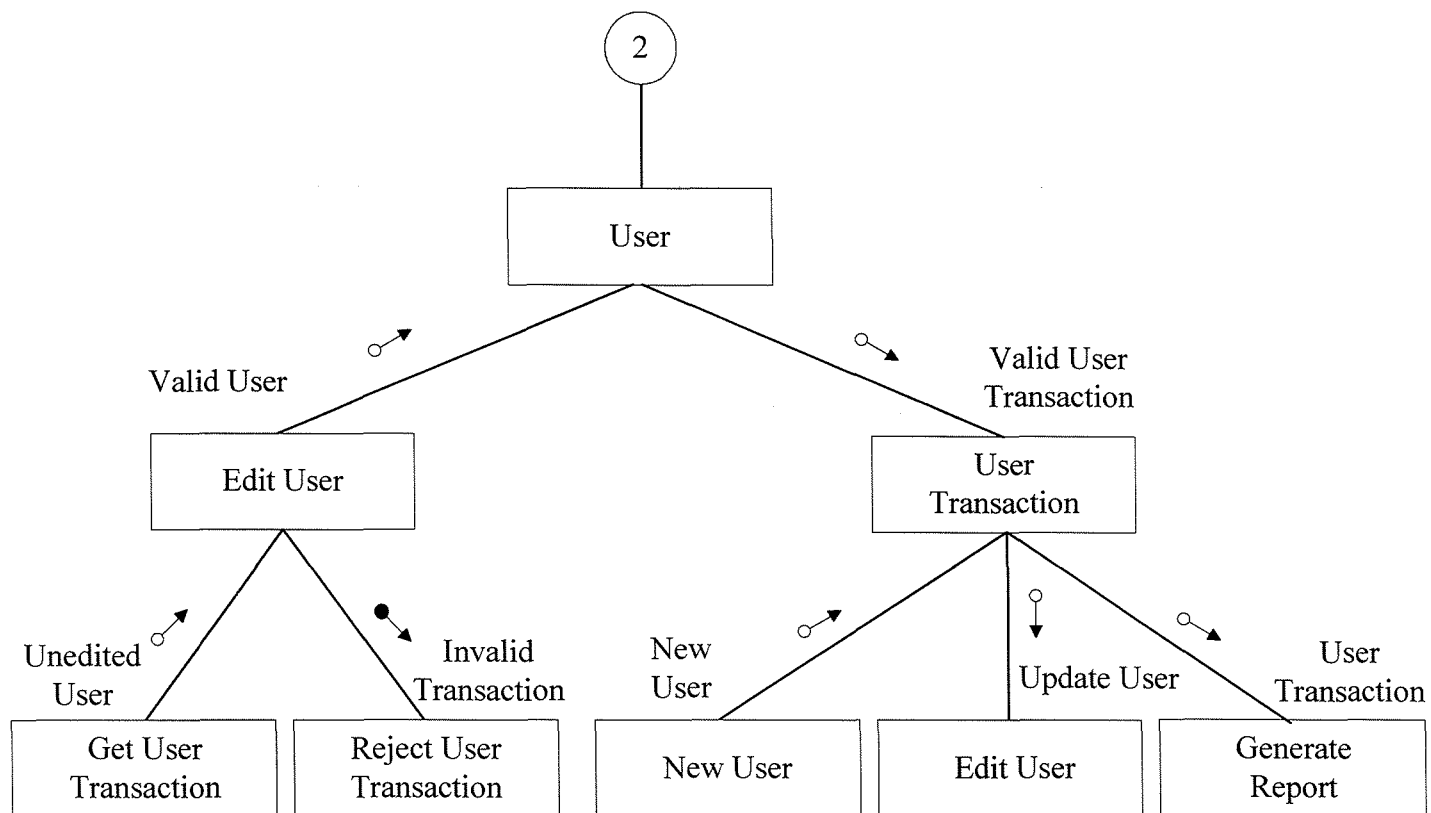
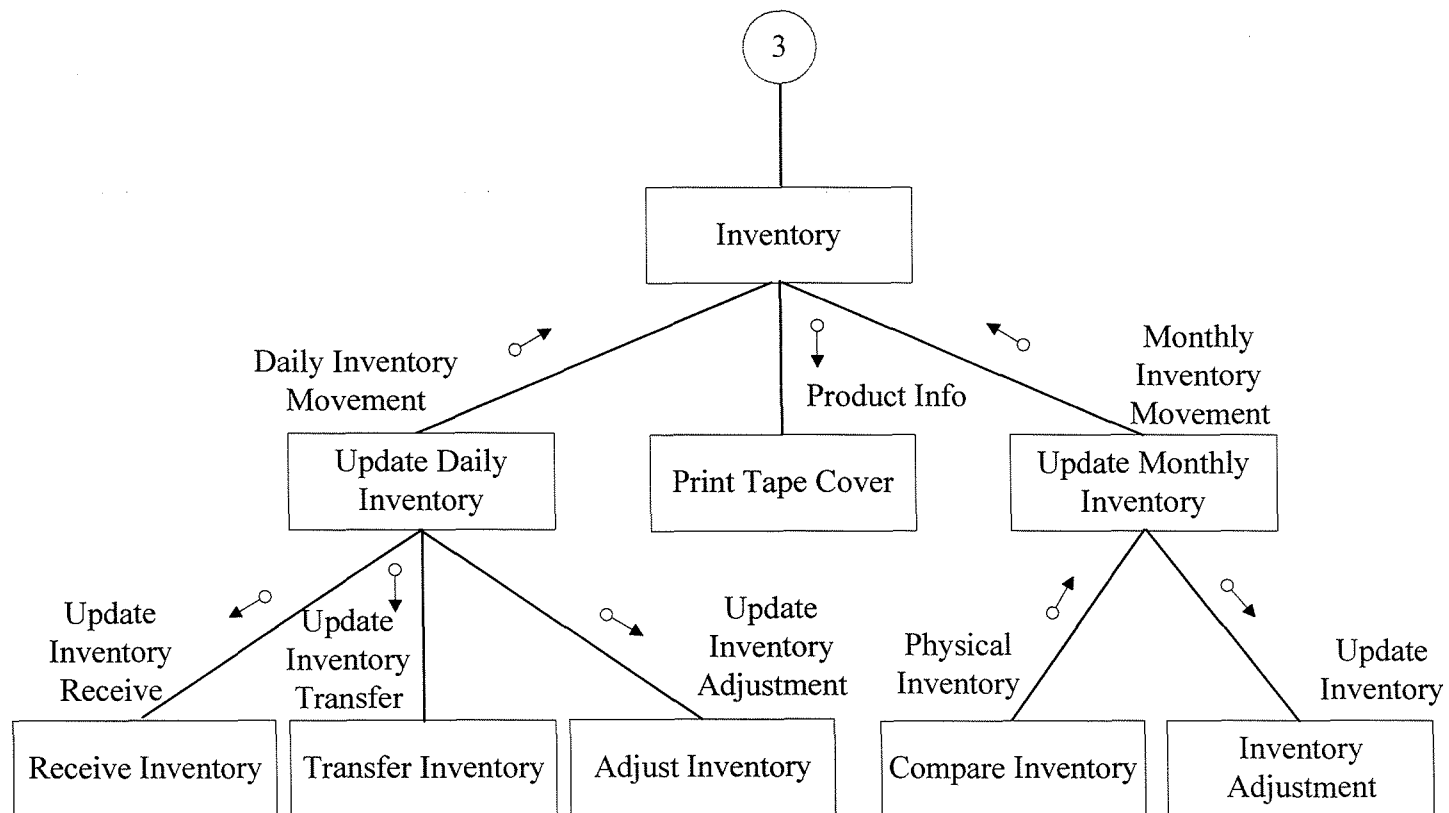Figure F.3.   Structure Chart of User Process.

