



Car Park Control System for Sharing Co., Ltd.

by

Ms.Patcharin Pratyapruit

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

Submitted in Partial Fulfillment  
of the Requirements for the Degree of  
Master of Science  
in Computer Information Systems  
Assumption University

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Project Title            Car Park Control System for Sharing Co., Ltd.

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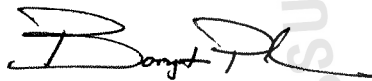
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The Graduate School of Assumption University has approved this final report of the three-credit course, CS 6998 System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information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

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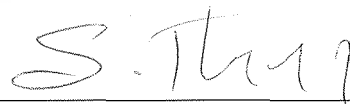
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## ABSTRACT

This project is constructed for developing car park control system of Sharing Co., Ltd. in order to analyze and design the computerized system for customer convenience and system enhancement for sharing Co., Ltd. which is involved with office space rental and chamber rental business for occasional events by using space of Live Tower. The company working schedule is 07.15-08.14 am. and 04.55 – 05.45 pm. because of congestion within the tower and other troubles such as punctuality and no parking space for visitors. Therefore, Sharing Co., Ltd realizes all these problems and desires to amend the parking lot from the existing system which is only manual work into computerized system as well as being able to connect with the corporate network system. The operation of new system would help visitors searching parking space in each storey without wasting time by calculating the number of cars parked in each floor. It also can specify parking floor of corporate employees including calculating parking fee of the visitors who do not specify the company. Besides, the system can also connect to the accounting and administration system for the use of vehicle report verification in the car park and parking fee. Furthermore, the information can be used in other advantages as well.

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 proposed 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 proposed system. Thriving of this system will be operated by the steps which are mentioned in the project plan.

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## **I. INTRODUCTION**

### **1.1 Background of the Project**

Sharing Co., Ltd. is an organization that offers completed services of architectural and interior design, construction supervision and management as well as graphics. Live Tower is the new project of the Organization that provides the office tower, business facilities and parking for more than 400 cars.

The Organization has 120 employees working for 6 divisions. The main activities of the Organization are to lease the office areas and conference rooms as well as to collect the parking fee from the parked cars that have no permission ticket and valid company's seal.

Live Tower is a ten-storey building with 50,000square meters. The ground floor is the reception area. The second floor and the third floor are arranged as the main conference room. The general office area is provided, as an open type laid out by system partitions and system furniture, from the fourth floor to the tenth floor. There are ten companies leasing the general office area for running their businesses. Approximately 300 employees of those companies have their own cars and facilitate the parking lot which is provided at the back part of the building from the ground floor to the eighth floor.

Currently, the Tower has no car park control system. There is a lot of traffic during the peak hours, i.e. during 7:45 – 9:00 am. and 5:00 – 6:00 pm. In the peak hours, there is a large number of cars and the traffic is very slow. Consequently, the employees arrived their workplace late. Some of them cannot, even, find an available parking lot.

## **1.2 Objectives of the Project**

This project is established in order to develop a car park control system for the Organization. This project needs to achieve the following :

- (1) To study, identify and analyze the problems in the existing system.
- (2) To design the new appropriate system for the car park control.
- (3) To improve the traffic condition during the peak hours.
- (4) To provide better service to customers.
- (5) To gain impression that leads to increase the trading opportunity.

## **1.3 Scope of the Project**

The new system would include the function to control the car park, which aims to solve the existing problems. This project covered the following functions:

- (1) Collect customers and parking lot information.
- (2) Provide the availability of the parking lot to drivers.
- (3) Calculate parking fee.

## **1.4 Deliverables**

The deliverables of the Car Park Control System project are as follows:

- (1) Project Introduction
  - (a) Background of the project
  - (b) Objectives
  - (c) Scope
  - (d) Deliverables
  - (e) Project Plan

- (2) The Existing System
  - (a) Background of the organization
  - (b) Current problems and areas for improvements
  - (c) Existing computer system
- (3) The Proposed System
  - (a) System specification
    - (1) Context diagram
    - (2) Data flow diagram
    - (3) Entity Relationship diagram
  - (b) System design
  - (c) Hardware and software requirement
  - (d) Security and controls
  - (e) Cost/Benefit analysis
- (4) Project Implementation
- (5) Conclusion and Recommendation

## 1.5 Project Plan

The Revise of Sharing Co., Ltd. is a system development specially a part of the car parking system. It can be connected to accounting and administration department. Also make the car parking system to increase a potential. The whole schedule of the new computerized system is about 3 months. The project is planned as follows:

### (1) System Analysis Phase

The period of time about a month to learn and analyze the existing system. It identifies problems that it found and write out to Cont. It creates for DFD. After that it brings all information to analysis. It shows the expense and benefits that will receive from this system.

(2) System Design Phase

It brings the information from an analysis of the existing system to analyze and design the purpose system to increase a potential. Separately work by making report, database, network and program is clearly see the working of this proposed system.

(3) System Implementation Phase

This system is a code writing of a program to use together with the proposed system. After a program is done, it begins to test the proposed system that how much it works to the propose system requirement. Then put the hardware and software into the system and test this system working by users.

This Project plan of Sharing Co., Ltd.: Car Park Control System is given in Figure1.1.



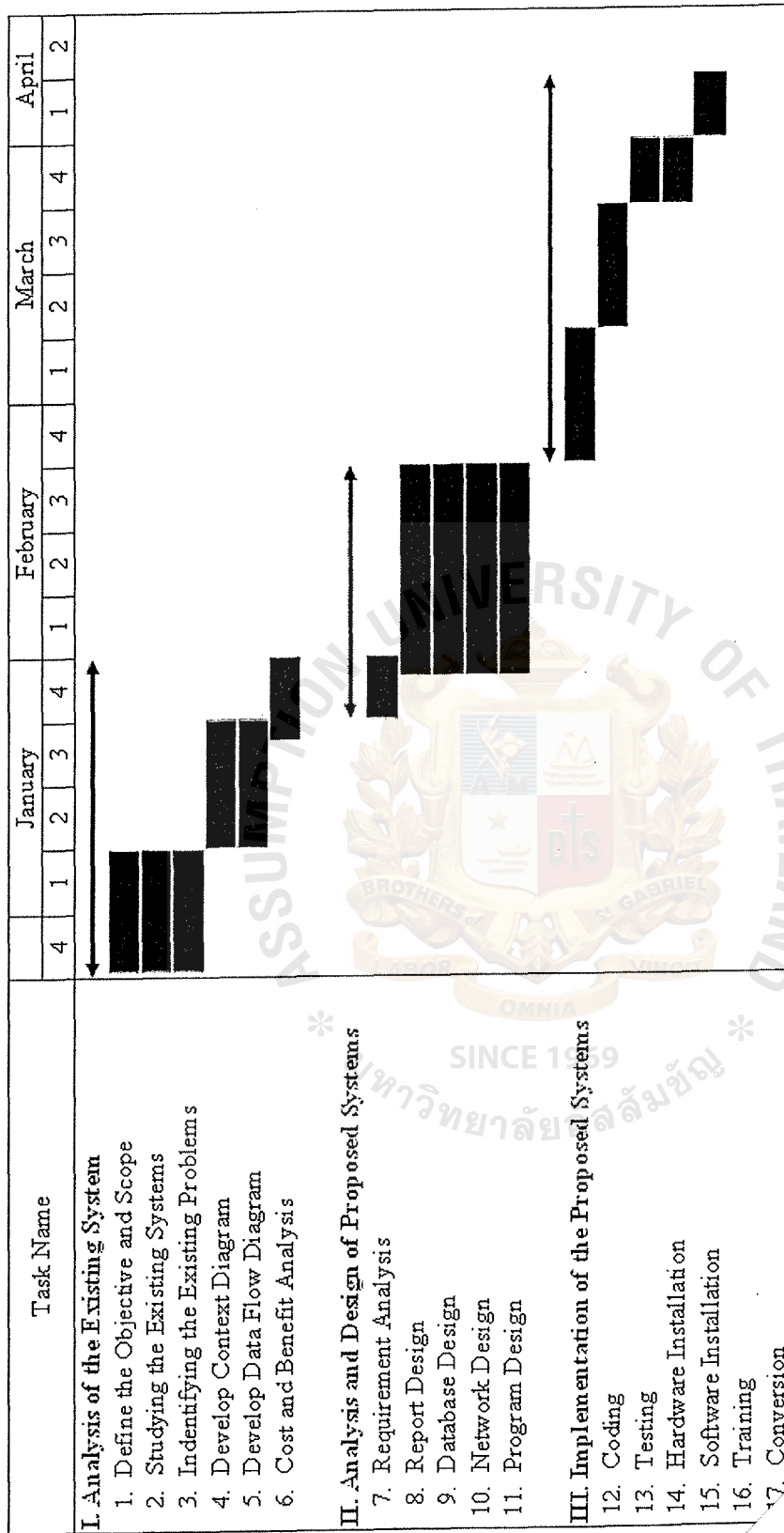


Figure 1.1. Project Plan of Sharing Co., Ltd.: Car Park Control System.

## II. THE EXISTING SYSTEM

### 2.1 Background of the Organization

Sharing Co., Ltd. established in 2000 from Thailand economy began to pick up that made business high and a lot of new companies were found. So these companies need area for offices. If they had to pay for land or building, it means immense investment. However some companies had not enough money for doing it. Therefore new companies like to find some places that were in preparation for office rent. Sharing Co., Ltd. saw those companies's need. Then it decided to construct the building (10 floor) on 50,000 square meters and gave the name "Live Tower". The Live Tower is made for office rent and cover to seminar room and event area.

Sharing Co., Ltd. shares the segment to 6 divisions which are Purchasing and Marketing Division, Administration Division, Personnel Division, Financial and Accounting Division, Maintenance Division, and Information Technology Division. Staffs of each division are controlled by each manager. Every work of division is connected by the computer system and use LAN to transfer information in the company. The Live Tower has internal car parking separated from division of the company. Every information of cars in-out to the Live Tower has back-up everyday. And then the operator brings that information to financial and accounting division and administration division is keep it.

The organization chart of Sharing Company is comprised of 6 divisions as shown in Figure 2.1.

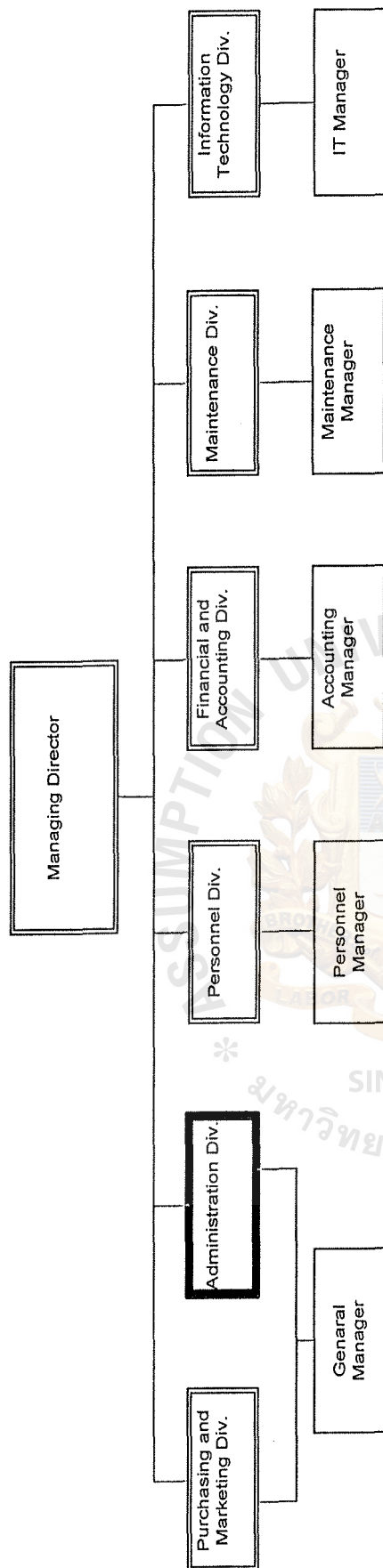


Figure 2.1. Organization Chart of Sharing Co., Ltd.

## 2.2 Business Functions and Operations

There are various departments of Sharing Company as follows:

(1) Purchasing Division

This department is buying material or merchandise for sale to the customer if the company cannot manufacture and office equipment for each division requirement. Also accumulates catalogs and prices by calculating for the best benefits to the company.

(2) Administration Division

This department is most important of the company. It includes chief executive officer, director and board to administrate and determine the company policy, planning strategy altogether short term and long term. Every division must work by following to the policy and support administration division.

(3) Personnel Division

This department manages about human resource such as recruitment, draft contract, keep all evidence and profile of employees also absence-sick leave record. Although personal problem of employee can be discussed with the personnel officer.

(4) Accounting Division

This department applies the principles of accounting within an assigned area of accounting. Creates and interprets moderately complex financial statements and reports. Some familiarity with and an awareness of the laws and regulations that apply to an accounting function are required to ensure compliance.



(5) Maintenance Division

This department is responsible to maintain priorities of work, adequate work loads, preventative maintenance, scheduling, performing staff evaluations and work documentation. In charge of oversee all work performed, ensure consistent level of quality. Moreover, all vehicles should be in a safe condition to be used.

(6) Information Technology Division

This department performs audits of organization's new or current information systems. Evaluates operating practices to determine if controls and security measures are adequate. Assesses dependability of information systems and locate data.

The context diagram of the existing business process is depicted in Figure 2.2.

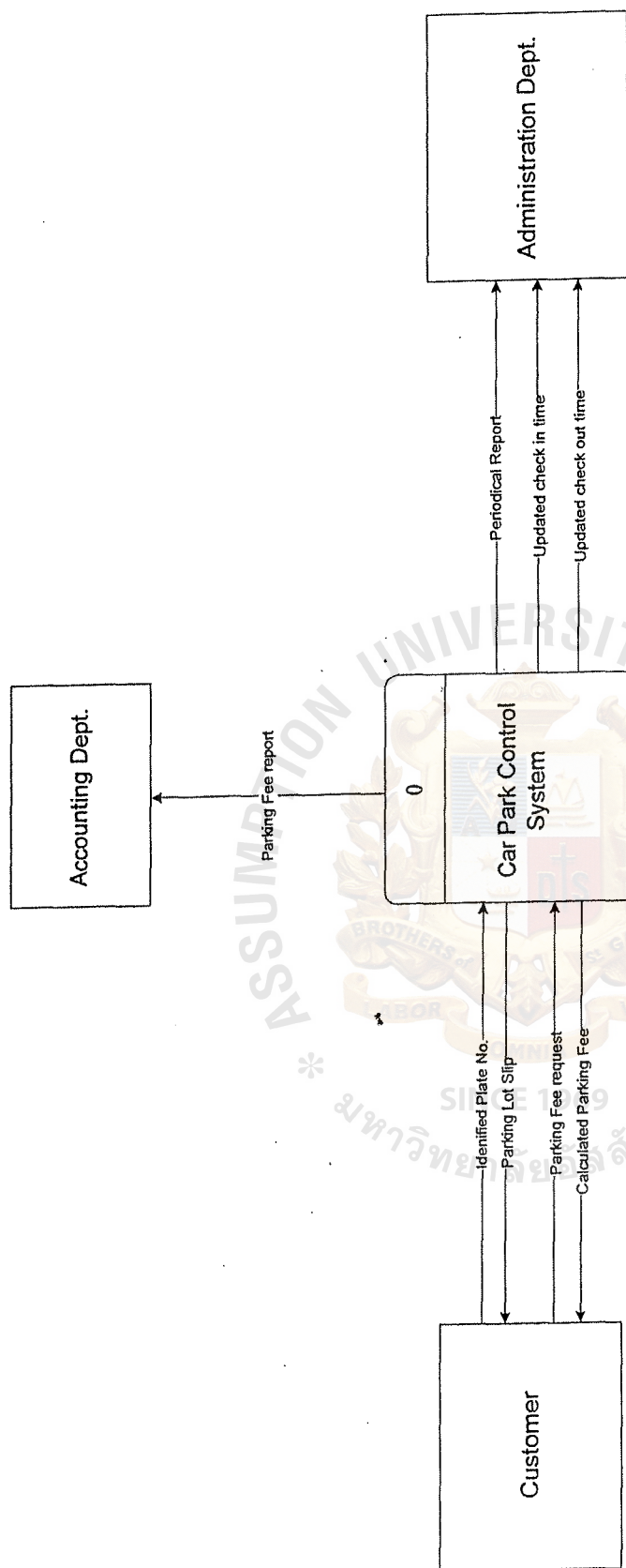


Figure 2.2. Context Diagram of Existing Business Process of Sharing Co., Ltd.

### 2.3 Current Problems and Areas for improvement

3126 e. 1

The current problems of the existing system of Sharing Co., Ltd. are as follows:

- (1) In the park section is to only provide the staffs operation which cannot verify the correctness of working. Moreover, the staffs cannot check amount of cars and the fees collected.
- (2) The cars have to slow down to search for the free areas of the park car. Therefore, the main problem is traffic jam in the park areas and the staffs will be late to go to work in the operation time.
- (3) Workflow is quite slow due to manual operation in the existing system.
- (4) The time duration of staffs who search for the free areas become late to go to work in the operation time.
- (5) The existing system cannot check the amount of cars which park in the whole of the park areas.
- (6) The existing system is collected in the manual operations which is hard to verify and immediately process.
- (7) The manual mistake on the order data provided to the operation section produces the problems to be solved.
- (8) Data cannot be shared easily among different departments. This leads to the problems of data duplication, data redundancy, and data inconsistency.
- (9) It takes too much time to generate the reports.
- (10) The working of the existing system, the manual system, is not perfect. The purpose of the System is created for the daily works and uses, so it is pretty difficult to retrieve and reuse for other purposes.

- (11) Difficulty in tracking the status of the current problem. If the employees want to check the current status, they have to search from the pile of papers.
- (12) The Staffs have to organize their document for each problem. Therefore they will waste much time organizing the documents.
- (13) There is poor quality of information.
- (14) There is poor security in the existing system.
- (15) The speed of work flow in the existing system is slow.
- (16) The existing system is inflexible. It is slow.

#### **2.4 Existing Computer System**

The existing system is operated solely manually. The staff will stay at the entry to the parking lane. When the contactor's car comes to the parking lane, that staff will record the plate number and check-in time on the ticket and also in the log book then hand the ticket to that contactor. When checking out, that contactor must return the ticket to staff. If the ticket is not stamped with company stamp mark, the staff will calculate the parking fee according to the preset rate. After that the staff will check the plate number and record check-out time in the log book. Every weekend, the staff will submit the information to the accounting and administration department.



### III. THE PROPOSED SYSTEM

#### 3.1 System Specifications

After analyzing the existing system, it is found that there are many problems occurred with manual system. So the management decides to replace the current system with computerized system to facilitate the operators.

From analyzing the existing system, the system requirements can be classified into 2 main categories:

(1) The requirements of operator's side.

1. The system must facilitate operator to locate the available spaces just in time especially during the rush hour to relieve the traffic problem in building.
2. The system must be able to monitor the number of cars parked in each storey in the building.
3. The system must be able to record the information of each car come in and out the building without the need to record manually that can cause mistakes easily.
4. The system must be able to calculate the parking fee automatically.
5. The system must connect with the corporate network system to transfer daily information back and forth with the accounting and administration system and also to prevent the data loss of manual system.
6. The proposed system must be user-friendly.

(2) The requirement of contactor's side.

1. The system must be able to locate the available spaces for contactor to save the time and petrol.
2. The system must be able to specify the target floor.
3. The system must be informed where the user parked.
4. The system must work just in time to facilitate the traffic flow.
5. The system must generate parking ticket that provides clear and adequate information and should prohibit editing information on ticket for the security reason.

### 3.2 System Design

The system design of the project will be done by carefully and gradually implementing the technical terms and conditions into the proposed system. As mentioned earlier in the system specification topic, the system must be designed accordingly. On top of those, the network architecture, database, data dictionary, interface and reports must be designed consistently. The discussion of the abovementioned issue is as follows:-

- (1) **Network Architecture:** The requirements of network required for this project is LAN network architecture that uses 2-tier client/server computing system. The network configuration of the proposed system is shown in Figure 3.3.
- (2) **Database Design:** The database is designed to specify the type, length, key type, foreign key relationship and domain check of every single attribute. The database design of every relational schema in this project, that we already specified all details, is elaborated in Appendix F. For more information, the details in database can be used as the source of information

to estimate the database size. The calculation methodology is done by multiplying the summation of attribute's length in each table by the approximate number the each instance. After that, summing up all the results from all tables, that is the approximate required database size. However, the decision of this project to choose the hard disk storage space is 73 gigabytes SCSI which is far more than the required storage disk space. There is no doubt that it is popular practice to have more space than it is needed. The company's data storage needs the additional disk space to support the stored data's growth in the near future.

- (3) **Data Dictionary:** The data dictionary needs to be designed in order to render the description of every attribute in relational schema (database table). The data dictionary is in Appendix B.
- (4) **User Interface Design:** The most important property of user interface design in this project is friendly to user. The User interface is in Appendix G.
- (5) **Report Design:** The outputs have both internal and external outputs. All formats are designed to be as simple and useful as it could be in order to fulfill the requirements of the user of the report. The output and reports in the project are shown in Appendix H.

### **3.3 Analysis of Candidate Solutions**

For practicing, the candidate solutions have been established. The specification of each candidate is usefully documented by analysis and decision making of the optimized solution for the proposed system. The tools which are used for the analysis of candidate solutions are the Candidate System Matrix and the Feasibility Analysis Matrix which are discussed in the Table 3.1. and 3.2. respectively. For the calculations of the economic feasibility, the details are demonstrated in topic 3.5 System Cost and Benefit Analysis. The comparison of the existing and all candidate solutions estimated the breakeven point. The calculations of Payback Period, Return on Investment and Net Present Value methodologies are all in topics.



Table 3.1. Candidate System Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
<b>Portion of System Computerized</b> Brief description of that portion of the system that would be computerized in this candidate.	The COTS would be purchased	In house software development by our own developer.	Same as candidate 2.
<b>Benefits</b> Brief description of the business benefits that would be realized for this candidate.	This solution can be implemented quickly because it's a purchased solution.	The solution fully supports user and flexible to update in the future	Same as candidate 2.
<b>Servers and Workstations</b> A description of the servers and workstations needed to support this candidate.	Acer Altos G710, Intel Xeon 2.8GHz MS Windows Server 2003. MS Windows XP Pro (Client).	Same as candidate 1.	Same as candidate 1.
<b>Software Tools</b> Needed Software tools needed to design and build the candidate. Not generally applicable if applications software packages are to be purchased.	Using Oracle database, Oracle tools	Using MS SQL Server 2000, MS Visual Basic.NET, Internet Explorer	Using MS Access 2003, Visual Basic.NET, Internet Explorer
<b>Application Software</b> A description of the software to be purchased, built or some combination.	Commercial package solution	Totally customized Solution	MS Access 2003 Partially customized
<b>Method of Data Processing</b> Generally some combination of: on-line, deferred, remote catch, and real time.	Client/Server with Samart ASDL-Biz Lite 256 Kbps. Connection.	Client/Server with KSC ADSL 512/256 Kbps. connection.	Same as candidate 2.
<b>Output Devices &amp; Implications:</b> A description of output devices that would be used, special output requirements and output considerations.	HP LaserJet 1020 Printer.	Same as candidate 1.	Same as candidate 1.
<b>Input Devices and Implications</b>	Keyboard, Mouse.	Metrologic MS-9540 Barcode Reader	Same as candidate 2.
<b>Storage Devices and Implications</b> Data to be stored & accessed storage media used, storage capacity needed, and how data would be organized.	Oracle Server DBMS with 120 GB arrayed capability.	MS SQL Server 2000 DBMS with 120 GB arrayed capability.	MS Access 2003.



Table 3.2. Feasibility Analysis Matrix.

Feasibility Criteria	Wt	Candidate 1	Candidate 2	Candidate 3
<b>Operational Feasibility</b> <b>Functionality:</b> <b>Political:</b>	30%	Fully support standard proposed system and basic business processes.  Requires training course for users to new system. The COTS comes with user friendly interface. <b>Score: 85</b>	Fully support the proposed system.  Training is required for users to operate the application. <b>Score: 90</b>	Same as candidate 2.  <b>Score: 90</b>
<b>Technical Feasibility</b> <b>Technology:</b> <b>Expertise:</b>	30%	The COTS is commercial package so it experts basic business functions and customized functions use highly effective tools like Oracle software. <b>Score: 80</b>	Programmers have Microsoft Visual Basic so this reduces development process. <b>Score: 90</b>	Programmers have Microsoft Visual Basic and apply MS Access 2003 to manage the database system. <b>Score: 95</b>
<b>Economic Feasibility</b> -Cost to development: -Payback period (discounted): -Net present value: -Detail calculations	30%	Approximately 945,278 Approximately 2 years 11 months Approximately 593,696  See Appendix E <b>Score: 85</b>	Approximately 663,468 Approximately 2 years 1 months Approximately 694,636  See Appendix E <b>Score: 90</b>	Approximately 493,468 Approximately 1 years 7 month Approximately 864,636  See Appendix E <b>Score: 95</b>
<b>Schedule Feasibility</b>	10%	3 months <b>Score: 100</b>	4.5 months <b>Score: 90</b>	4 months <b>Score: 95</b>
<b>Ranking</b>	100%	85%	90%	93.50%

### 3.4 Hardware and Software Requirement.

The hardware and software specifications have been set up according to the LAN network architecture with 2-tier client/server system in the structure of distributed data in which only data layer and data manipulation layer are stored and executed in the server. The client/server has more advantage and there is much less network traffic and database integrity is easier to maintain.

The specification of hardware and software for both server and client and the other components are listed in table 3.3, 3.4, 3.5 and 3.6.

Table 3.3. Hardware Specification for the Server.

Hardware	Specification
CPU	Intel Xeon 2.80 GHz or higher
Primary Memory	DDR RAM 2*512 MB
HARDDISK	73GB SCSI or higher
CD ROM	CD-RW 52x32x52x
Floppy Drive	3.5" 1.44 MB
LAN	10/100 56K Modem or Ethernet
Display Screen	CRT 17"
Display Monitor	VGA 8 MB or higher
Mouse	Optical Scroll Mouse
Keyboard	104 keys Support Window

Table 3.4. Software Specification for the System.

Software	Specification
Server Operating System	Microsoft Window Server 2003
Client Operating System	Microsoft Window XP Professional
Application System	Visual Basic.NET
Database System	Microsoft Access 2003

Table 3.5. Hardware Specification for the Client.

Hardware	Specification
CPU	Intel Pentium4 3.4GHz
Primary Memory	DDR RAM 512 MB
HARDDISK	80 GB (7,200 rpm)
CD ROM	CD-RW 52x32x52x
Floppy Drive	3.5" 1.44 MB
Display Screen	CRT 17"
Display Monitor	VGA 16MB Share (AGP Slot)
Mouse	Optical Scroll Mouse
Keyboard	104 keys Support Window

Table 3.6. Specification of Other Component.

Equipment	Specification
Laser Printer	Laser Printer - HP LaserJet 1020 recommended
UPS	UPS-1000 VA/Matrix
Ethernet Switch Hub 10/100	16-port 10/100 Mbps
Barcode Reader	Single-line Barcode Reader – Metrologic MS-9540 recommended



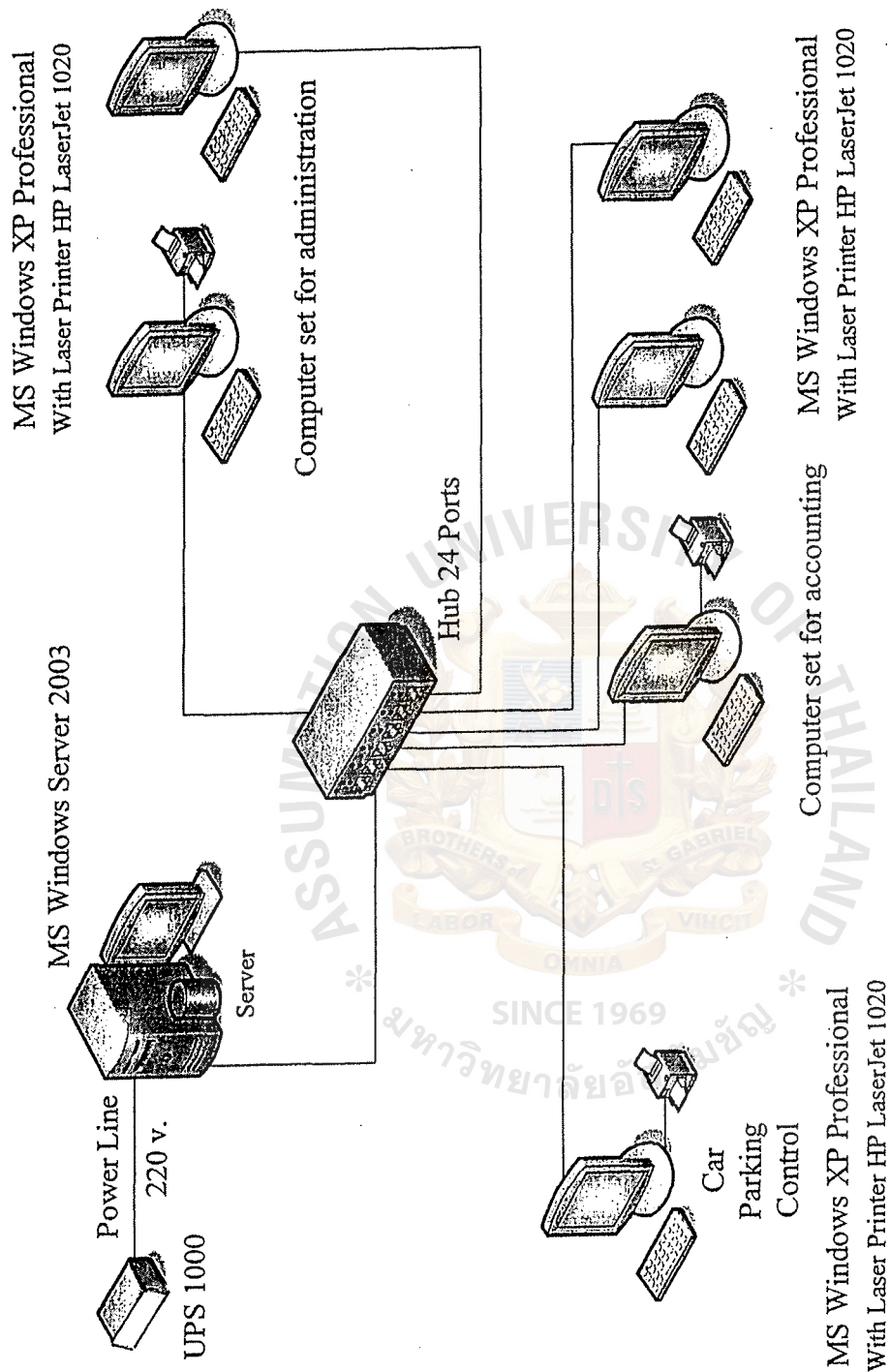


Figure 3.1. The Network Configuration of Car Park Control System.



### 3.5 Security and Control

The security and control plan of the organization for the proposed system pointed to the authorization technique, authentication, Virus prevention, backup and recovery.

The security and control are discussed as below:

#### (1) Authentication

Authentication is any process by which the user verifies that someone is who they claim they are. In order to determine whether a particular username/password combination is valid, the username and password supplied by the user will need to be compared to some authoritative listing of usernames and password.

#### (2) Authorization

Authorization is finding out if the person, once identified, is permitted to have the resource. In this case, the proposed system applies the policy of user access level such as the administration division is allowed car park control system and the accounting division is allowed to retrieve the parking fee reports.

#### (3) Virus Prevention

The firewall will be used to prevent and protect the company data in the database from virus or even hacking. Moreover, the proposed system will install anti-virus program and update the latest versions of the software.

#### (4) Backup and Recovery

The system plans for the database management is having backup files in the database system.

### 3.6 Cost and Benefit Analysis

This part describes the economic feasibility analysis which shows the cost of existing system compared to the proposed system (the chosen candidate), benefit of setting up the new system, and evaluation such as the estimated breakeven point, the payback period.

#### (1) Cost Analysis

The existing system is a manual system. The cost is divided into 2 main groups, i.e. the fixed assets cost and the operation cost. The fixed assets cost is counted on the first year operation only whereas the operation cost tends to be gradually increased. From the analysis, the operation cost is expected to rise 10% every year.

The proposed system is the candidate solution 3 which is an in-house development solution. It is the computerized system aimed to replace the existing system. Major cost of the proposed system is mainly spent on investment as initial investment of the new system. Hardware and software costs of the proposed system are shared among the five-year operation. With the computerized system, there is the maintenance cost which is counted starting from the second year of operation.

The detailed cost and the five-year accumulated cost of both the existing system and the proposed system are shown in the following tables: -

Table 3.7. Detailed Cost of the Existing System (Unit: Baht = THB)

Cost Items	Year				
	1	2	3	4	5
<b>Fixed Assets Cost (THB)</b>					
<b>Office Equipment Cost</b>					
Desktop calculator: Sharp XE-A101 2 units @ 3,990	7,980.00	-	-	-	-
Personal calculator: Casio MX-120V 4 units @ 299	1,196.00	-	-	-	-
Electric Typewriter: Olympia Splendid II BT 2 units @ 5,750	11,500.00	-	-	-	-
<b>Total Fixed Assets Cost (THB)</b>	<b>20,676.00</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Operation Cost (THB)</b>					
<b>Employee Salary (THB)</b>					
Accounting Officer 2 person @ 15,000/mth	360,000.00	396,000.00	435,600.00	479,160.00	527,076.00
Administrative Officer 2 person @ 12,000/mth	288,000.00	316,800.00	348,480.00	383,328.00	421,660.80
Operators 5 person @ 6,000/mth	360,000.00	396,000.00	435,600.00	479,160.00	527,076.00
Overtime Allowance @ 8,000/mth	96,000.00	105,600.00	116,160.00	127,776.00	140,553.60
<b>Total Employee Salary</b>	<b>1,104,000.00</b>	<b>1,214,400.00</b>	<b>1,335,840.00</b>	<b>1,469,424.00</b>	<b>1,616,366.40</b>
<b>Office Supplies &amp; Miscellaneous Cost (THB)</b>					
Utility @ 5,000/mth	60,000.00	66,000.00	72,600.00	79,860.00	87,846.00
Paper @ 800/mth	9,600.00	10,560.00	11,616.00	12,777.60	14,055.36
Stationery @ 800/mth	9,600.00	10,560.00	11,616.00	12,777.60	14,055.36
Miscellaneous Cost @ 3,000/mth	36,000.00	39,600.00	43,560.00	47,916.00	52,707.60
<b>Total Office Supplies &amp; Miscellaneous Cost</b>	<b>115,200.00</b>	<b>126,720.00</b>	<b>139,392.00</b>	<b>153,331.20</b>	<b>168,664.32</b>
<b>Total Annual Operating Cost (THB)</b>	<b>1,219,200.00</b>	<b>1,341,120.00</b>	<b>1,475,232.00</b>	<b>1,622,755.20</b>	<b>1,785,030.72</b>
<b>Total Manual System Cost (THB)</b>	<b>1,239,876.00</b>	<b>1,341,120.00</b>	<b>1,475,232.00</b>	<b>1,622,755.20</b>	<b>1,785,030.72</b>
<b>Total Accumulated Manual System Cost (THB)</b>	<b>1,239,876.00</b>	<b>2,580,996.00</b>	<b>4,056,228.00</b>	<b>5,678,983.20</b>	<b>7,464,013.92</b>

Table 3.8. 5-Year Accumulated Cost of the Existing System (THB).

Year	Total Manual Cost	Accumulated Manual Cost
1	1,239,876.00	1,239,876.00
2	1,341,120.00	2,580,996.00
3	1,475,232.00	4,056,228.00
4	1,622,755.20	5,678,983.20
5	1,785,030.72	7,464,013.92



Table 3.9. Detailed Cost of the Chosen Candidate Solution.

Cost Items	Year				
	1	2	3	4	5
<b>Fixed Assets Cost (THB)</b>					
<b>Hardware Cost</b>					
Acer Altos G710 Server 1 set @ 92,000	18,400.00	18,400.00	18,400.00	18,400.00	18,400.00
Acer Aspire E500 P4 Client 4 sets @ 36,900	29,520.00	29,520.00	29,520.00	29,520.00	29,520.00
<b>Total Hardware Cost</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>
<b>Software Cost</b>					
MS Windows 2003 Server @ 45,000	9,000.00	9,000.00	9,000.00	9,000.00	9,000.00
MS Windows XP Pro @ 27,000	5,400.00	5,400.00	5,400.00	5,400.00	5,400.00
MS Office 2003 @ 16,000	3,200.00	3,200.00	3,200.00	3,200.00	3,200.00
MS Visual Studio.NET @ 35,000	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00
<b>Total Software Cost</b>	<b>24,600.00</b>	<b>24,600.00</b>	<b>24,600.00</b>	<b>24,600.00</b>	<b>24,600.00</b>
<b>Office Equipment Cost</b>					
Netgear Cable/DSL Wireless Router @ 5,000	5,000.00	-	-	-	-
3COM 24Ports Fast Ethernet Managed Switch @ 24,900	24,900.00	-	-	-	-
Backup Device & Tapes @ 38,000	38,000.00	-	-	-	-
APC Back Pro UPS 1500i (1500VA) 1 unit @ 15,300	15,300.00	-	-	-	-
Stream-800 UPS (800VA) 4 units @ 2,000	8,000.00	-	-	-	-
HP LaserJet Printer 1020 1 unit @ 5,880	5,880.00	-	-	-	-
Metrologic MS-9540 Barcode Reader 2 units @ 9,095	18,190.00	-	-	-	-
Casio MX-120V Calculator 2 units @ 299	598.00	-	-	-	-
<b>Total Office Equipment Cost</b>	<b>115,868.00</b>	-	-	-	-
<b>Maintenance Cost</b>	-	10,000.00	11,000.00	13,200.00	17,160.00
<b>Implementation Cost</b>					
Training Cost	10,000.00	-	-	-	-
Setup Cost	10,000.00	-	-	-	-
Additional Miscellaneous Cost	5,000.00	-	-	-	-
<b>Total Implementation Cost</b>	<b>25,000.00</b>	-	-	-	-
<b>Total Fixed Assets Cost (THB)</b>	<b>213,388.00</b>	<b>82,520.00</b>	<b>83,520.00</b>	<b>85,720.00</b>	<b>89,680.00</b>
<b>Operation Cost (THB)</b>					
<b>Employee Salary (THB)</b>					
Accounting Officer 1 person @ 15,000/mth	180,000.00	192,600.00	206,082.00	220,507.74	235,943.28
Administrative Officer 1 person @ 12,000/mth	144,000.00	154,080.00	164,865.60	176,406.19	188,754.63
Operators 4 person @ 8,000/mth	384,000.00	410,880.00	439,641.60	470,416.51	503,345.67
IT Support 1 person @ 15,000/mth	180,000.00	192,600.00	206,082.00	220,507.74	235,943.28
<b>Total Employee Salary</b>	<b>888,000.00</b>	<b>950,160.00</b>	<b>1,016,671.20</b>	<b>1,087,838.18</b>	<b>1,163,986.86</b>
<b>Office Supplies &amp; Miscellaneous Cost (THB)</b>					
Utility @ 4,000/mth	48,000.00	50,400.00	52,920.00	55,566.00	58,344.30
KSC ADSL 512/256Kbps Fee @ 10,000/mth	120,000.00	126,000.00	132,300.00	138,915.00	145,860.75
Paper @ 500/mth	6,000.00	6,300.00	6,615.00	6,945.75	7,293.04
Stationery @ 800/mth	9,600.00	10,080.00	10,584.00	11,113.20	11,668.86
Miscellaneous Cost @ 2,500/mth	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
<b>Total Office Supplies &amp; Miscellaneous Cost</b>	<b>213,600.00</b>	<b>225,780.00</b>	<b>238,719.00</b>	<b>252,469.95</b>	<b>267,089.95</b>



Table 3.9. Detailed Cost of the Chosen Candidate Solution (Cont.).

Cost Items	Year				
	1	2	3	4	5
<b>Total Annual Operating Cost (THB)</b>	1,101,600.00	1,175,940.00	1,255,390.20	1,340,308.13	1,431,076.80
<b>Total Computerized System Cost (THB)</b>	1,314,988.00	1,258,460.00	1,338,910.20	1,426,028.13	1,520,756.80
<b>Total Accumulated Computerized System Cost (THB)</b>	1,314,988.00	2,573,448.00	3,912,358.20	5,338,386.33	6,859,143.14

Table 3.10. 5-Year Accumulated Cost of the Chosen Candidate Solution (THB).

Year	Total Computerized Cost	Accumulated Computerized Cost
1	1,314,988.00	1,314,988.00
2	1,258,460.00	2,573,448.00
3	1,338,910.20	3,912,358.20
4	1,426,028.13	5,338,386.33
5	1,520,756.80	6,859,143.14

Further analysis has also been performed in order to evaluate the cost compared against the benefit of the proposed system. The following figure represents the breakeven point when the cost difference of both existing system and proposed system is equal to zero.

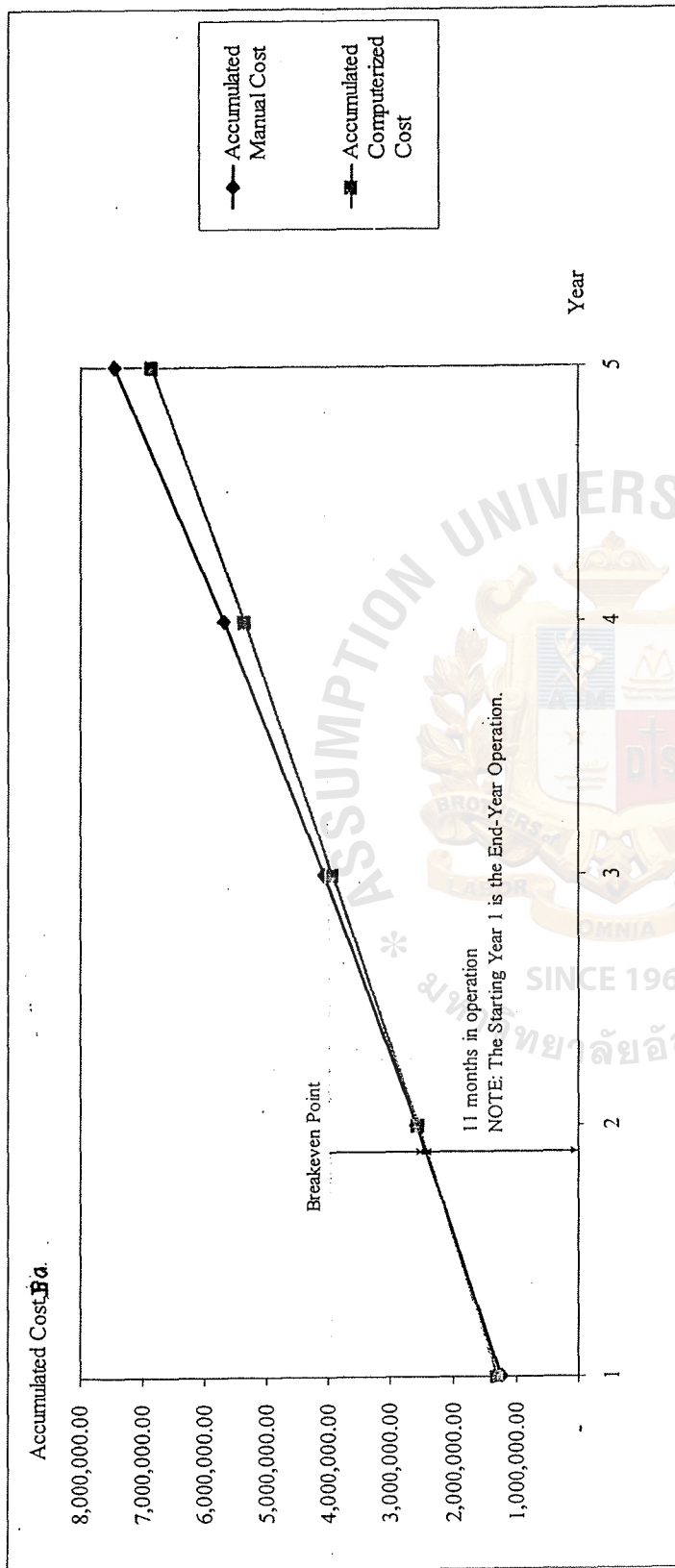


Figure 3.2. Cost Comparison of the Existing System and the Proposed System.