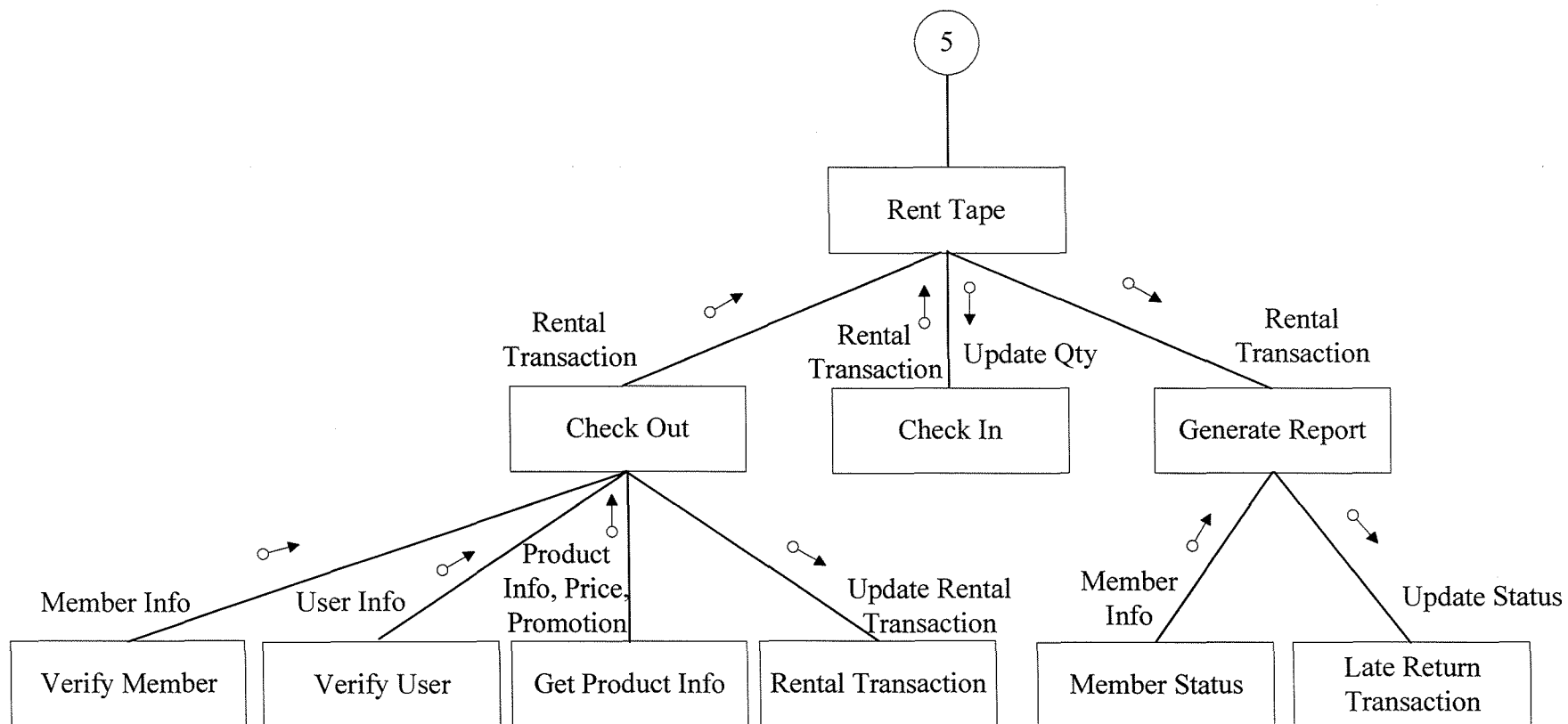Figure F.4.   Structure Chart of Inventory Process.

Figure F.5.   Structure Chart of Rent Tape Process.

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