Table 3.11. Payback Analysis of the Chosen Candidate Solution.

Cash flow description	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)
Development cost:	493,468.00					
Operation & maintenance cost:						
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted costs (adjusted to present value):	493,468.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00
Cumulative time-adjusted costs over lifetime:	493,468.00	1,513,105.00	2,532,742.00	3,552,379.00	4,572,016.00	5,591,653.00
Benefits derived from operation of new system:						
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted benefits (current of present value):	0.00	1,363,637.00	1,326,447.00	1,290,271.00	1,255,082.00	1,220,852.00
Cumulative time-adjusted benefits over lifetime:	0.00	1,363,637.00	2,690,084.00	3,980,355.00	5,235,437.00	6,456,289.00
	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)
Cumulative lifetime time-adjusted costs + benefits:	493,468.00	149,468.00	157,342.00	427,976.00	663,421.00	864,636.00

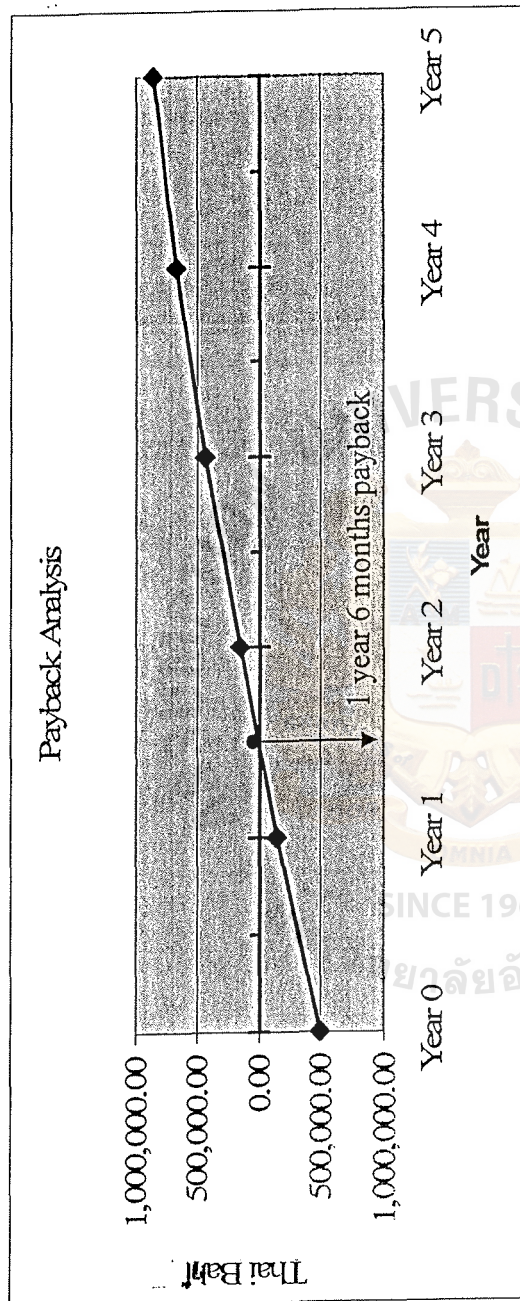


Figure 3.3. Payback Analysis of the Chosen Candidate Solution.

Table 3.12. Net Present Value Analysis of the Chosen Candidate Solution.

Cash flow description	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)	Total (THB)
Development cost:	493,468.00	0.00	0.00	0.00	0.00	0.00	
Operation & maintenance cost:	0.00	1,121,600.00	1,233,760.00	1,357,136.00	1,492,849.60	1,642,134.56	
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621	
Present value of annual costs:	493,468.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00	
total present value of lifetime costs:							5,591,653.00
Benefits derived from operation of new system:	0.00	1,500,000.00	1,605,000.00	1,717,350.00	1,837,564.50	1,966,194.02	
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621	
Present value of annual benefits:	0.00	1,363,637.00	1,326,447.00	1,290,271.00	1,255,082.00	1,220,852.00	
Total present value of lifetime benefits:							6,456,289.00
NET PRESENT VALUE OF THIS ALTERNATIVE:							864,636.00



(2) Benefit Analysis.

Apart from the economic benefits which are shown in the previous section, there are other benefits gained from the proposed system.

Tangible benefits.

- a. Reduce the operation cost.
- b. Minimize human error in calculation.
- c. Capable to generate accurate and timely report.
- d. Increase sales income.

Intangible benefits.

- a. Strengthen the business service quality to satisfy customers needs.
- b. Better working environment for better mentalities of staffs.
- c. Increase efficiency and effectiveness in business processes.
- d. Increase the company reputation.

## **IV. PROJECT IMPLEMENTATION**

### **4.1 Overview of Project Implementation**

System Implementation is estimated to take 1 month to replace the manual system with computerized system which will be fully implemented. But if the proposed system cannot be implemented on schedule, the manual system is still operating. Before implementing the proposed system, user input the information into the system and makes system test according to real processes until the system can work according to the requirements.

### **4.2 Coding**

In the coding phase it is decided to use the MS Access 2003 and Visual Basic.Net as software tools for developing proposed system. The coding will be done on the VB.Net part. The Microsoft Visual Basic.Net is a powerful tool but comes up with easy-to-use functions. To prevent the problem of incompatibility between developing tool and DBMS system, the Microsoft products is chosen for both software systems. The customized coding will focus on the complicated retrieval process for the data utilization.

### **4.3 Testing**

After coding phase, the testing phase must be proceeded in order to check whether the system operates according to the user requirements. Users will be given a chance to test the interface as well as to see how the system operates. Test data are also requested to put into the system in order to be able to produce the output.

All programs will be tested to ensure that they all work together. Real data will be obtained and ensure that different tests have been successfully performed. .

#### **4.4 System Conversion**

The policy of conversion is to accelerate the utilization of the newly launched system. The strategic conversion plan has been studied and found that the fastest conversion type is the abrupt cut-over conversion. There is no effect derived from this kind of conversion. Therefore the abrupt cut-over conversion is selected to apply to the system conversion. The conversion will be implemented as soon as all installation and testing has been fulfilled as they are scheduled. This can shorten by a day.

#### **4.5 Documentation and Training**

During the developing of the system, all the relevant information like project proposal, requirement, software and hardware specification are kept in the central repository for future reference. The program manual is created and written in Thai language and used as a tool for user training.

The next step that the user training participates is the system testing phase. In this phase, the users will be assigned to key input the data to test the system. Before the input testing from the users, there is training course which the programmer and relevant persons explain how to use the system with user manual and how to fill the forms and entry data into the application screen.

## V. CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Conclusions

According to the section 3.6 Cost and Benefit Analysis, it shows that the payback period of the system is approximately one year and eleven months which is quite a short time period for investment. Also the system generates a lot of benefits both tangible and intangible. The highlight of this project development is the outcome system that facilitates the customer in taking the car in and out of the car park. The information is systematically kept which can be easily made use of. The report can be rapidly and accurately created without a lot of time-consumption. The service performance is getting more efficient. With the new system, the organization gains more reputation for its highly computerized system. This facilitation convinces more new customers and the existing customers to come back for the services. The new system provides the following advantages: -

1. The car park control system provides the better traffic flow inside the building. The driver does not need to look for the available parking lot as the system has already provided the specified parking lot for the car. This helps to reduce the traffic load during the work-in and work-out time.
2. The driver can request for the specific storey for the parking. Then the operator checks for the availability as required. If there is a parking lot available, then the system can fix the space for the car.
3. In case of the registered customer, the system reduces the time spending in the car park. Since a parking lot is fixed for the car, the driver does not need to look for the available parking lot. This reduces the late timestamp of employees.

4. The computerized system provides more complete and accurate information than the manual system does.
5. The data has systematic flow. The information is completely and accurately kept in the system which can be more efficiently made use of.
  - a. It is very convenient for everyone to the system due to the user-friendly interface.
6. The calculation of the parking fee can be done faster and more accurate than the manual system does. The auditing can be performed through the system to avoid the cheating.
7. The administrative officer and the accounting officer can check the parking status at any time on the real time basis. They do not need to wait for the report from the operator.

In addition, the degree of achievement could be shown in Table 5.1 as follows:

Table 5.1. Table of Achievement.

<b>Job Title</b>	<b>Ave. Existing Working Time</b>	<b>Ave. Improved Working Time</b>	<b>Time Saving</b>
Data Entry	5 Minutes	3 Minutes	2 Minutes
Checking Data	3 Minutes	0.5 Minutes	2.5 Minutes
Making the Inquiries	15 Minutes	2 Minutes	13 Minutes
Calculating Bill	5 Minutes	0.5 Minutes	4.5 Minutes
Generating Report	1 Hours	2 Minutes	58 Minutes



## 5.2 Recommendations

The car park control system provides the facilitator to customers as well as assists the operator to work systematically and accurately. It provides the better performance of the operator. The system develops the better flow in car in and out control, the data collection.

RFID (Radio Frequency Identification) is interesting technology to replace the barcode system in facilitating the operation. It can operate in automatic manner such as record the check-in and check-out time, locate the available space, calculate parking fee. It also can help monitoring and controlling traffic in the building which can smooth the traffic flow within the building and reduce the time to locate the available space.

The system can further develop the integration with the back office system to become the total computerized organization. For the system, itself, the new technology such as the sensor can be applied to enhance the capability of the system.



**APPENDIX A**  
**DATA FLOW DIAGRAMS**

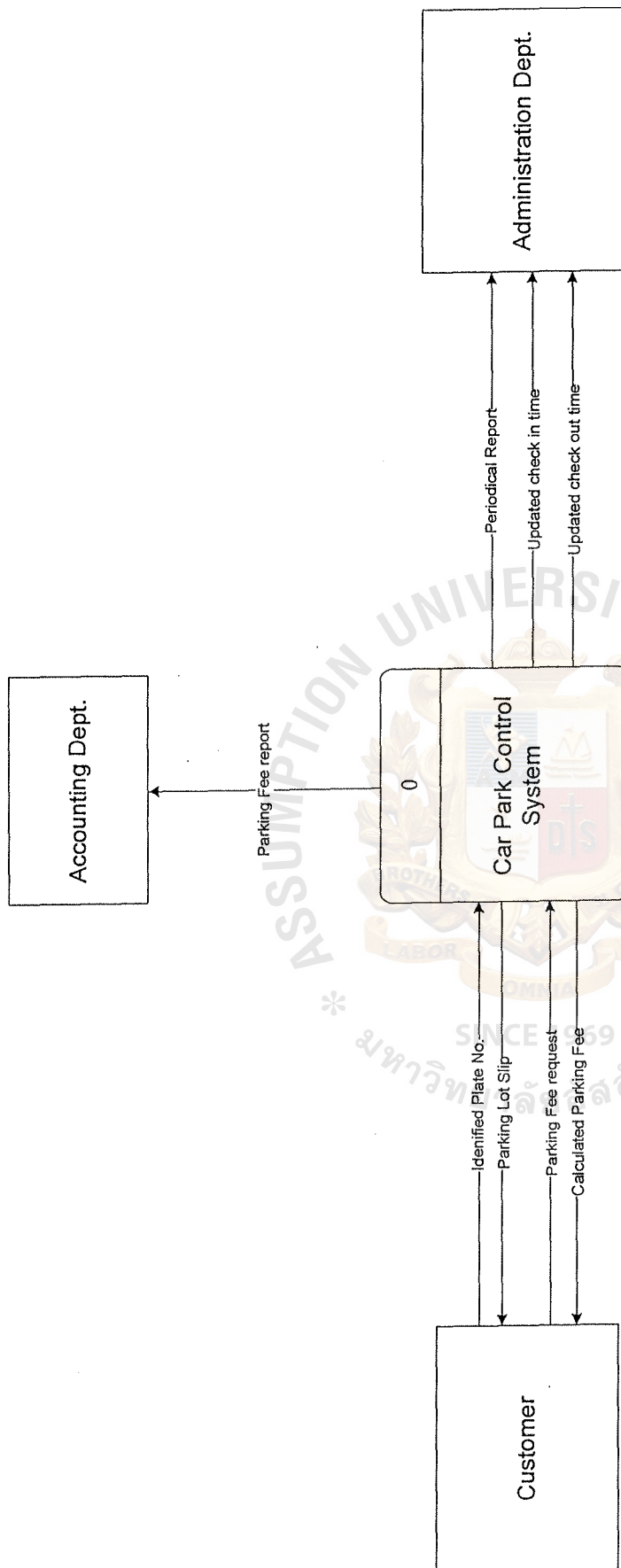


Figure A.1. Context Data Flow Diagram of Existing System.

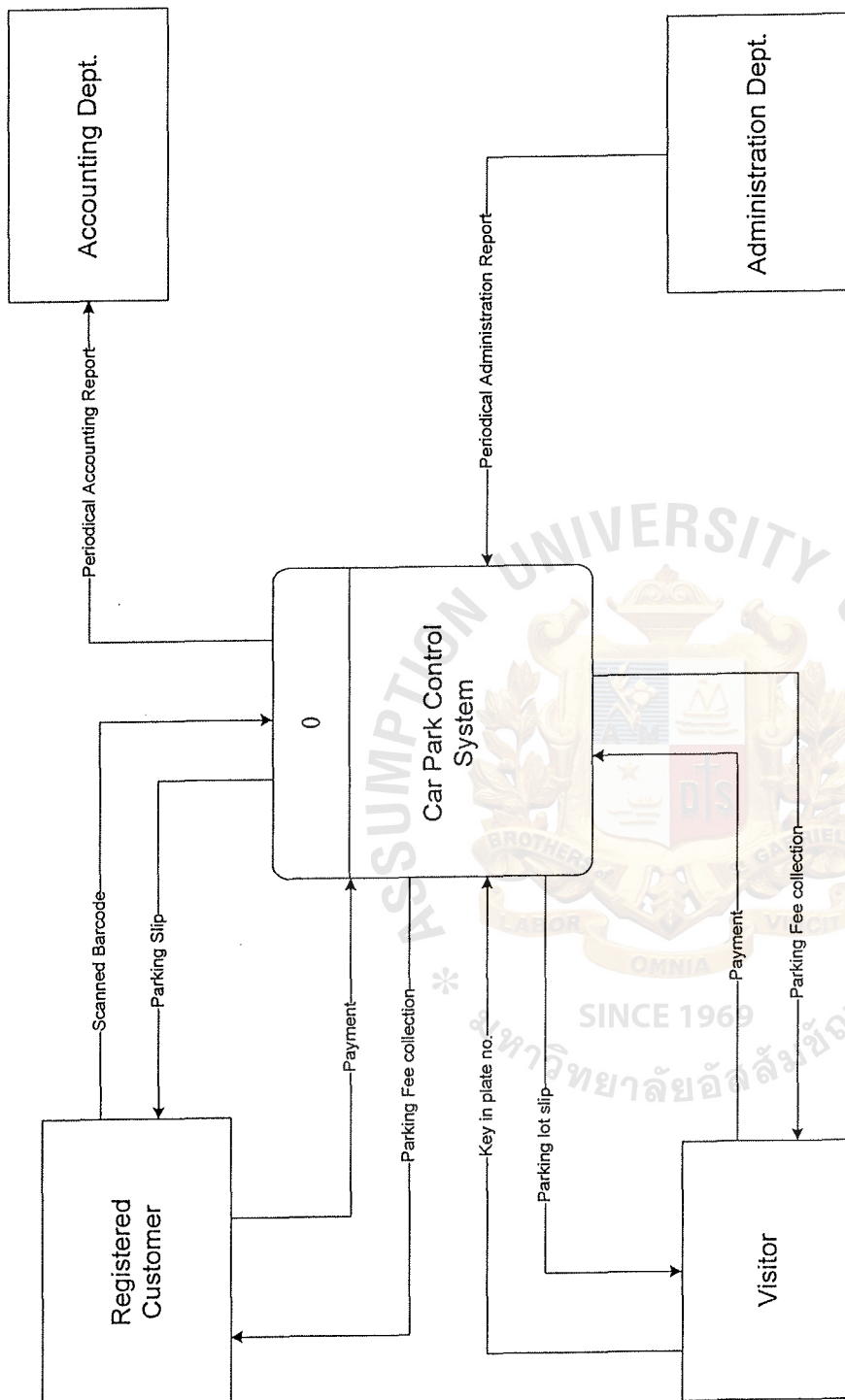


Figure A.2. Context Data Flow Diagram of Proposed System.

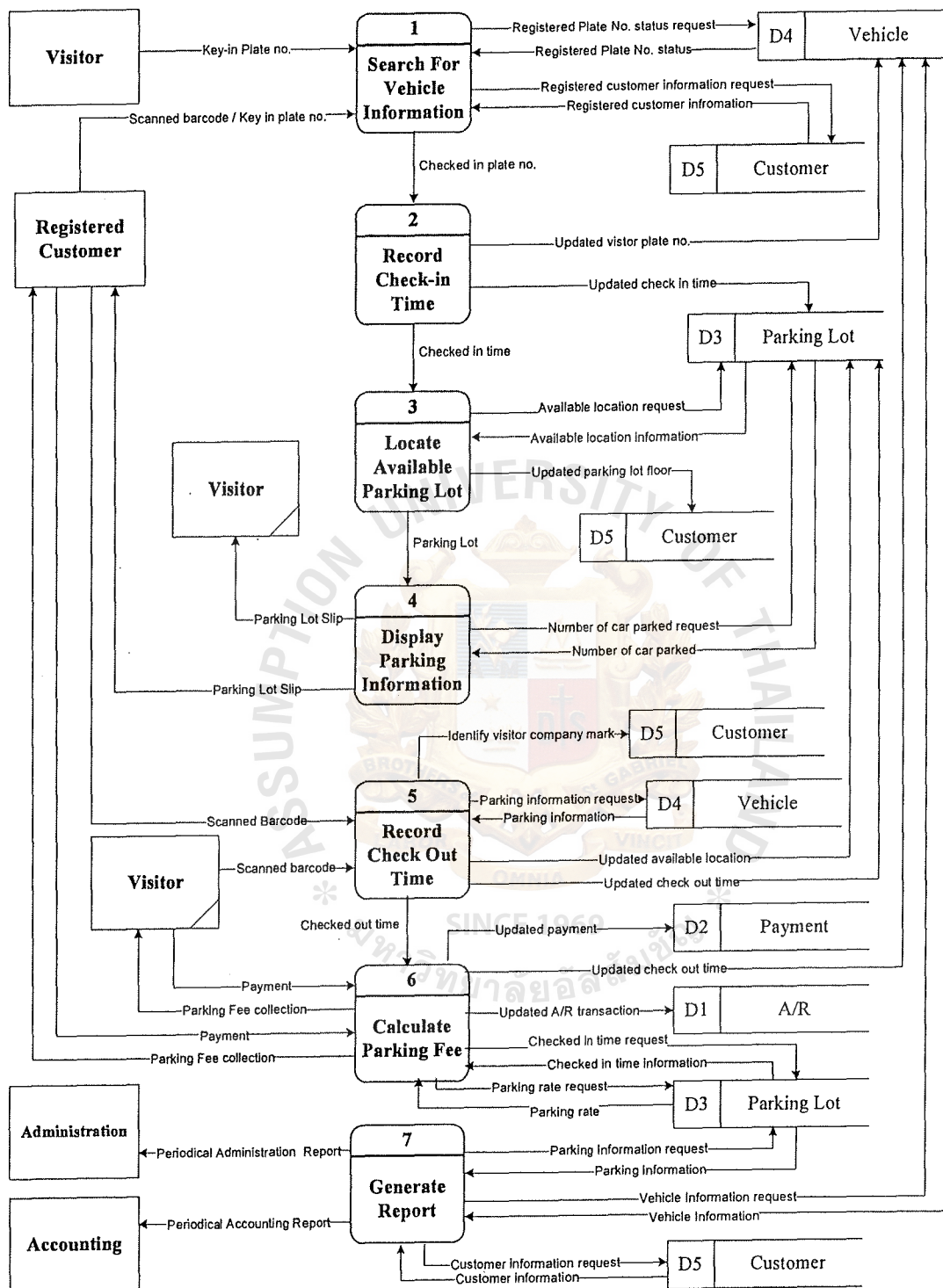


Figure A.3. Level 0 Data Flow Diagram of Car Park Control System.



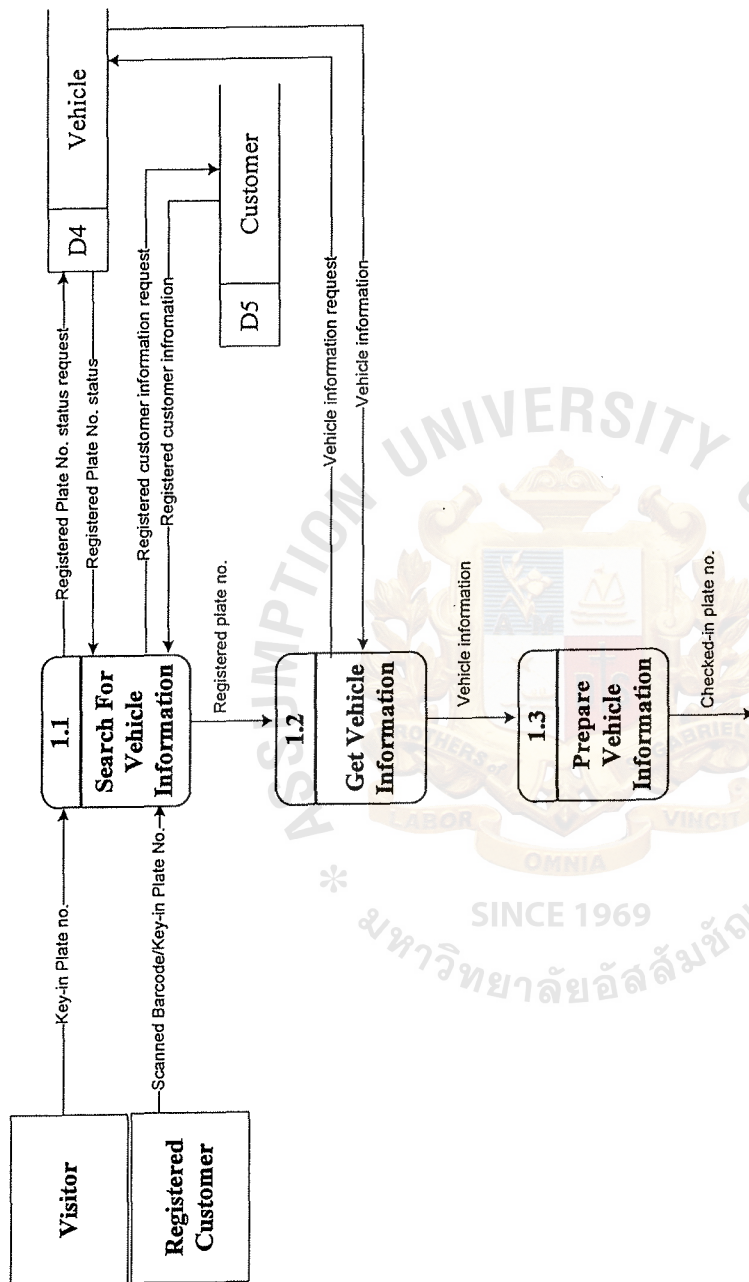


Figure A.4. Level 1 Data Flow Diagram of Process Search for Vehicle Information

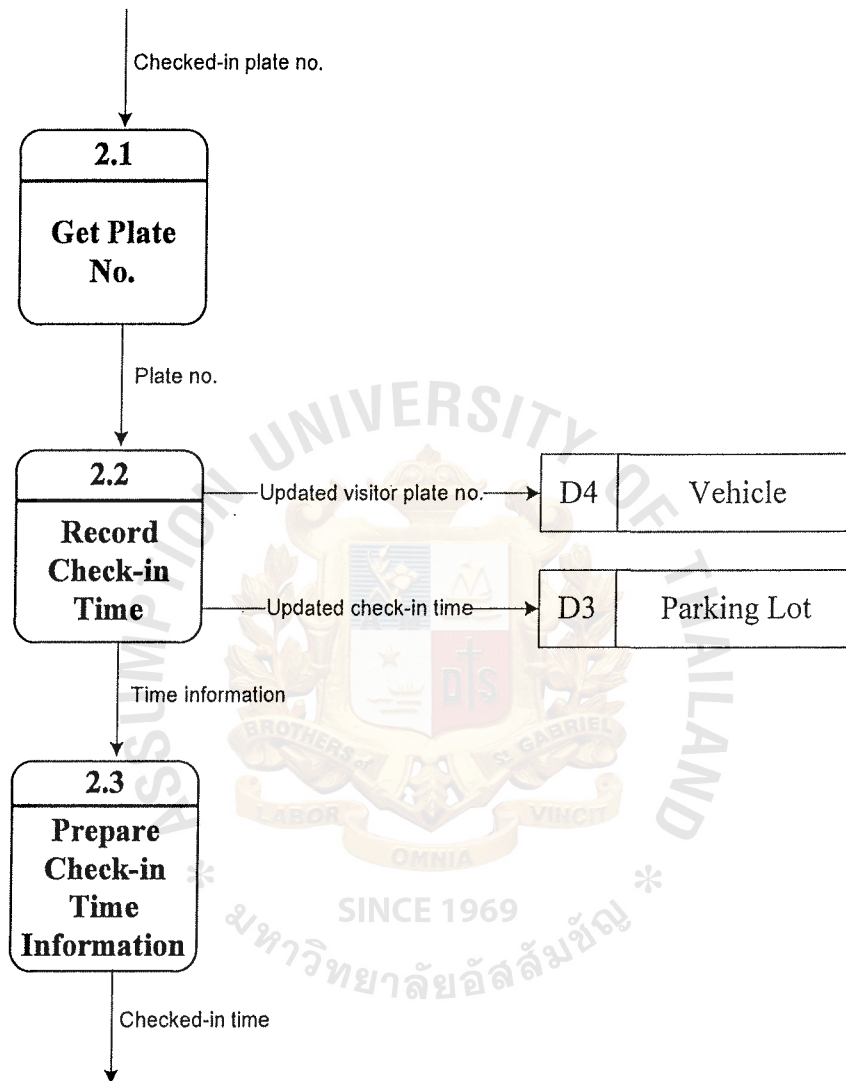


Figure A.5. Level 1 Data Flow Diagram of Process Record Check-in Time.

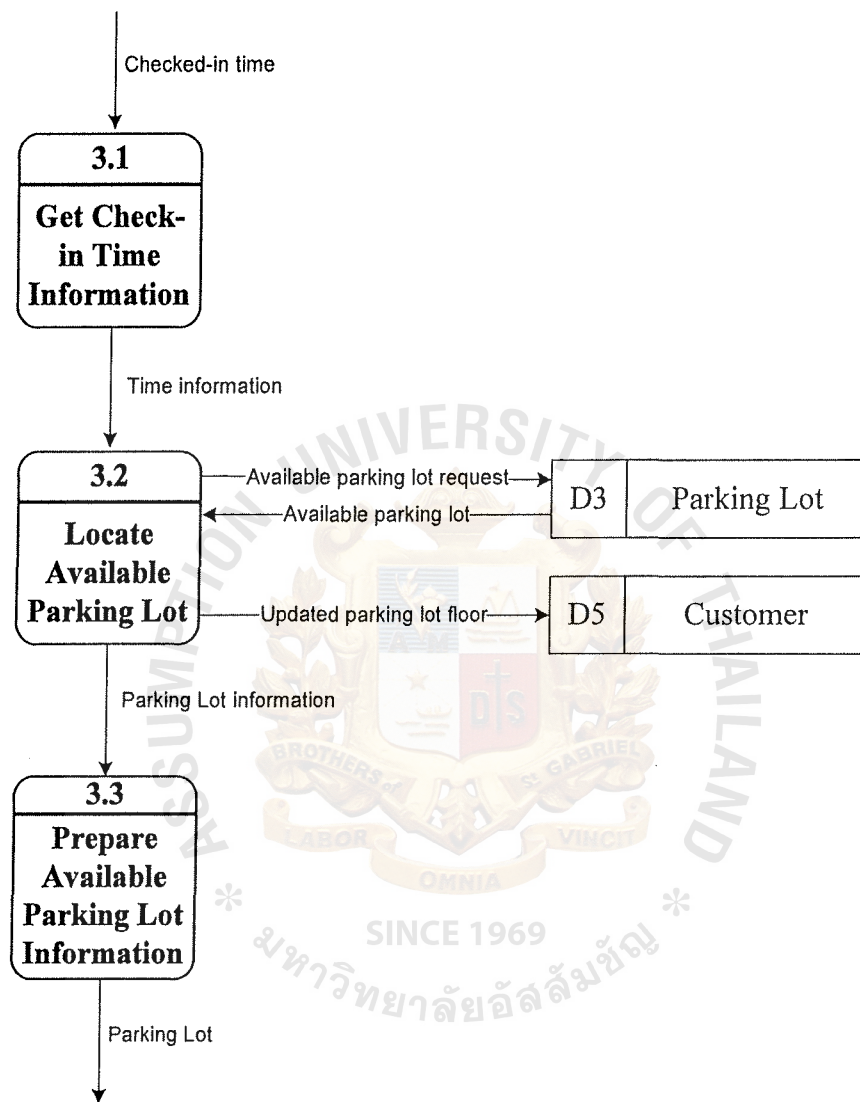


Figure A.6. Level 1 Data Flow Diagram of Process Locate Available Parking Lot.

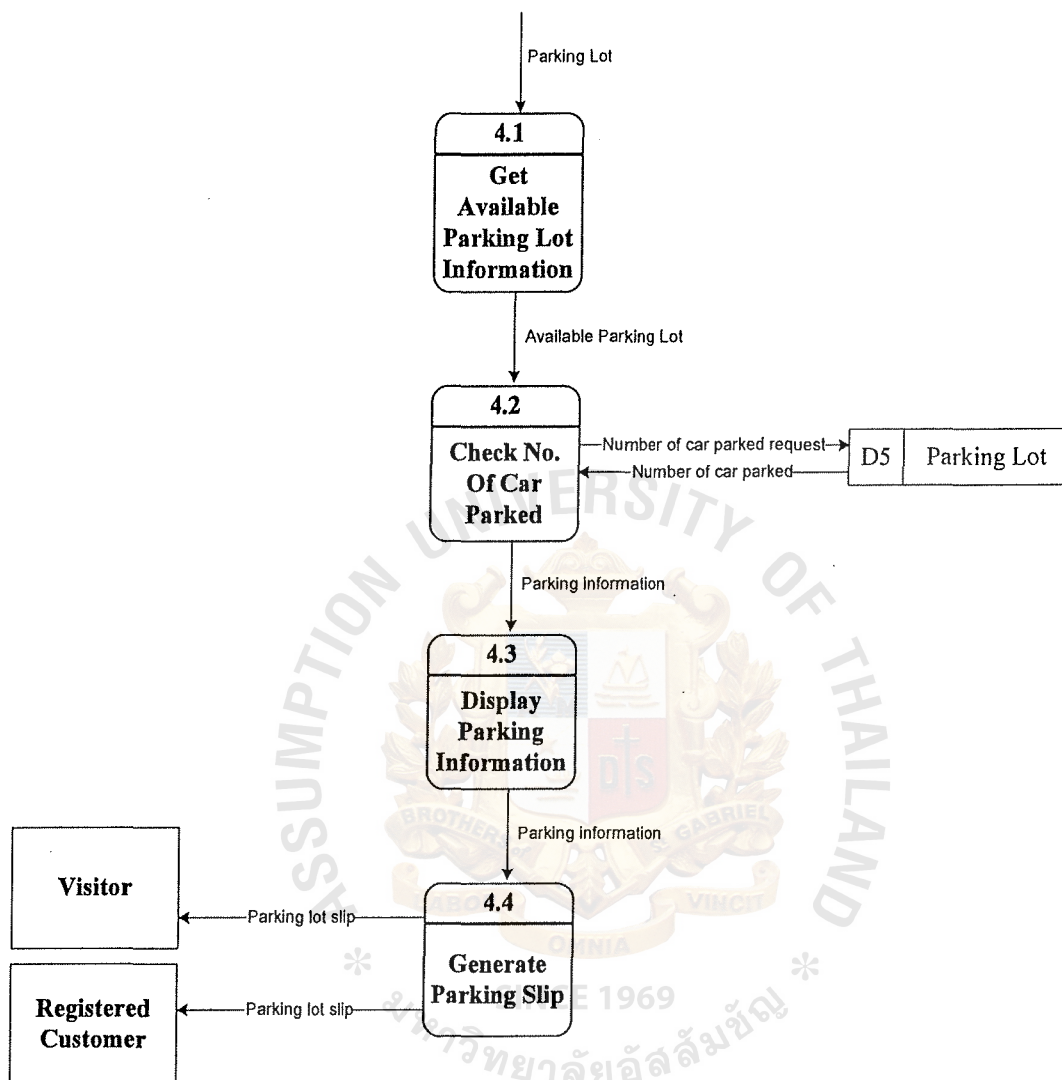


Figure A.7. Level 1 Data Flow Diagram of Process Display Parking Information.

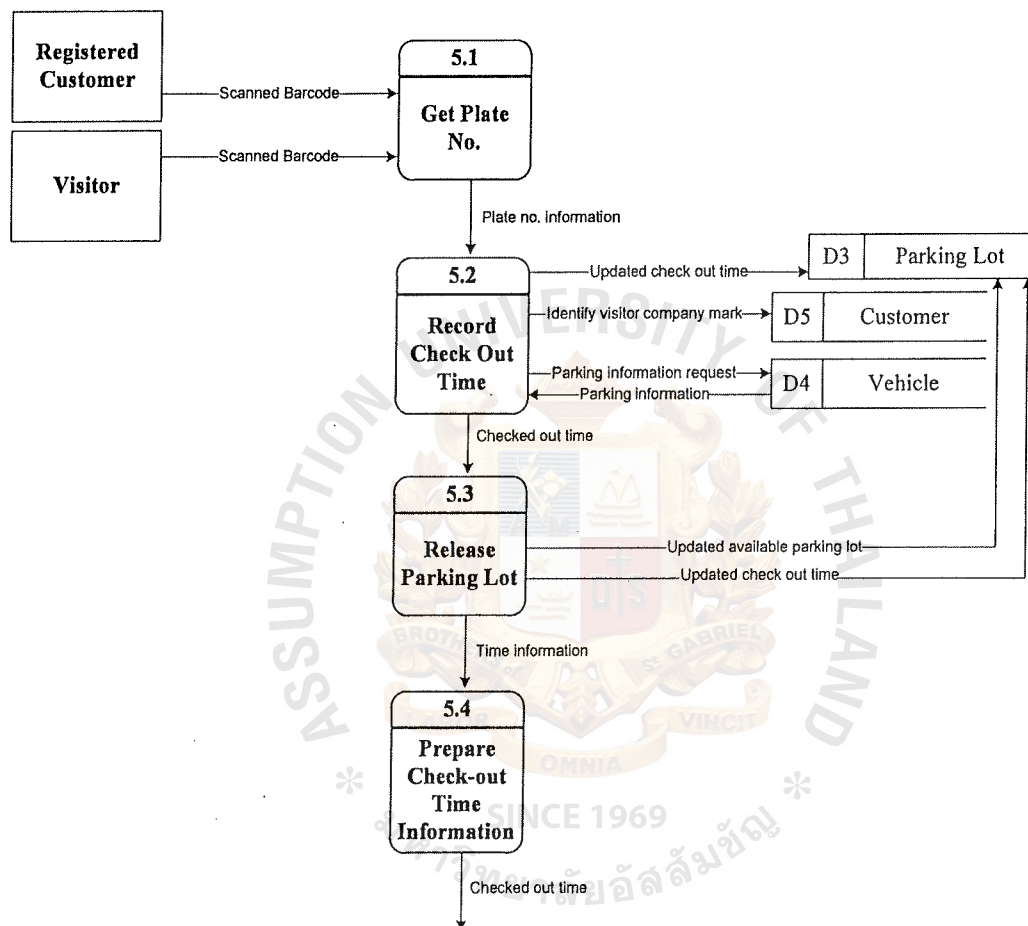


Figure A.8. Level 1 Data Flow Diagram of Process Record Check-out Time.



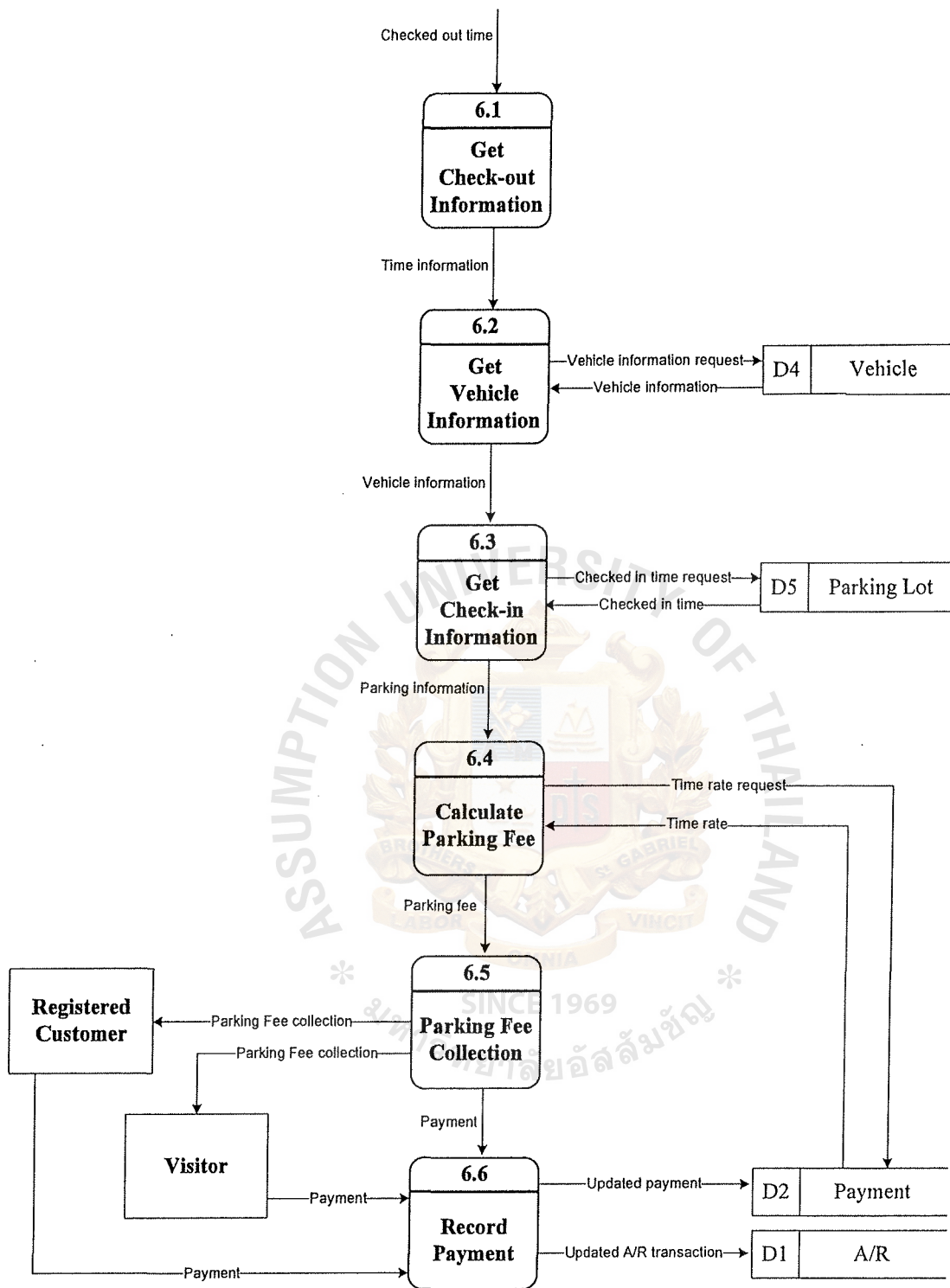


Figure A.9. Level 1 Data Flow Diagram of Process Calculate Parking Fee.

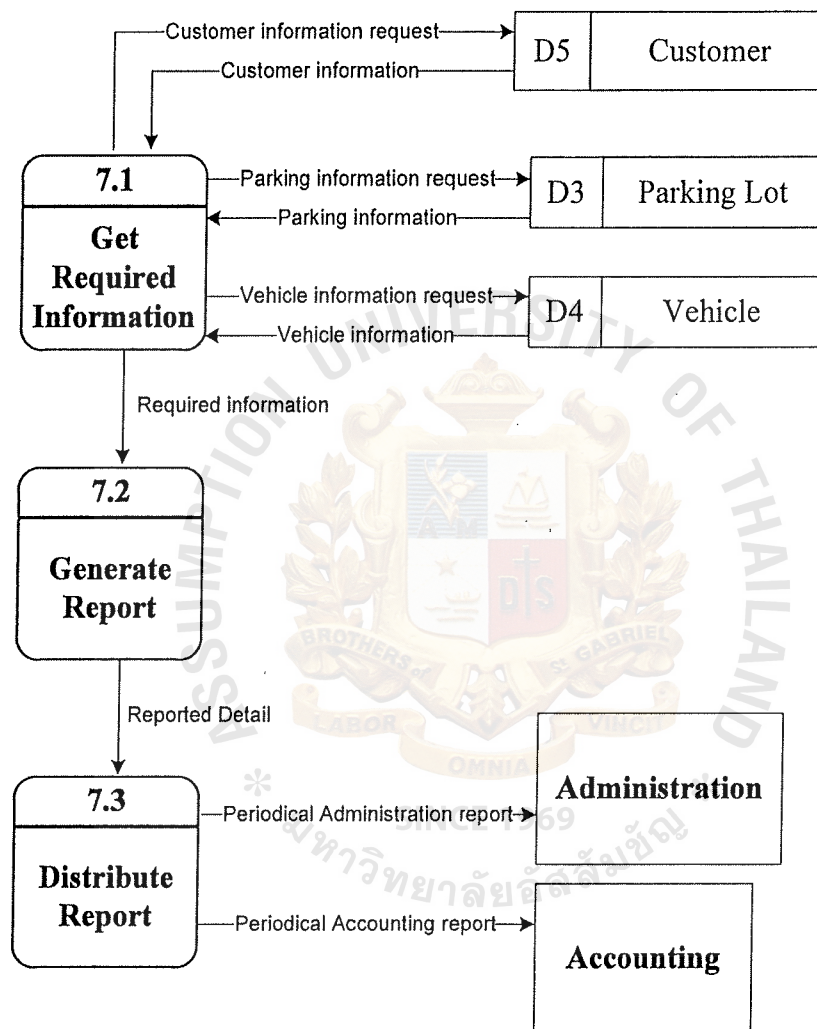


Figure A.10. Level 1 Data Flow Diagram of Generate Report.

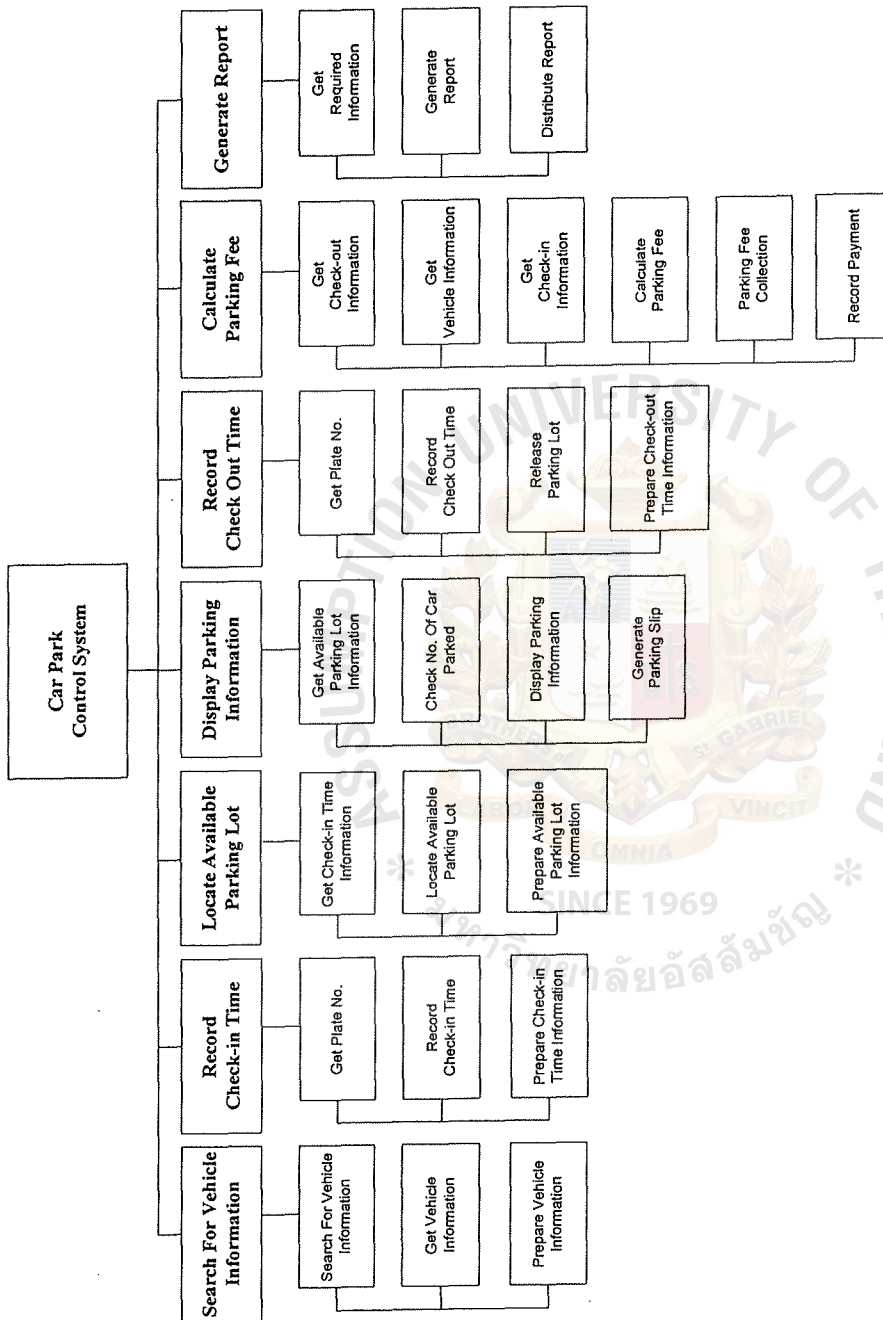


Figure A.11. Functional Decomposition Diagram of the proposed System.



**APPENDIX B**  
**DATA DICTIONARY**

Table B.1. Data Dictionary of A/R Table.

Field Name	Meaning
A/R_No	Number of A/R
A/R_Amount	Total of amount
Date/Time	Date and time of transaction

Table B.2. Data Dictionary of Payment Table.

Field Name	Meaning
Payment_No	Payment number
TimeRate	Time of calculate parking fee
Total_Time	Usage of parking time
Total_Pay	Calculated payment of parking fee

Table B.3. Data Dictionary of Parking Lot Table.

Field Name	Meaning
Parking_No	Identification floor of parking lot
Total_Car	Total of car parking
Chk_In_Time	Customer car check-in time
Chk_Out_Time	Customer car check-out time
Status	Parking lot available status
ParkingRate	Parking fee rate

Table B.4. Data Dictionary of Vehicle Table.

Field Name	Meaning
Plate No.	Number plate of car
Car_Brand	Brand of car
Car_Color	Color of car
Veh_Type	Type of vehicle
Barcode_No	Barcode number



Table B.5. Data Dictionary of Customer Table.

Field Name	Meaning
Barcode_No	Barcode number
Date	Date of parking
ParkingLotFloor	Identification floor of car parking
CompanyID	Number of company

Table B.6. Data Dictionary of Registered Customer Table.

Field Name	Meaning
CustomerID	Number of registered customer
CustomerFirstName	First name of registered customer
CustomerLastName	Last name of registered customer
CustomerPhone	Phone number of registered customer
CustomerPosition	Position of registered customer

Table B.7. Data Dictionary of Visitor Table.

Field Name	Meaning
ID_Record	Number of Visitor
CompanyMark	Identification contact company (yes or no)



**APPENDIX C**  
**PROCESS SPECIFICATIONS**

Table C.1. Process Specification of Process 1.1.

Item	Description
Process name:	Search for vehicle information
Data In:	Plate No.
Data Out:	Registered plate no.
Process:	<ol style="list-style-type: none"> <li>1. The customer inputs plate no. /scan barcode to the system.</li> <li>2. The system requires registered plate no. from vehicle data store.</li> <li>3. The system gets registered plate no. from vehicle data store.</li> <li>4. The system updates plate no. in order data store.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Registered Customer</li> <li>2. Visitor</li> <li>3. Data Store Vehicle.</li> <li>4. Data Store Customer.</li> </ol>

Table C.2. Process Specification of Process 1.2.

Item	Description
Process name:	Get Vehicle Information
Data In:	Registered plate no.
Data Out:	Vehicle information
Process:	<ol style="list-style-type: none"> <li>1. The system gets registered plate no.</li> <li>2. The system requires vehicle information from vehicle data store.</li> <li>3. The system gets vehicle information.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Vehicle.</li> </ol>

Table C.3. Process Specification of Process 1.3.

Item	Description
Process name:	Prepare Vehicle Information
Data In:	Vehicle Information
Data Out:	Plate no.
Process:	<ol style="list-style-type: none"> <li>1. The system verifies vehicle information from the previous process.</li> <li>2. The system prepares detailed plate no.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Vehicle.</li> </ol>

Table C.4. Process Specification of Process 2.1.

Item	Description
Process name:	Get Plate No.
Data In:	Plate No.
Data Out:	Detail Plate No.
Process:	1. The system gets plate no. from the previous process.
Attachment:	1. Data Store Vehicle

Table C.5. Process Specification of Process 2.2.

Item	Description
Process name:	Record Check-in Time
Data In:	Plate No.
Data Out:	Check-in time
Process:	1. The system updates plate no. in parking lot data store. 2. The system record check-in time in vehicle data store.
Attachment:	1. Data Store Parking Lot. 2. Data Store Vehicle.

Table C.6. Process Specification of Process 2.3.

Item	Description
Process name:	Prepare Check-in time information
Data In:	Check-in time
Data Out:	Time Information
Process:	1. The system verifies check-in time from vehicle data store. 2. The system prepares detailed time information.
Attachment:	1. Data Store Vehicle.

Table C.7. Process Specification of Process 3.1.

Item	Description
Process name:	Get Check-in Time Information
Data In:	Time Information
Data Out:	Detail Time Information
Process:	1. The system gets check-in time information.
Attachment:	1. Data Store Vehicle

Table C.8. Process Specification of Process 3.2.

Item	Description
Process name:	Locate Available parking Lot
Data In:	Time Information
Data Out:	Parking Lot Information
Process:	<ol style="list-style-type: none"> <li>1. The system gets check-in time information.</li> <li>2. The system identification parking lot floor in parking lot data store.</li> <li>3. The system updated parking lot floor in customer data store</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Parking Lot</li> <li>2. Data Store Customer</li> </ol>

Table C.9. Process Specification of Process 3.3.

Item	Description
Process name:	Prepare Available parking Lot
Data In:	Parking Lot Information
Data Out:	Detail Parking Lot Information
Process:	<ol style="list-style-type: none"> <li>1. The system gets available parking lot from parking lot data store.</li> <li>2. The system prepares detailed parking lot information.</li> </ol>
Attachment:	1. Data Store Parking Lot

Table C.10. Process Specification of Process 4.1.

Item	Description
Process name:	Get Available Parking Lot Information
Data In:	Detail Parking Lot Information
Data Out:	Available Parking Lot
Process:	1. The system gets available parking lot information.
Attachment:	1. Data Store Parking Lot

Table C.11. Process Specification of Process 4.2.

Item	Description
Process name:	Check No. of Car Parked
Data In:	Available Parking Lot
Data Out:	Parking Information
Process:	<ol style="list-style-type: none"> <li>1. The system verifies available parking lot information.</li> <li>2. The system requires no. of car parked in parking lot data store.</li> <li>3. The system updates no. of car parked in parking lot data store.</li> </ol>
Attachment:	1. Data Store Parking Lot

Table C.12. Process Specification of Process 4.3.

Item	Description
Process name:	Display Parking Information
Data In:	Parking Information
Data Out:	Record Parking Information
Process:	<ol style="list-style-type: none"> <li>1. The system gets parking lot information.</li> <li>2. The system display parking lot information for operator on screen.</li> </ol>
Attachment:	1. Data Store Parking Lot



Table C.13. Process Specification of Process 4.4.

Item	Description
Process name:	Generate Parking Slip
Data In:	Parking Information
Data Out:	Parking Lot Slip
Process:	<ol style="list-style-type: none"> <li>1. The system gets parking information.</li> <li>2. The system generates parking lot slip and print out to customer.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Parking Lot</li> <li>2. Registered Customer</li> <li>3. Visitor</li> </ol>

Table C.14. Process Specification of Process 5.1.

Item	Description
Process name:	Get Plate No.
Data In:	Plate no./ Scanned Barcode
Data Out:	Plate No. Information
Process:	<ol style="list-style-type: none"> <li>1. The system gets plate no..</li> <li>2. The system search plate no. information.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Parking Lot</li> <li>2. Registered Customer</li> <li>3. Visitor</li> </ol>

Table C.15. Process Specification of Process 5.2.

Item	Description
Process name:	Record Check-out Time
Data In:	Plate No. Information
Data Out:	Check-out Time
Process:	<ol style="list-style-type: none"> <li>1. The system gets plate no..</li> <li>2. The system identification visitor company mark.</li> <li>3. The system requires visitor information from customer data store.</li> <li>4. The system gets visitor information from customer data store.</li> <li>5. The system requires registered customer information from customer data store.</li> <li>6. The system gets registered customer information from customer data store.</li> <li>7. The system updates check-out time in parking lot data store.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Parking Lot</li> <li>2. Data Store Customer</li> <li>3. Data Store Vehicle</li> </ol>

Table C.16. Process Specification of Process 5.3.

Item	Description
Process name:	Release Parking Lot
Data In:	Check-out Time
Data Out:	Time Information
Process:	<ol style="list-style-type: none"> <li>1. The system release available parking lot in parking lot data store.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Parking Lot</li> </ol>

Table C.17. Process Specification of Process 5.4.

Item	Description
Process name:	Prepare Check-out Time Information
Data In:	Time Information
Data Out:	Check-out Time Information
Process:	<ol style="list-style-type: none"> <li>1. The system gets check-out time information.</li> <li>2. The system prepares detailed check-out time information.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Parking Lot</li> </ol>

Table C.18. Process Specification of Process 6.1.

Item	Description
Process name:	Get Check-out Time Information
Data In:	Check-out Time Information
Data Out:	Check-out Time
Process:	1. The system gets check-out time information.
Attachment:	1. Data Store Parking Lot

Table C.19. Process Specification of Process 6.2.

Item	Description
Process name:	Get Vehicle Information
Data In:	Check-out Time
Data Out:	Vehicle Information
Process:	<ol style="list-style-type: none"> <li>1. The system gets check-out time information.</li> <li>2. The system requests vehicle information in vehicle data store.</li> <li>3. The system verifies vehicle information.</li> </ol>
Attachment:	1. Data Store Vehicle

Table C.20. Process Specification of Process 6.3.

Item	Description
Process name:	Get Check-in Information
Data In:	Vehicle Information
Data Out:	Parking Information
Process:	<ol style="list-style-type: none"> <li>1. The system gets vehicle information.</li> <li>2. The system requests check-in time information in parking data store.</li> <li>3. The system verifies check-in time information.</li> </ol>
Attachment:	1. Data Store Parking Lot

Table C.21. Process Specification of Process 6.4.

Item	Description
Process name:	Calculate Parking Fee
Data In:	Parking Information
Data Out:	Parking Fee
Process:	<ol style="list-style-type: none"> <li>1. The system gets check-in and check-out time for calculate parking fee.</li> <li>2. The system requests time rate in payment data store for calculate parking fee.</li> <li>3. The system gets time rate.</li> <li>4. The system calculate parking fee.</li> </ol>
Attachment:	1. Data Store Payment

Table C.22. Process Specification of Process 6.5.

Item	Description
Process name:	Parking Fee Collection
Data In:	Parking Fee
Data Out:	Parking Fee Collection Payment
Process:	<ol style="list-style-type: none"> <li>1. The system gets parking fee.</li> <li>2. The system collection parking fee to customer.</li> <li>3. The system verifies payment.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Payment</li> <li>2. Registered Customer</li> <li>3. Visitor</li> </ol>

Table C.23. Process Specification of Process 6.6.

Item	Description
Process name:	Record Payment
Data In:	Payment
Data Out:	Payment A/R Transaction
Process:	<ol style="list-style-type: none"> <li>1. The system receives payment from customer.</li> <li>2. The system updates payment in payment data store.</li> <li>3. The system updates A/R transaction in A/R data store.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Payment</li> <li>2. Data Store A/R</li> <li>3. Registered Customer</li> <li>4. Visitor</li> </ol>

Table C.24. Process Specification of Process 7.1.

Item	Description
Process name:	Get Required Information
Data In:	Payment A/R Transaction
Data Out:	Required Information
Process:	<ol style="list-style-type: none"> <li>1. The system requires parking information in parking lot data store.</li> <li>2. The system gets parking information.</li> <li>3. The system requires vehicle information in vehicle data store.</li> <li>4. The system gets vehicle information.</li> <li>5. The system requires customer information from customer data store.</li> <li>6. The system gets customer information from customer data store.</li> <li>7. The system gets required information.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Parking Lot</li> <li>2. Data Store Vehicle</li> <li>3. Data Store Customer</li> </ol>



Table C.25. Process Specification of Process 7.2.

Item	Description
Process name:	Generate Report
Data In:	Required Information
Data Out:	Report Detail
Process:	<ol style="list-style-type: none"> <li>1. The system verifies required information.</li> <li>2. The system generates report.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Parking Lot</li> <li>2. Data Store Vehicle</li> </ol>

Table C.26. Process Specification of Process 7.3.

Item	Description
Process name:	Distribute Report
Data In:	Report Detail
Data Out:	Periodical report
Process:	<ol style="list-style-type: none"> <li>1. The system gets report detail.</li> <li>2. The system distributes report to administration and accounting.</li> </ol>
Attachment:	<ol style="list-style-type: none"> <li>1. Data Store Parking Lot</li> <li>2. Data Store Vehicle</li> <li>3. Administration</li> <li>4. Accounting</li> </ol>





**APPENDIX D**  
**STRUCTURE CHARTS**

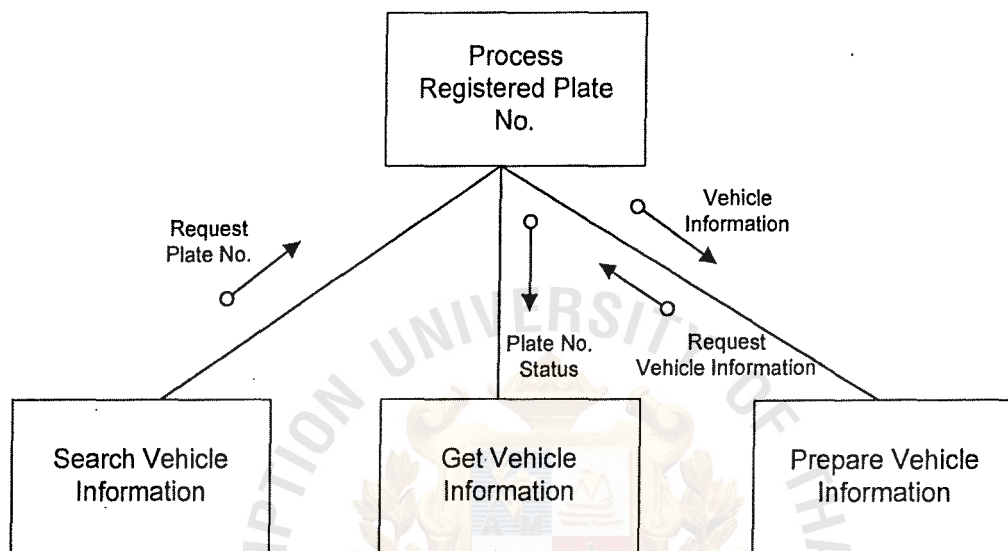


Figure D.1. Structure Chart of Process Registered Plate No.

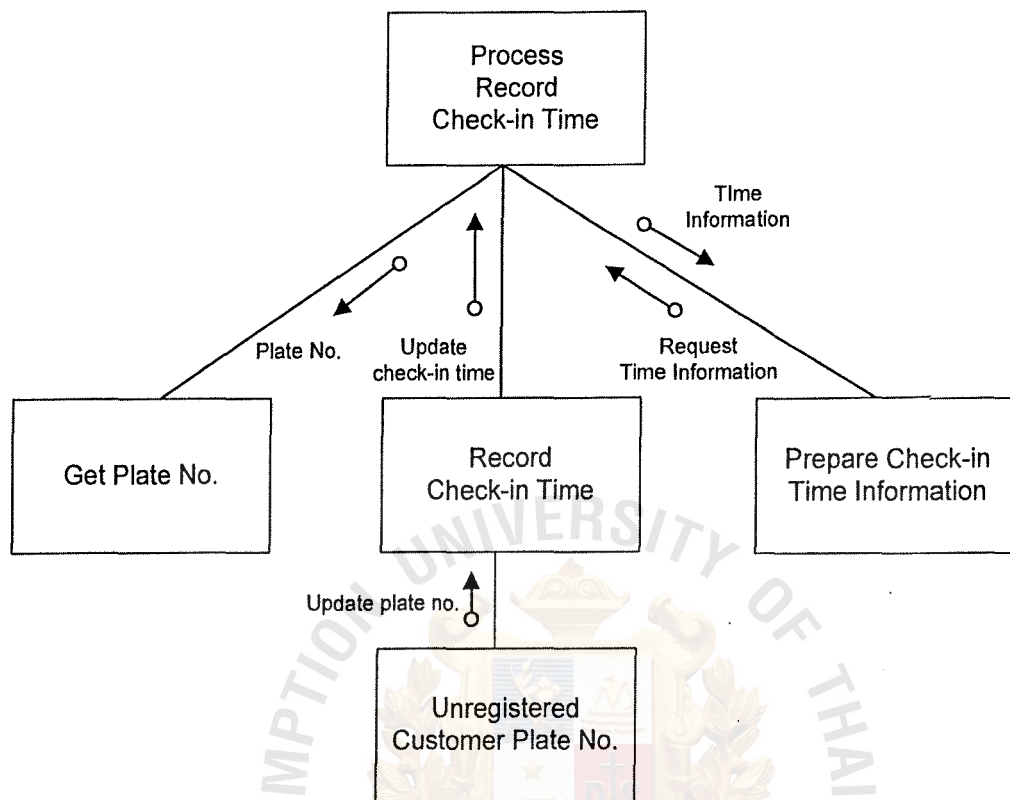


Figure D.2. Structure Chart of Process Record Check-in Time.

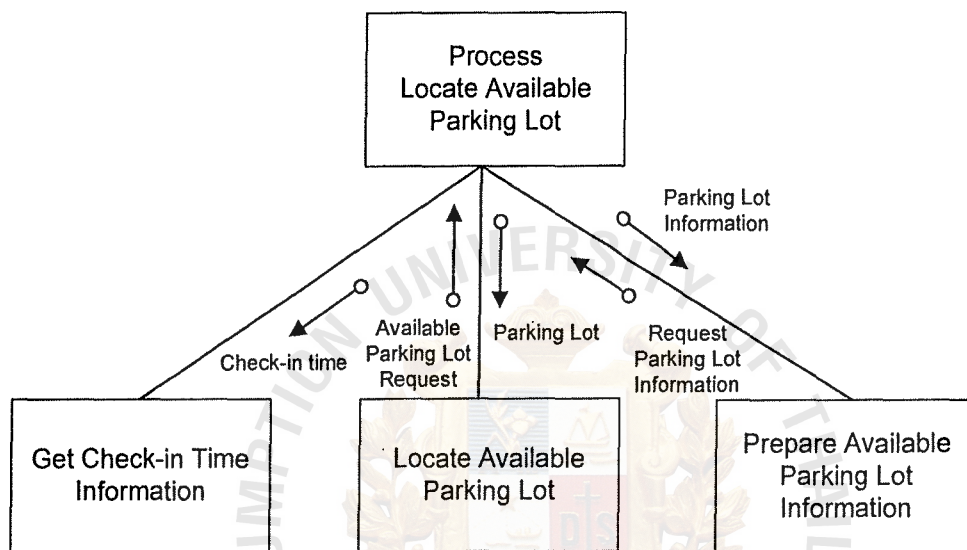


Figure D.3. Structure Chart of Process Locate Available Parking Lot.

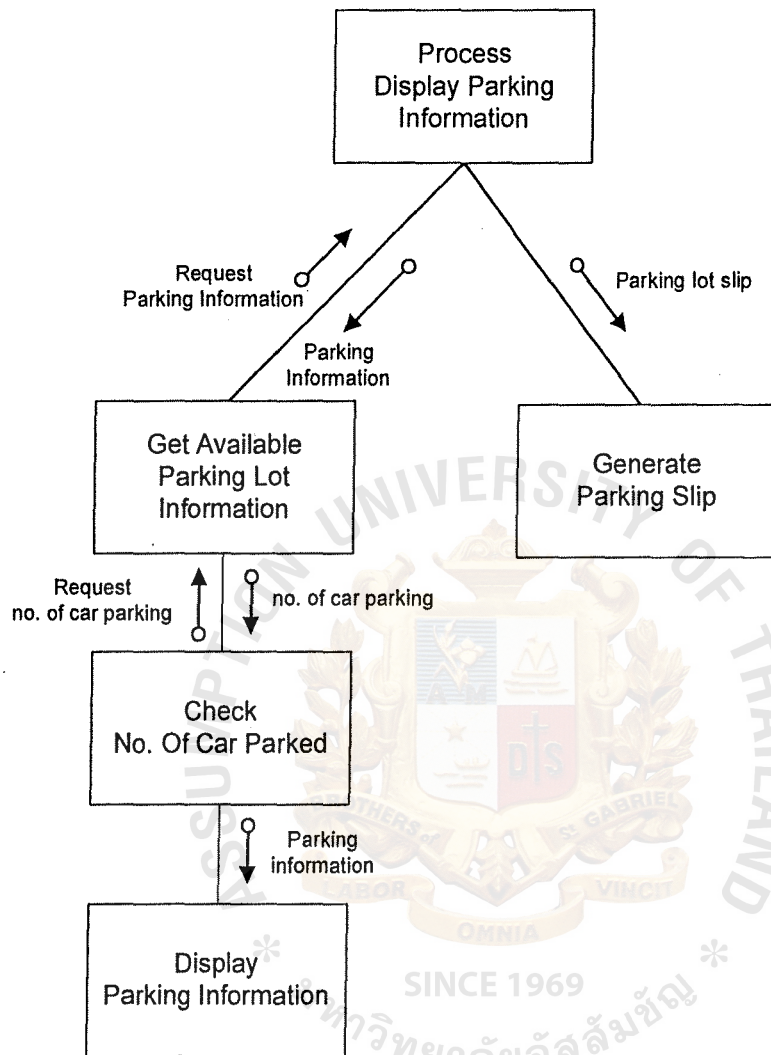


Figure D.4. Structure Chart of Process Display Parking Lot Information.

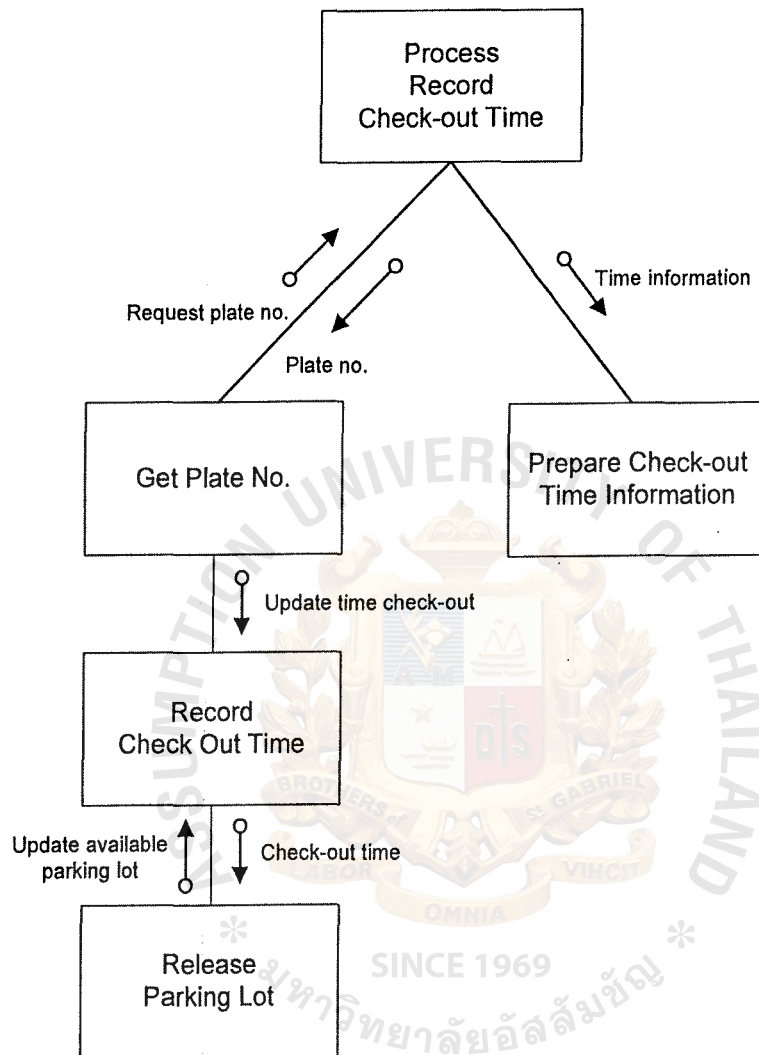


Figure D.5. Structure Chart of Process Record Check-out Time.



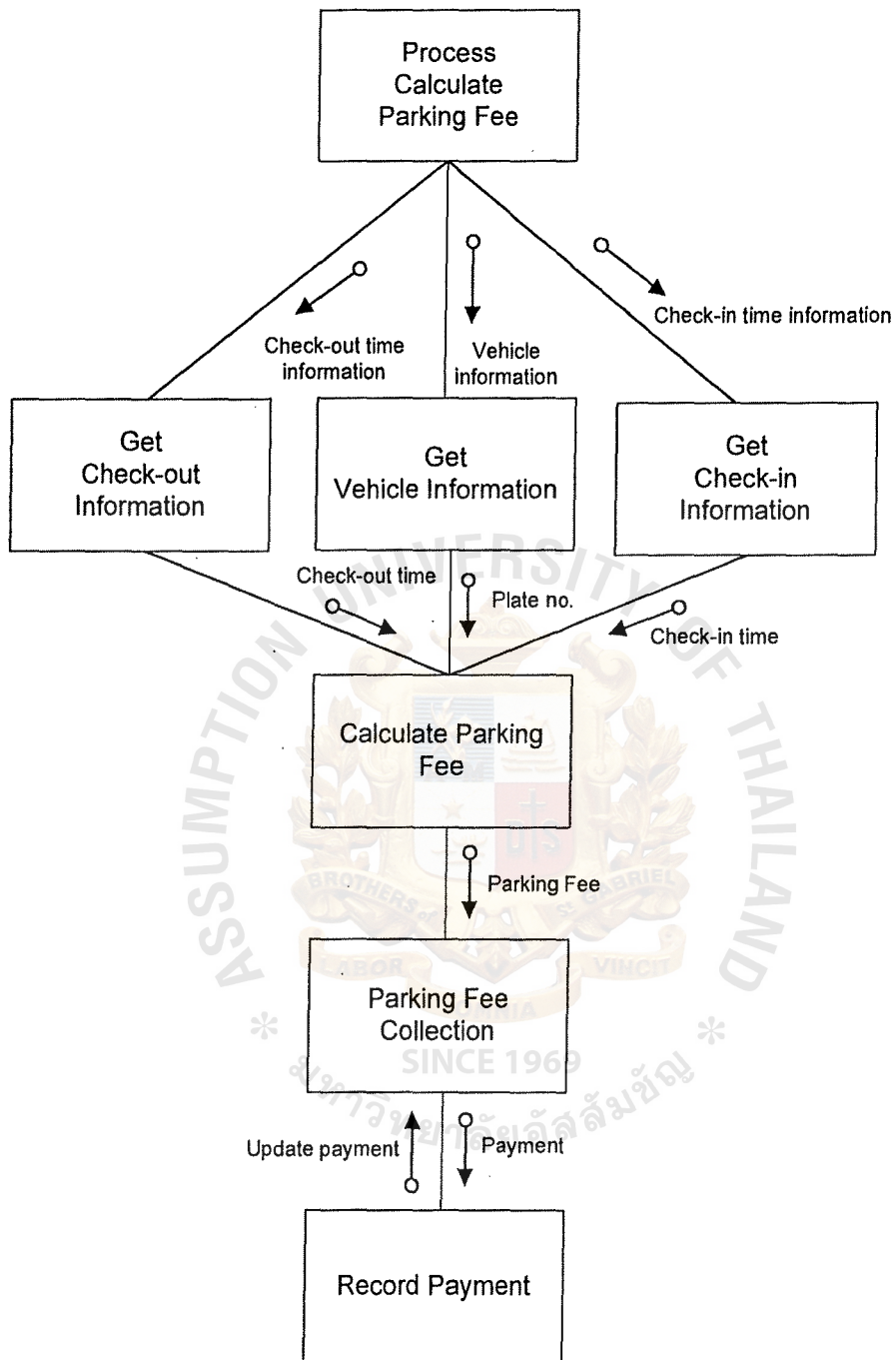


Figure D.6. Structure Chart of Process Calculate Parking Fee.

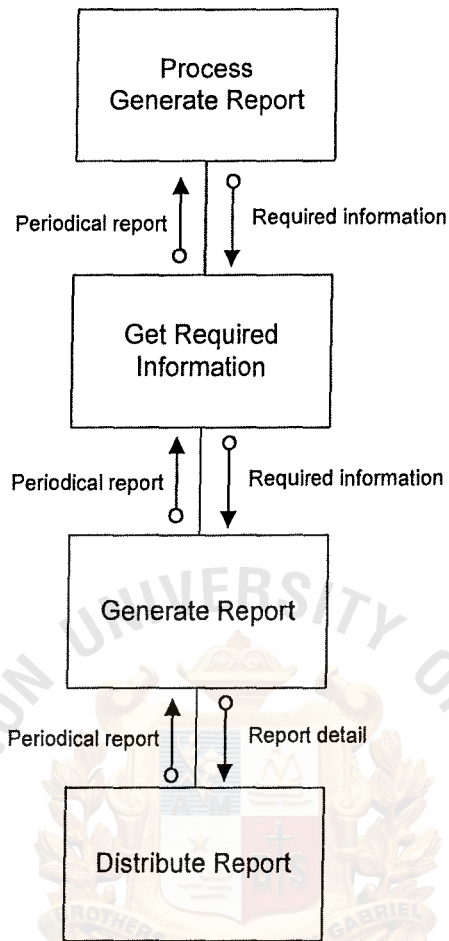


Figure D.7. Structure Chart of Process Generate Report.



## APPENDIX E

### ENTITY RELATIONSHIP DIAGRAMS

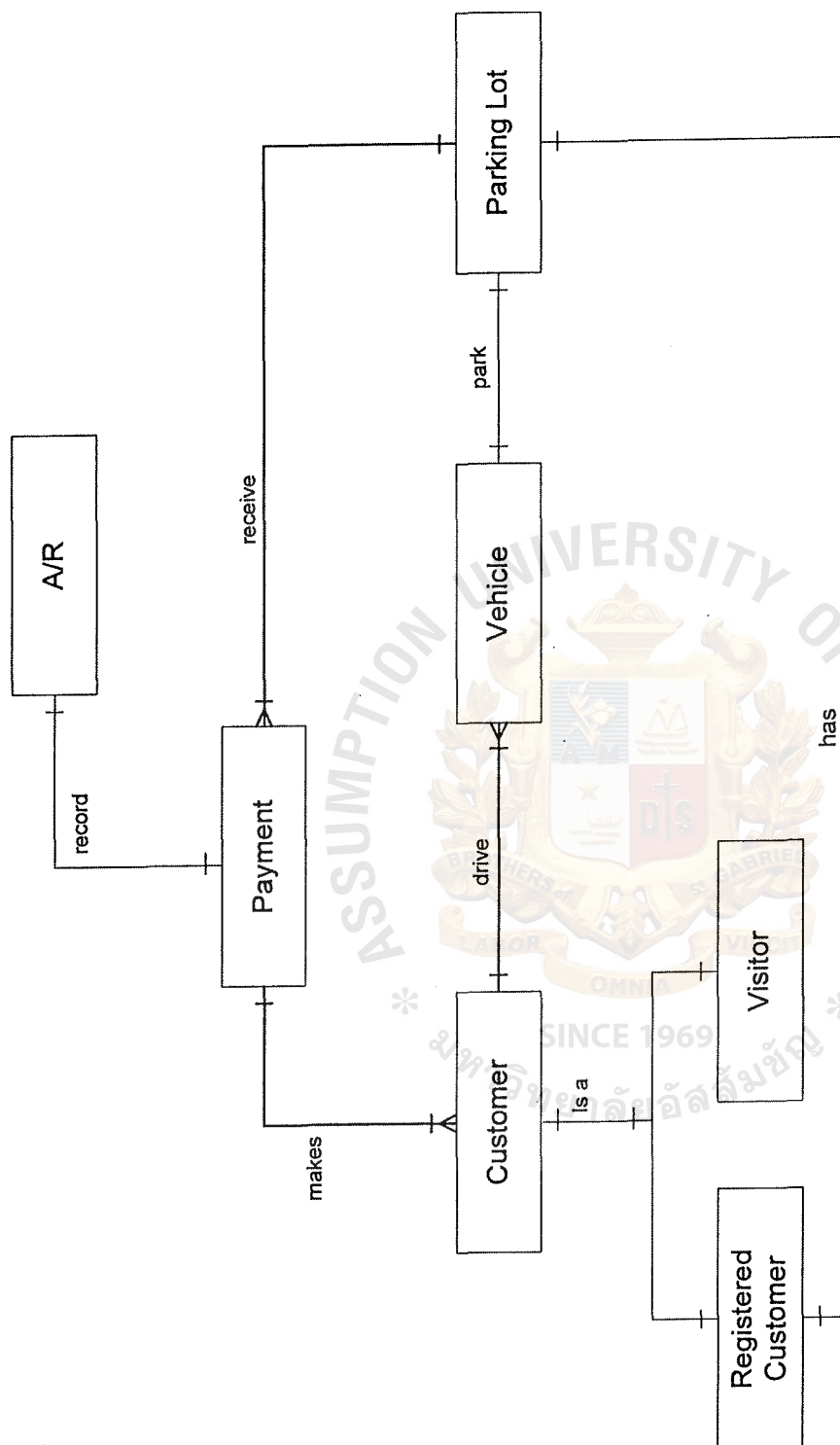


Figure E.1. Entity Relationship Diagram of Proposed System.

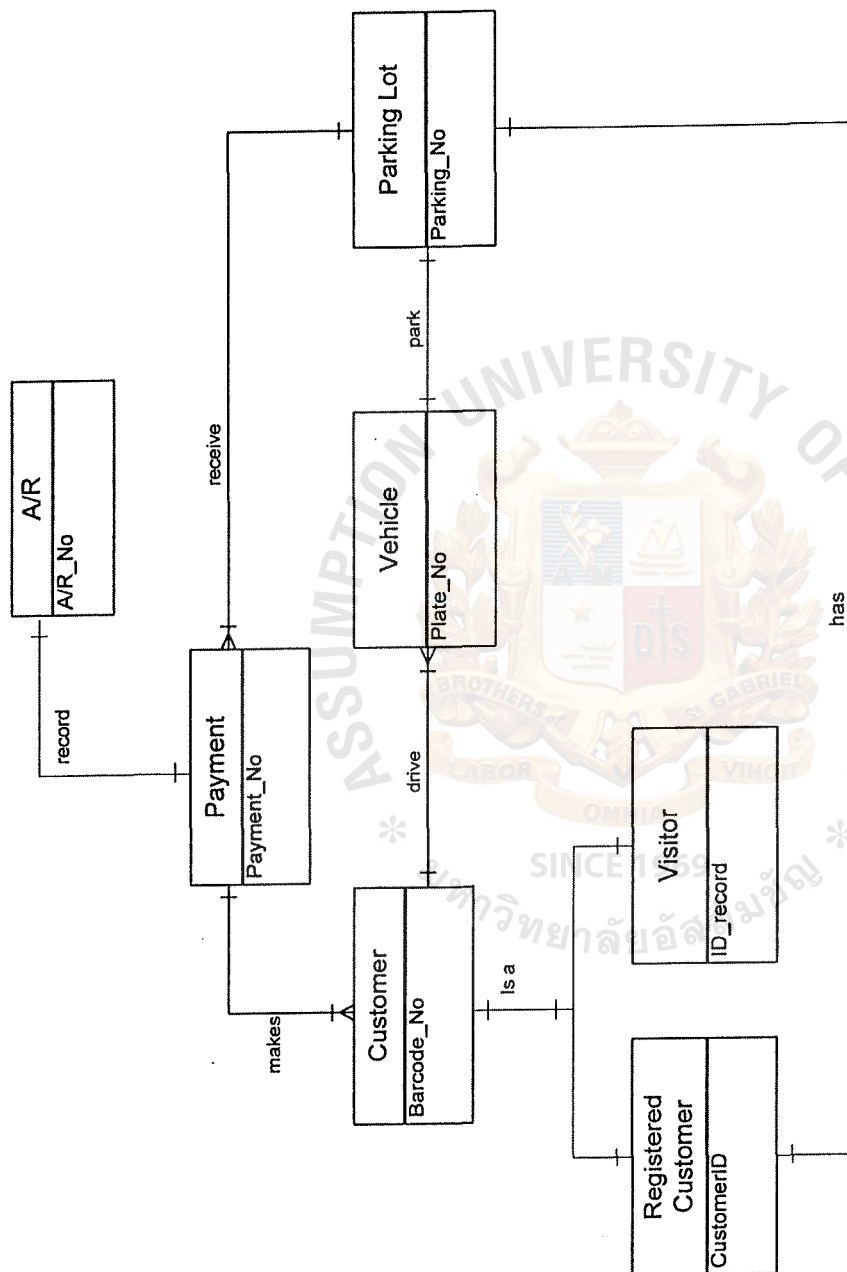


Figure E.2. Key Based Entity Relationship Diagram of Proposed System.

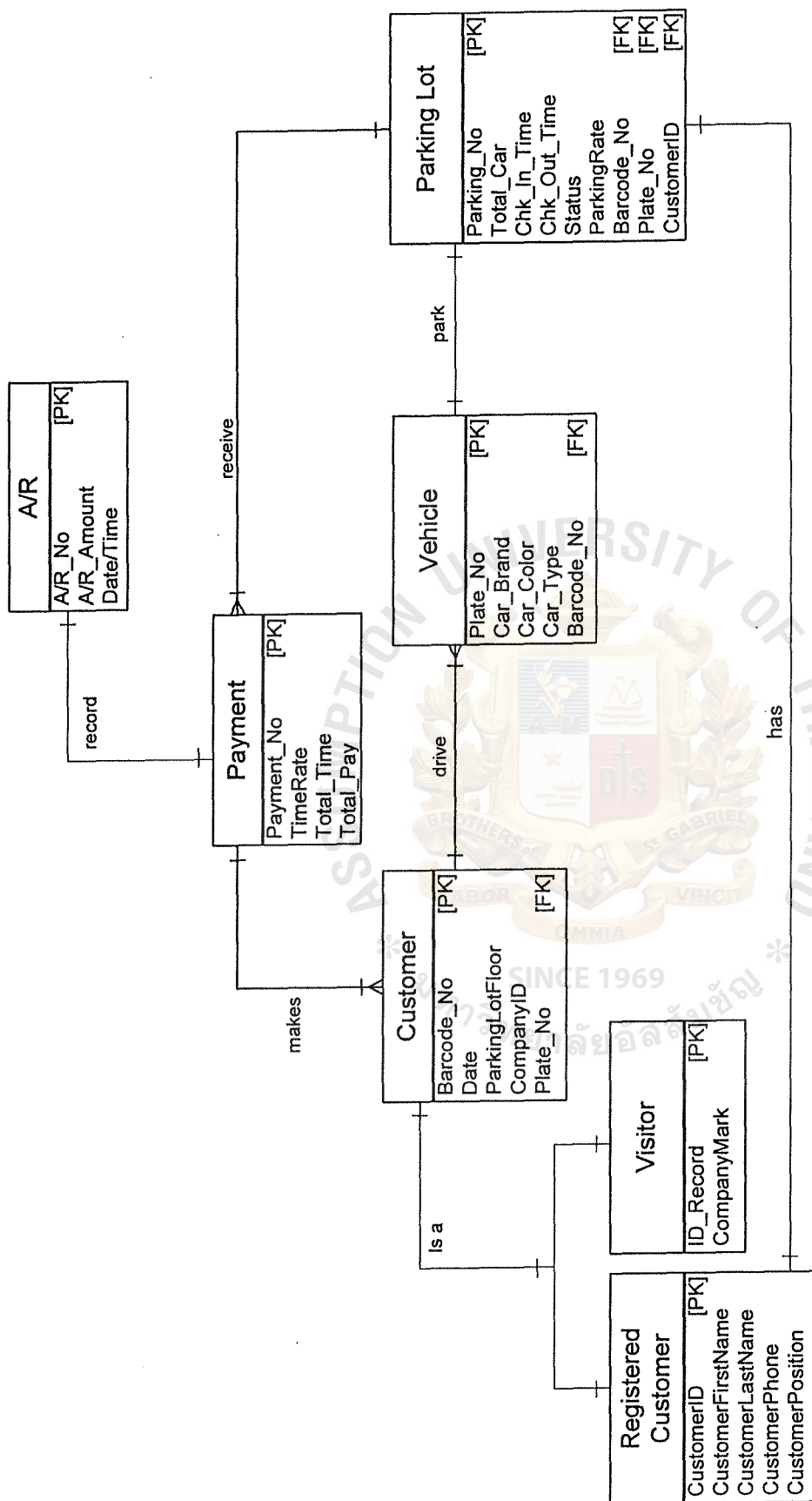
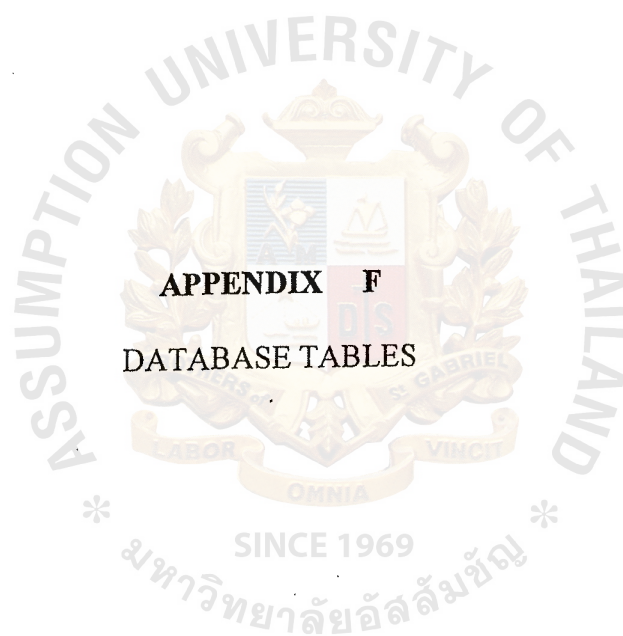


Figure E.3. Fully Attribute Entity Relationship Diagram of Proposed system.





**APPENDIX F**  
DATABASE TABLES

Table F.1. Structure of A/R Table: Data Store D1.

No.	Field Name	Field Type	Null	Key Type
1	A/R No	Integer	Not Null	Primary
2	A/R Amount	Text(20)		Attribute
3	Date/Time	Date/Time		Attribute

Table F.2. Structure of Payment Table: Data Store D2.

No.	Field Name	Field Type	Null	Key Type
1	Payment No	Text(10)	Not Null	Primary
2	TimeRate	Integer		Attribute
3	Total Time	Time		Attribute
4	Total Pay	Integer		Attribute

Table F.3. Structure of Parking Lot Table: Data Store D3.

No.	Field Name	Field Type	Null	Key Type
1	Parking_No	Integer	Not Null	Primary
2	Barcode_No	Integer		Foreign
3	Plate_No	Text(9)		Foreign
4	CustomerID	Integer		Foreign
5	Total_Car	Integer		Attribute
5	Chk_In_Time	Time		Attribute
6	Chk_Out_Time	Time		Attribute
7	Status	Text(12)		Attribute
8	ParkingRate	Text(30)		Attribute

Table F.4. Structure of Vehicle Table: Data Store D4.

No.	Field Name	Field Type	Null	Key Type
1	Plate No	Text(9)	Not Null	Primary
2	Car Brand	Text(12)		Attribute
3	Car Color	Text(12)		Attribute
4	Veh_Type	Text(12)		Attribute
5	Barcode_No	Integer		Foreign

Table F.5. Structure of Customer Table: Data Store D5.

No.	Field Name	Field Type	Null	Key Type
1	Barcode_No	Integer	Not Null	Primary
2	Date	Date		Attribute
3	ParkingLotFloor	Integer		Attribute
4	CompanyID	Integer		Attribute
5	Plate_No	Text(9)		Foreign

Table F.6. Structure of Registered Customer Table: Data Store D6.

No.	Field Name	Field Type	Null	Key Type
1	CustomerID	Integer	Not Null	Primary
2	CustomerFirstName	Text(20)		Attribute
3	CustomerLastName	Text(30)		Attribute
4	CustomerPhone	Text(12)		Attribute
5	CustomerPosition	Text(30)		Attribute

Table F.7. Structure of Unregistered customer Table: Data Store D7.

No.	Field Name	Field Type	Null	Key Type
1	ID_Record	Integer	Not Null	Primary
2	CompanyMark	Text(6)		Attribute



**APPENDIX G**  
**USER INTERFACE DESIGN**

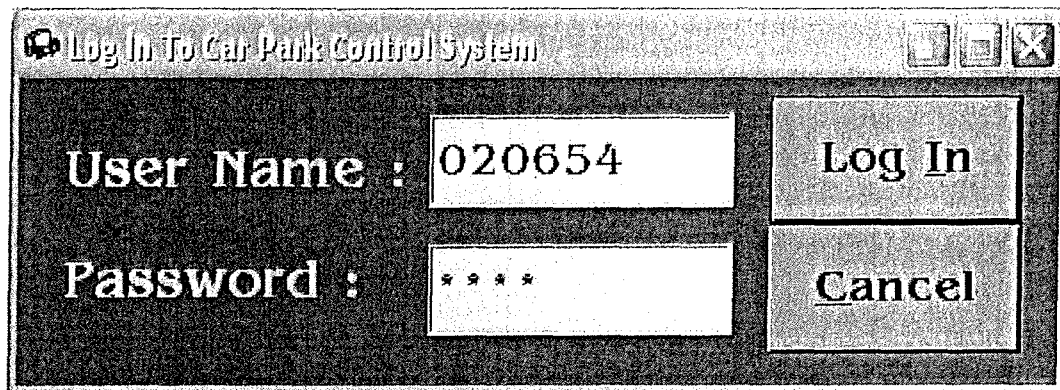


Figure G.1. Interface Design of Operator Log in.

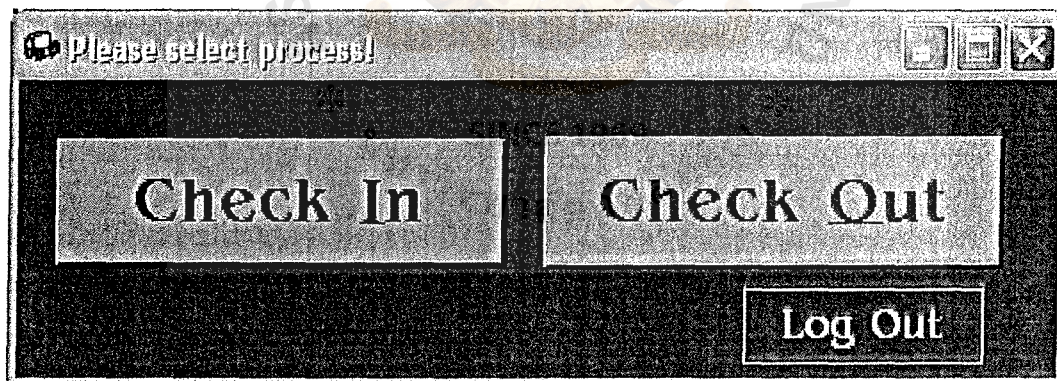



Figure G.2. Interface Design of selected process check-in or check out.



Check In

### CHECK IN

Date : Tuesday , February 14, 2006 Barcode :   
1 1 0 9 4 8 5

Time Check In : 7:45:21 AM

Company : Pull & Push Co., Ltd.

Customer's Name : Mr. Theptarin Dungkamrundee

Plate No. : **พข4937** Parking Floor : **6**

Check In Cancel

Figure G.3. Interface Design of Check-in for Registered Customer.



**Check In**

**CHECK IN**

Date: Tuesday , February 14, 2006 Barcode: 2 1 0 0 7 6 8

Time Check In: 2:34:45 PM

Company:

Customer's Name:


Plate No: วน 645 Parking Floor: 4

Check In Cancel

Figure G.4. Interface Design of Check-in for Visitor.

**check-out**

**CHECK OUT**

Date : Tuesday , February 14, 2006 Barcode :   
1 1 0 9 4 8 5

Time Check In : 7:45:21 AM

Time Check Out : 6:10:01 PM

Stamp Mark  
☐ Stamp ☐ No Stamp

Company : 61 Pull & Push co., Ltd.

Customer's Name : Mr. Theptarin Dungkamrundee

Plate No. : **WU4937** Parking Floor : **6**


**Check Out** **Cancel**

Figure G.5. Interface Design of Check-out for Registered Customer.



**check out**

**CHECK OUT**

Date : Tuesday , February 14, 2006 Barcode :   
2 1 0 0 7 6 8

Time Check In : 2:34:45 AM

Time Check Out : 2:59:06 PM

Stamp Mark  
☒ Stamp ☐ No Stamp

Company : 42 J&P Group

Customer's Name :

Plate No. : 3U 645 Parking Floor : 4

Check Out Cancel

Figure G.6. Interface Design of Check-out for Visitor – Mark Stamp.




Figure G.7. Interface Design of Verify Plate No.



check Out

**CHECK OUT**

Date : Tuesday , February 14, 2006 Barcode :   
2 1 0 0 6 7 4

Time Check In : 10:13:44 AM

Time Check Out : 11:55:13 AM

Stamp Mark  
☐ Stamp ☒ No Stamp

Company :

Customer's Name :

Plate No. : บป4875 Parking Floor : 3

Check Out Cancel

Figure G.8. Interface Design of Check-out for Visitor – No Mark Stamp.

**Calculate Parking Fee**

**'Parking Fee'**

**Plate No. : UU4875**

**Time Of Parking**

Time Check In : 10:13:44 AM

Time Check Out : 11:55:13 AM

Usage of Parking Time : 01:42:29

**Total Of Payment : 20 Baht**

**Pay**

Figure G.9. Interface Design of Calculate Parking Fee.



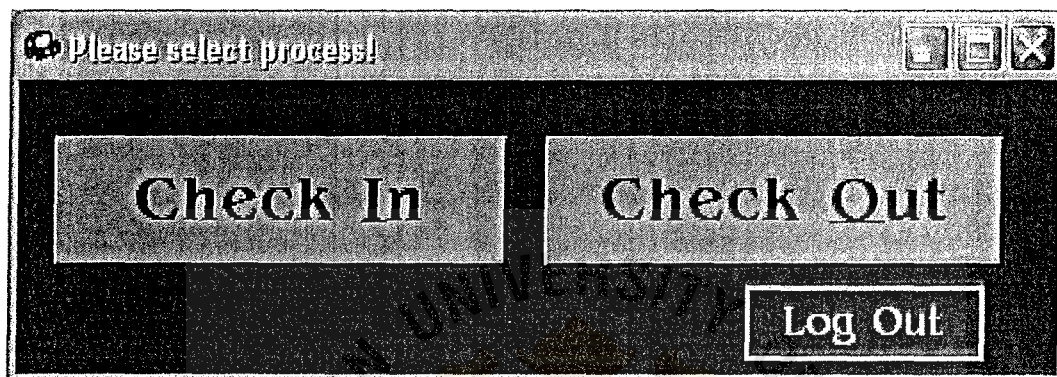


Figure G.10. Interface Design of Log out.



**APPENDIX H**  
**OUTPUT REPORTS**

<b>Report of Registered Customer</b>					
<b>Date</b>	<b>Plate No.</b>	<b>Time Check In</b>	<b>Time Check Out</b>	<b>Contact Company</b>	<b>Customer Name</b>
14/02/06	บพ3487	07:40 AM.	11:42 AM.	J&P Group	Witaya D.
	บย6554	07:43 AM.	Not check out	Prowork co., Ltd.	Jada L.
	กค5621	07:50 AM.	Not check out	Prowork co., Ltd.	Iyara O.
	ปท3421	07:50 AM.	Not check out	Show work Co., Ltd.	Rattana L.
	นร2353	07:50 AM.	Not check out	Show work Co., Ltd.	Ponkasi Y.
	พค4590	07:51 AM.	10:36 AM.	Pull & Push co., Ltd.	Keaw M.
	กค5566	07:51 AM.	11:48 AM.	Prowork co., Ltd.	Surawut T.
	1a2409	07:51 AM.	12:10 PM.	Arda Graphic	Wirat S.
	6ส7723	07:51 AM.	Not check out	DecaView Co.,Ltd.	Oranut R.
	ภพ457	07:53 AM.	09:52 AM.	J&P Group	Philp P.
	กท893	07:54 AM.	12:05 AM.	Pull & Push co., Ltd.	Somjai T.
	บค3754	07:55 AM.	12:10 AM.	J&P Group	Titti Y.
	ธร2138	07:56 AM.	12:11 AM.	INDIGO Design Co.,Ltd.	Arvee K.
	พท4654	07:58 AM.	12:14 AM.	DecaView Co.,Ltd.	Paveena S.
	ภย5645	07:59 AM.	Not check out	Ceremony Service Co., Ltd.	Siwaporn B.
	บว3214	08:00 AM.	11:29 AM.	DecaView Co.,Ltd.	Suijai K.
	ลพ8393	08:00 AM.	10:39 AM.	Purifier co., Ltd.	Nisarat T.
	ทน4521	08:01 AM.	Not check out	Show work Co., Ltd.	Veera S.
	กท2456	08:05 AM.	12:12 AM.	In House Co., Ltd.	Somporn S.
<b>Time to generate :</b> 12-30 pm. 14/02/06 <b>Total of car:</b> 19 cars <b>Generated by :</b> Jamsai Susakul					

Figure H.1. Output Report Design of Registered Customer.

## Report of Visitor

Date	Plate No.	Time Check In	Time Check Out	Contact Company
14/02/06	บพ3487	08:10 AM.	08:42 AM.	J&P Group
	วบ6554	08:11 AM.	08:38 AM.	Prowork co., Ltd.
	กด5621	08:15 AM.	08:41 AM.	Prowork co., Ltd.
	ปน3421	08:23 AM.	10:14 AM.	Show work Co., Ltd.
	นร2353	08:23 AM.	11:43 AM.	Show work Co., Ltd.
	พด4590	08:32 AM.	08:51 AM.	Pull & Push co., Ltd.
	กน5566	09:04 AM.	11:48 AM.	Prowork co., Ltd.
	1อ2409	09:08 AM.	12:10 PM.	Arda Graphic
	6ส7723	09:19 AM.	09:34 AM.	DecaView Co.,Ltd.
	ภพ457	09:26 AM.	09:52 AM.	J&P Group
	กน893	09:44 AM.	10:39 AM.	Pull & Push co., Ltd.
	บด3754	09:45 AM.	10:32 AM.	J&P Group
	ธร2138	09:45 AM.	11:43 AM.	INDIGO Design Co.,Ltd.
	พน4654	09:49 AM.	10:26 AM.	DecaView Co.,Ltd.
	ภย5645	09:58 AM.	10:47 AM.	Ceremony Service Co., Ltd.
	บว3214	10:10 AM.	11:29 AM.	DecaView Co.,Ltd.
	ลพ8393	10:17 AM.	10:39 AM.	Purifier co., Ltd.
	ทน4521	10:34 AM.	10:50 AM.	Show work Co., Ltd.
	กน2456	10:47 AM.	11:42 AM.	In House Co., Ltd.
	รน7421	11:07 AM.	11:55 AM.	Tribble Jump Co., Ltd.

**Time to generate :** 12-30 pm. 14/02/06

**Total of car:** 28 cars

**Generated by :** Jamsai Susakul

Figure H.2. Output Report Design of Visitor.

Report of Visitor					
Date	Plate No.	Time Check In	Time Check Out	Usage of time	Total of Payment
14/02/06	บพ3487	08:10 AM.	08:42 AM.	XX:XX	XX.-
	วข6554	08:11 AM.	08:38 AM.	XX:XX	XX.-
	กค5621	08:15 AM.	08:41 AM.	XX:XX	XX.-
	ปข3421	08:23 AM.	10:14 AM.	XX:XX	XX.-
	นร2353	08:23 AM.	11:43 AM.	XX:XX	XX.-
	พค4590	08:32 AM.	08:51 AM.	XX:XX	XX.-
	กข5566	09:04 AM.	11:48 AM.	XX:XX	XX.-
	1อ2409	09:08 AM.	12:10 PM.	XX:XX	XX.-
	6ส7723	09:19 AM.	09:34 AM.	XX:XX	XX.-
	ภพ457	09:26 AM.	09:52 AM.	XX:XX	XX.-
	กข893	09:44 AM.	10:39 AM.	XX:XX	XX.-
	บค3754	09:45 AM.	10:32 AM.	XX:XX	XX.-
	พข4654	09:49 AM.	10:26 AM.	XX:XX	XX.-
	ภข5645	09:58 AM.	10:47 AM.	XX:XX	XX.-
	บข3214	10:13 AM.	11:55 AM.	01:42	40.-
	ลพ8393	10:17 AM.	10:39 AM.	XX:XX	XX.-
	ทข4521	10:34 AM.	10:50 AM.	XX:XX	XX.-
	กข2456	10:47 AM.	11:42 AM.	XX:XX	XX.-
<b>Time to generate :</b> 12-30 pm. 14/02/06 <b>Total of car:</b> 18 cars <b>Total of payment :</b> X,XXX Baht <b>Generated by :</b> Jamsai Susakul					

Figure H.3. Output Report Design of Visitor for Accounting Division.



## Car Parking of Live Tower

Parking Floor : **6**  
Plate No. : **พข4937**  
Id No. : 1109485  
Date : 14/02/06  
Time : 07.45 AM.

### Parking Regulations

- Baht 20.-/hr.

Partial hour calculated as an hour.

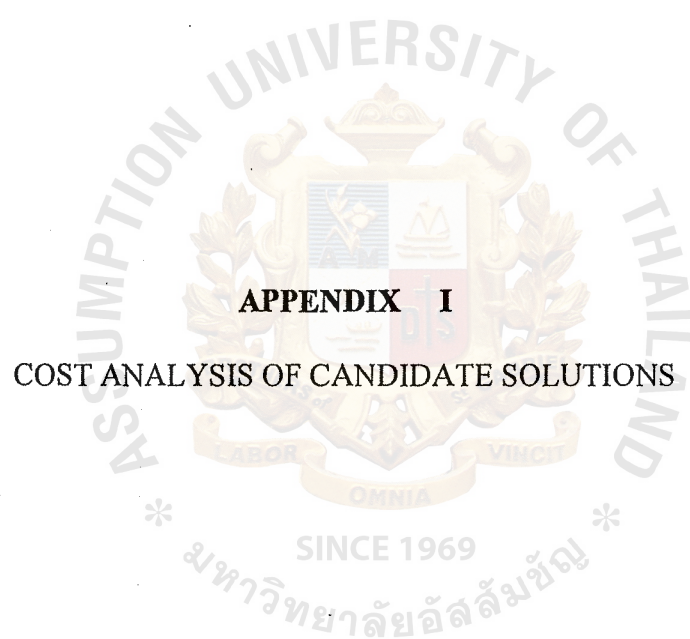
- Count on longest hour stamp.
- Baht 500.- fine for loss of ticket.  
(excluding parking charge)
- No responsibility for any loss/damage  
to vehicle.
- The Occupants agree to comply with all  
Building's Regulations.



- Thank you -

Figure H.4. Output Report Design of Parking Lot slip.





## **APPENDIX I**

### **COST ANALYSIS OF CANDIDATE SOLUTIONS**

Table I.1. Detailed Cost of the Proposed System Candidate 1.

Cost Items	Year				
	1	2	3	4	5
<b>Fixed Assets Cost (THB)</b>					
<b>Hardware Cost</b>					
Acer Altos G710 Server 1 set @ 92,000	18,400.00	18,400.00	18,400.00	18,400.00	18,400.00
Acer Aspire E500 P4 Client 4 sets @ 36,900	29,520.00	29,520.00	29,520.00	29,520.00	29,520.00
<b>Total Hardware Cost</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>
<b>Software Cost</b>					
Commercial Package (incl. implementation cost)	60,000.00	60,000.00	60,000.00	60,000.00	60,000.00
MS Windows 2003 Server @ 45,000	9,000.00	9,000.00	9,000.00	9,000.00	9,000.00
Oracle DBMS @ 220,000	44,000.00	44,000.00	44,000.00	44,000.00	44,000.00
MS Windows XP Pro @ 27,000	5,400.00	5,400.00	5,400.00	5,400.00	5,400.00
MS Office 2003 @ 16,000	3,200.00	3,200.00	3,200.00	3,200.00	3,200.00
<b>Total Software Cost</b>	<b>121,600.00</b>	<b>121,600.00</b>	<b>121,600.00</b>	<b>121,600.00</b>	<b>121,600.00</b>
<b>Office Equipment Cost</b>					
Netgear Cable/DSL Wireless Router @ 5,000	5,000.00	-	-	-	-
3COM 24Ports Fast Ethernet Managed Switch @ 24,900	24,900.00	-	-	-	-
Backup Device & Tapes @ 38,000	38,000.00	-	-	-	-
APC Back Pro UPS 1000i (1000VA) 1 unit @ 15,300	15,300.00	-	-	-	-
Stream-800 UPS (1000VA) 4 units @ 2,000	8,000.00	-	-	-	-
HP LaserJet Printer 1020 1 unit @ 5,880	5,880.00	-	-	-	-
Casio MX-120V Calculator 2 units @ 299	598.00	-	-	-	-
<b>Total Office Equipment Cost</b>	<b>97,678.00</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Maintenance Cost</b>	<b>-</b>	<b>10,000.00</b>	<b>11,000.00</b>	<b>13,200.00</b>	<b>17,160.00</b>
<b>Total Fixed Assets Cost (THB)</b>	<b>267,198.00</b>	<b>179,520.00</b>	<b>180,520.00</b>	<b>182,720.00</b>	<b>186,680.00</b>
<b>Operation Cost (THB)</b>					
<b>Employee Salary (THB)</b>					
Accounting Officer 1 person @ 15,000/mth	180,000.00	192,600.00	206,082.00	220,507.74	235,943.28
Administrative Officer 1 person @ 12,000/mth	144,000.00	154,080.00	164,865.60	176,406.19	188,754.63
Operators 4 person @ 8,000/mth	384,000.00	410,880.00	439,641.60	470,416.51	503,345.67
IT Support 1 person @ 15,000/mth	180,000.00	192,600.00	206,082.00	220,507.74	235,943.28
<b>Total Employee Salary</b>	<b>888,000.00</b>	<b>950,160.00</b>	<b>1,016,671.20</b>	<b>1,087,838.18</b>	<b>1,163,986.86</b>

Table I.1. Detailed Cost of the Proposed System Candidate 1 (Cont.).

Cost Items	Year				
	1	2	3	4	5
<b>Office Supplies &amp; Miscellaneous Cost (THB)</b>					
Utility @ 4,000/mth	48,000.00	50,400.00	52,920.00	55,566.00	58,344.30
Samart ADSL Biz Lite 512/256Kbps Fee @ 11,900/mth	142,800.00	149,940.00	157,437.00	165,308.85	173,574.29
Paper @ 500/mth	6,000.00	6,300.00	6,615.00	6,945.75	7,293.04
Stationery @ 800/mth	9,600.00	10,080.00	10,584.00	11,113.20	11,668.86
Miscellaneous Cost @ 2,500/mth	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
<b>Total Office Supplies &amp; Miscellaneous Cost</b>	<b>236,400.00</b>	<b>249,720.00</b>	<b>263,856.00</b>	<b>278,863.80</b>	<b>294,803.49</b>
<b>Total Annual Operating Cost (THB)</b>	1,124,400.00	1,199,880.00	1,280,527.20	1,366,701.98	1,458,790.35
<b>Total Computerized System Cost (THB)</b>	1,391,598.00	1,379,400.00	1,461,047.20	1,549,421.98	1,645,470.35
<b>Total Accumulated Computerized System Cost (THB)</b>	1,391,598.00	2,770,998.00	4,232,045.20	5,781,467.18	7,426,937.53

Table I.2. Detailed Cost of the Proposed System Candidate 2.

Cost Items	Year				
	1	2	3	4	5
<b>Fixed Assets Cost (THB)</b>					
<b>Hardware Cost</b>					
Acer Altos G710 Server 1 set @ 92,000	18,400.00	18,400.00	18,400.00	18,400.00	18,400.00
Acer Aspire E500 P4 Client 4 sets @ 36,900	29,520.00	29,520.00	29,520.00	29,520.00	29,520.00
<b>Total Hardware Cost</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>
<b>Software Cost</b>					
MS Windows 2003 Server @ 45,000	9,000.00	9,000.00	9,000.00	9,000.00	9,000.00
MS SQL Server 2000 @ 170,000	34,000.00	34,000.00	34,000.00	34,000.00	34,000.00
MS Windows XP Pro @ 27,000	5,400.00	5,400.00	5,400.00	5,400.00	5,400.00
MS Office 2003 @ 16,000	3,200.00	3,200.00	3,200.00	3,200.00	3,200.00
MS Visual Studio.NET @ 35,000	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00
<b>Total Software Cost</b>	<b>58,600.00</b>	<b>58,600.00</b>	<b>58,600.00</b>	<b>58,600.00</b>	<b>58,600.00</b>
<b>Office Equipment Cost</b>					
Netgear Cable/DSL Wireless Router @ 5,000	5,000.00	-	-	-	-
3COM 24Ports Fast Ethernet Managed Switch @ 24,900	24,900.00	-	-	-	-
Backup Device & Tapes @ 38,000	38,000.00	-	-	-	-
APC Back Pro UPS 1000i (1000VA) 1 unit @ 15,300	15,300.00	-	-	-	-
Stream-1000 UPS (1000VA) 4 units @ 2,000	8,000.00	-	-	-	-
HP LaserJet Printer 1020 1 unit @ 5,880	5,880.00	-	-	-	-
Metrologic MS-9540 Barcode Reader 2 units @ 9,095	18,190.00	-	-	-	-
Casio MX-120V Calculator 2 units @ 299	598.00	-	-	-	-
<b>Total Office Equipment Cost</b>	<b>115,868.00</b>	-	-	-	-

Table I.2. Detailed Cost of the Proposed System Candidate 2 (Cont.).

Cost Items	Year				
	1	2	3	4	5
<b>Maintenance Cost</b>	-	10,000.00	11,000.00	13,200.00	17,160.00
<b>Implementation Cost</b>					
Training Cost	10,000.00	-	-	-	-
Setup Cost	10,000.00	-	-	-	-
Additional Miscellaneous Cost	5,000.00	-	-	-	-
<b>Total Implementation Cost</b>	<b>25,000.00</b>	-	-	-	-
<b>Total Fixed Assets Cost (THB)</b>	<b>247,388.00</b>	<b>116,520.00</b>	<b>117,520.00</b>	<b>119,720.00</b>	<b>123,680.00</b>
<b>Operation Cost (THB)</b>					
<b>Employee Salary (THB)</b>					
Accounting Officer 1 person @ 15,000/mth	180,000.00	192,600.00	206,082.00	220,507.74	235,943.28
Administrative Officer 1 person @ 12,000/mth	144,000.00	154,080.00	164,865.60	176,406.19	188,754.63
Operators 4 person @ 8,000/mth	384,000.00	410,880.00	439,641.60	470,416.51	503,345.67
IT Support 1 person @ 15,000/mth	180,000.00	192,600.00	206,082.00	220,507.74	235,943.28
<b>Total Employee Salary</b>	<b>888,000.00</b>	<b>950,160.00</b>	<b>1,016,671.20</b>	<b>1,087,838.18</b>	<b>1,163,986.86</b>
<b>Office Supplies &amp; Miscellaneous Cost (THB)</b>					
Utility @ 4,000/mth	48,000.00	50,400.00	52,920.00	55,566.00	58,344.30
KSC ADSL 512/256Kbps Fee @ 10,000/mth	120,000.00	126,000.00	132,300.00	138,915.00	145,860.75
Paper @ 500/mth	6,000.00	6,300.00	6,615.00	6,945.75	7,293.04
Stationery @ 800/mth	9,600.00	10,080.00	10,584.00	11,113.20	11,668.86
Miscellaneous Cost @ 2,500/mth	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
<b>Total Office Supplies &amp; Miscellaneous Cost</b>	<b>213,600.00</b>	<b>225,780.00</b>	<b>238,719.00</b>	<b>252,469.95</b>	<b>267,089.95</b>
<b>Total Annual Operating Cost (THB)</b>	<b>1,101,600.00</b>	<b>1,175,940.00</b>	<b>1,255,390.20</b>	<b>1,340,308.13</b>	<b>1,431,076.80</b>
<b>Total Computerized System Cost (THB)</b>	<b>1,348,988.00</b>	<b>1,292,460.00</b>	<b>1,372,910.20</b>	<b>1,460,028.13</b>	<b>1,554,756.80</b>
<b>Total Accumulated Computerized System Cost (THB)</b>	<b>1,348,988.00</b>	<b>2,641,448.00</b>	<b>4,014,358.20</b>	<b>5,474,386.33</b>	<b>7,029,143.14</b>

Table I.3. Detailed Cost of the Proposed System Candidate 3.

Cost Items	Year				
	1	2	3	4	5
<b>Fixed Assets Cost (THB)</b>					
<b>Hardware Cost</b>					
Acer Altos G710 Server 1 set @ 92,000	18,400.00	18,400.00	18,400.00	18,400.00	18,400.00
Acer Aspire E500 P4 Client 4 sets @ 36,900	29,520.00	29,520.00	29,520.00	29,520.00	29,520.00
<b>Total Hardware Cost</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>	<b>47,920.00</b>
<b>Software Cost</b>					
MS Windows 2003 Server @ 45,000	9,000.00	9,000.00	9,000.00	9,000.00	9,000.00
MS Windows XP Pro @ 27,000	5,400.00	5,400.00	5,400.00	5,400.00	5,400.00
MS Office 2003 @ 16,000	3,200.00	3,200.00	3,200.00	3,200.00	3,200.00
MS Visual Studio.NET @ 35,000	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00
<b>Total Software Cost</b>	<b>24,600.00</b>	<b>24,600.00</b>	<b>24,600.00</b>	<b>24,600.00</b>	<b>24,600.00</b>

Table I.3. Detailed Cost of the Proposed System Candidate 3 (Cont.).

Cost Items	Year				
	1	2	3	4	5
<b>Office Equipment Cost</b>					
Netgear Cable/DSL Wireless Router @ 5,000	5,000.00	-	-	-	-
3COM 24Ports Fast Ethernet Managed Switch @ 24,900	24,900.00	-	-	-	-
Backup Device & Tapes @ 38,000	38,000.00	-	-	-	-
APC Back Pro UPS 1000i (1000VA) 1 unit @ 15,300	15,300.00	-	-	-	-
Stream-1000 UPS (1000VA) 4 units @ 2,000	8,000.00	-	-	-	-
HP LaserJet Printer 1020 1 unit @ 5,880	5,880.00	-	-	-	-
Metrologic MS-9540 Barcode Reader 2 units @ 9,095	18,190.00	-	-	-	-
Casio MX-120V Calculator 2 units @ 299	598.00	-	-	-	-
<b>Total Office Equipment Cost</b>	<b>115,868.00</b>	-	-	-	-
<b>Maintenance Cost</b>	-	10,000.00	11,000.00	13,200.00	17,160.00
<b>Implementation Cost</b>					
Training Cost	10,000.00	-	-	-	-
Setup Cost	10,000.00	-	-	-	-
Additional Miscellaneous Cost	5,000.00	-	-	-	-
<b>Total Implementation Cost</b>	<b>25,000.00</b>	-	-	-	-
<b>Total Fixed Assets Cost (THB)</b>	<b>213,388.00</b>	<b>82,520.00</b>	<b>83,520.00</b>	<b>85,720.00</b>	<b>89,680.00</b>
<b>Operation Cost (THB)</b>					
<b>Employee Salary (THB)</b>					
Accounting Officer 1 person @ 15,000/mth	180,000.00	192,600.00	206,082.00	220,507.74	235,943.28
Administrative Officer 1 person @ 12,000/mth	144,000.00	154,080.00	164,865.60	176,406.19	188,754.63
Operators 4 person @ 8,000/mth	384,000.00	410,880.00	439,641.60	470,416.51	503,345.67
IT Support 1 person @ 15,000/mth	180,000.00	192,600.00	206,082.00	220,507.74	235,943.28
<b>Total Employee Salary</b>	<b>888,000.00</b>	<b>950,160.00</b>	<b>1,016,671.20</b>	<b>1,087,838.18</b>	<b>1,163,986.86</b>
<b>Office Supplies &amp; Miscellaneous Cost (THB)</b>					
Utility @ 4,000/mth	48,000.00	50,400.00	52,920.00	55,566.00	58,344.30
KSC ADSL 512/256Kbps Fee @ 10,000/mth	120,000.00	126,000.00	132,300.00	138,915.00	145,860.75
Paper @ 500/mth	6,000.00	6,300.00	6,615.00	6,945.75	7,293.04
Stationery @ 800/mth	9,600.00	10,080.00	10,584.00	11,113.20	11,668.86
Miscellaneous Cost @ 2,500/mth	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
<b>Total Office Supplies &amp; Miscellaneous Cost</b>	<b>213,600.00</b>	<b>225,780.00</b>	<b>238,719.00</b>	<b>252,469.95</b>	<b>267,089.95</b>
<b>Total Annual Operating Cost (THB)</b>	<b>1,101,600.00</b>	<b>1,175,940.00</b>	<b>1,255,390.20</b>	<b>1,340,308.13</b>	<b>1,431,076.80</b>
<b>Total Computerized System Cost (THB)</b>	<b>1,314,988.00</b>	<b>1,258,460.00</b>	<b>1,338,910.20</b>	<b>1,426,028.13</b>	<b>1,520,756.80</b>
<b>Total Accumulated Computerized System Cost (THB)</b>	<b>1,314,988.00</b>	<b>2,573,448.00</b>	<b>3,912,358.20</b>	<b>5,338,386.33</b>	<b>6,859,143.14</b>



Table I.4. The Comparison: Manual system cost and computerized system cost, THB.

Year	Accumulated Existing Cost	Accumulated Candidate 1 Cost	Accumulated Candidate 2 Cost	Accumulated Candidate 3 Cost
1	1,239,876.00	1,391,598.00	1,348,988.00	1,314,988.00
2	2,580,996.00	2,770,998.00	2,641,448.00	2,573,448.00
3	4,056,228.00	4,232,045.20	4,014,358.20	3,912,358.20
4	5,678,983.20	5,781,467.18	5,474,386.33	5,338,386.33
5	7,464,013.92	7,426,937.53	7,029,143.14	6,859,143.14





Table I.5. Payback Analysis of the Proposed System Candidate 1.

Cash flow description	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)
Development cost:	945,278.00					
Operation & maintenance cost:		1,134,400.00	1,247,840.00	1,372,624.00	1,509,886.40	1,660,875.04
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted costs (adjusted to present value):	945,278.00	1,031,273.00	1,031,273.00	1,031,273.00	1,031,273.00	1,031,273.00
Cumulative time-adjusted costs over lifetime:	945,278.00	1,976,551.00	3,007,824.00	4,039,097.00	5,070,370.00	6,101,643.00
Benefits derived from operation of new system:	0.00	1,500,000.00	1,635,000.00	1,782,150.00	1,942,543.50	2,117,372.42
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted benefits (current of present value):	0.00	1,363,637.00	1,351,240.00	1,338,956.00	1,326,784.00	1,314,722.00
Cumulative time-adjusted benefits over lifetime:	0.00	1,363,637.00	2,714,877.00	4,053,833.00	5,380,617.00	6,695,339.00
	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)
Cumulative lifetime time-adjusted costs + benefits:	945,278.00	612,914.00	292,947.00	14,736.00	310,247.00	593,696.00

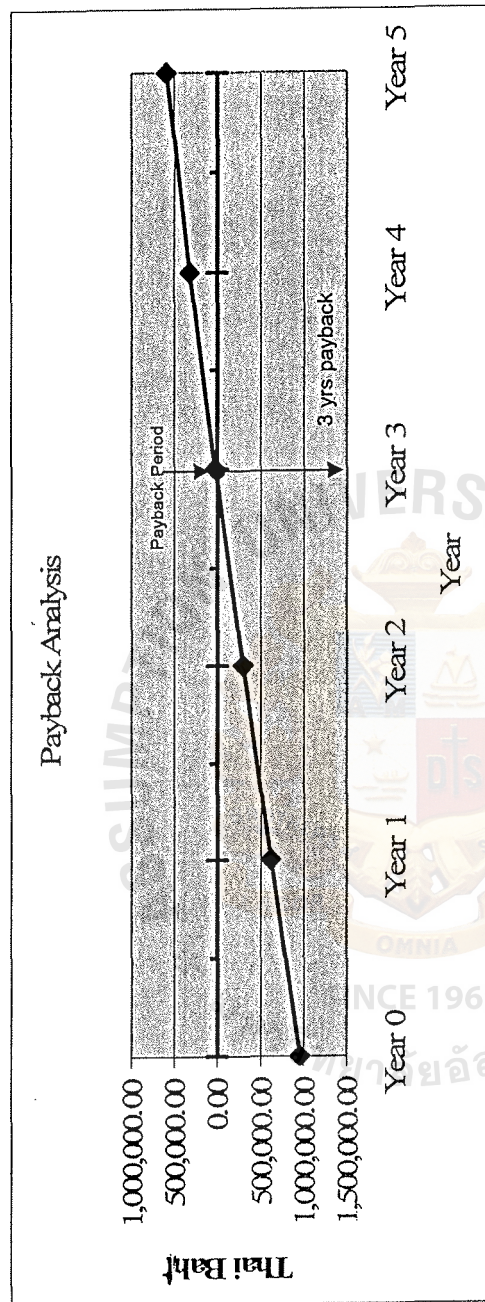


Figure I.1. Payback Analysis of the Proposed System Candidate 1.

Table I.6. Net Present Value Analysis of the Proposed System Candidate 1.

Cash flow description	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)	Total (THB)
Development cost:	945,278.00	0.00	0.00	0.00	0.00	0.00	
Operation & maintenance cost:	0.00	1,134,400.00	1,247,840.00	1,372,624.00	1,509,886.40	1,660,875.04	
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621	
Present value of annual costs:	945,278.00	1,031,273.00	1,031,273.00	1,031,273.00	1,031,273.00	1,031,273.00	
total present value of lifetime costs:							6,101,643.00
Benefits derived from operation of new system:	0.00	1,500,000.00	1,635,000.00	1,782,150.00	1,942,543.50	2,117,372.42	
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621	
Present value of annual benefits:	0.00	1,363,637.00	1,351,240.00	1,338,956.00	1,326,784.00	1,314,722.00	
Total present value of lifetime benefits:							6,695,339.00
NET PRESENT VALUE OF THIS ALTERNATIVE:							593,696.00

Table I.7. Payback Analysis of the Proposed System Candidate 2.

Cash flow description	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)
Development cost:	663,468.00					
Operation & maintenance cost:		1,121,600.00	1,233,760.00	1,357,136.00	1,492,849.60	1,642,134.56
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted costs (adjusted to present value):	663,468.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00
Cumulative time-adjusted costs over lifetime:	663,468.00	1,683,105.00	2,702,742.00	3,722,379.00	4,742,016.00	5,761,653.00
Benefits derived from operation of new system:	0.00	1,500,000.00	1,605,000.00	1,717,350.00	1,837,564.50	1,966,194.02
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted benefits (current of present value):	0.00	1,363,637.00	1,326,447.00	1,290,271.00	1,255,082.00	1,220,852.00
Cumulative time-adjusted benefits over lifetime:	0.00	1,363,637.00	2,690,084.00	3,980,355.00	5,235,437.00	6,456,289.00
	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)
Cumulative lifetime time-adjusted costs + benefits:	663,468.00	319,468.00	12,658.00	257,976.00	493,421.00	694,636.00



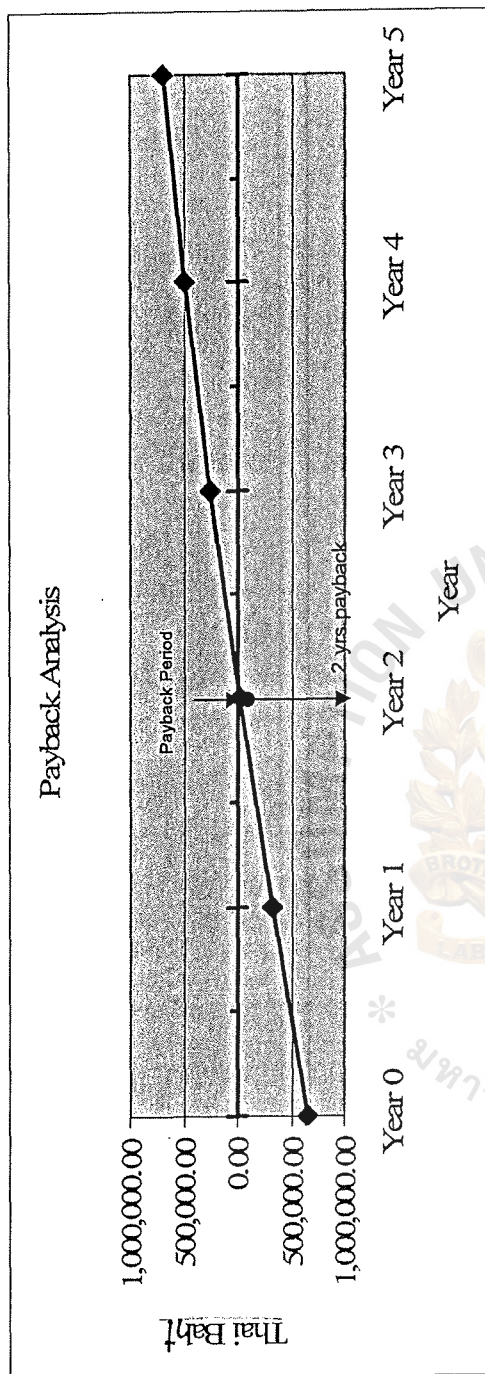


Figure I.2. Payback Analysis of the Proposed System Candidate 2.



Table I.8. Net Present Value Analysis of the Proposed System Candidate 2.

Cash flow description	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)	Total (THB)
Development cost:	663,468.00	0.00	0.00	0.00	0.00	0.00	
Operation & maintenance cost:	0.00	1,121,600.00	1,233,760.00	1,357,136.00	1,492,849.60	1,642,134.56	
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621	
Present value of annual costs:	663,468.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00	
total present value of lifetime costs:							5,761,653.00
Benefits derived from operation of new system:	0.00	1,500,000.00	1,605,000.00	1,717,350.00	1,837,564.50	1,966,194.02	
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621	
Present value of annual benefits:	0.00	1,363,637.00	1,326,447.00	1,290,271.00	1,255,082.00	1,220,852.00	
Total present value of lifetime benefits:							6,456,289.00
NET PRESENT VALUE OF THIS ALTERNATIVE:							694,636.00

Table I.9. Payback Analysis of the Proposed System Candidate 3.

Cash flow description	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)
Development cost:	493,468.00					
Operation & maintenance cost:		1,121,600.00	1,233,760.00	1,357,136.00	1,492,849.60	1,642,134.56
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted costs (adjusted to present value):	493,468.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00
Cumulative time-adjusted costs over lifetime:	493,468.00	1,513,105.00	2,532,742.00	3,552,379.00	4,572,016.00	5,591,653.00
Benefits derived from operation of new system:	0.00	1,500,000.00	1,605,000.00	1,717,350.00	1,837,564.50	1,966,194.02
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted benefits (current of present value):	0.00	1,363,637.00	1,326,447.00	1,290,271.00	1,255,082.00	1,220,852.00
Cumulative time-adjusted benefits over lifetime:	0.00	1,363,637.00	2,690,084.00	3,980,355.00	5,235,437.00	6,456,289.00
	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)
Cumulative lifetime time-adjusted costs + benefits:	493,468.00	149,468.00	157,342.00	427,976.00	663,421.00	864,636.00

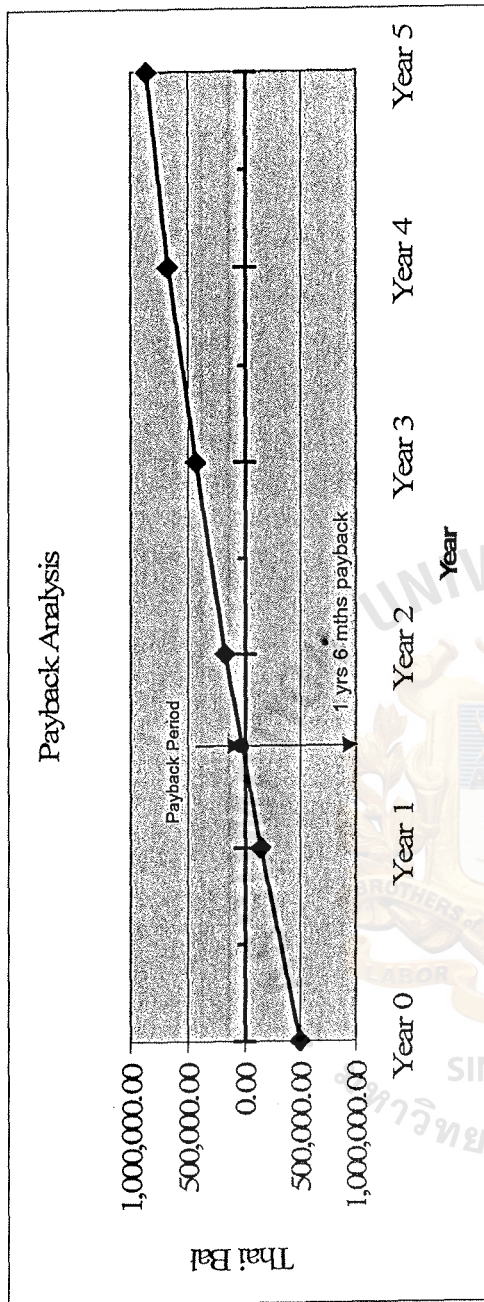


Figure I.3. Payback Analysis of the Proposed System Candidate 3.

Table I.10. Net Present Value Analysis of the Proposed System Candidate 3.

Cash flow description	Year 0 (THB)	Year 1 (THB)	Year 2 (THB)	Year 3 (THB)	Year 4 (THB)	Year 5 (THB)	Total (THB)
Development cost:	493,468.00	0.00	0.00	0.00	0.00	0.00	
Operation & maintenance cost:	0.00	1,121,600.00	1,233,760.00	1,357,136.00	1,492,849.60	1,642,134.56	
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621	
Present value of annual costs:	493,468.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00	1,019,637.00	
total present value of lifetime costs:							5,591,653.00
Benefits derived from operation of new system:	0.00	1,500,000.00	1,605,000.00	1,717,350.00	1,837,564.50	1,966,194.02	
Discount factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621	
Present value of annual benefits:	0.00	1,363,637.00	1,326,447.00	1,290,271.00	1,255,082.00	1,220,852.00	
Total present value of lifetime benefits:							6,456,289.00
NET PRESENT VALUE OF THIS ALTERNATIVE:							864,636.00

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