Auto Repair Order Information System

by

Ms. Patchaliya Chavananikul

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

March 2001

Auto Repair Order Information System

by
Ms. Patchaliya Chavananikul

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

March 2001

Project Title	Auto Repair Order Information System
Name	Ms. Patchaliya Chavananikul
Project Advisor	Assoc.Prof.Dr. Suphamit Chittayasothorn
Academic Year	March 2001

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.

Approval Committee:

(Assoc.Prof.Dr. Suphamit Chittayasothorn)
Advisor

(Prof.Dr. Srisakdi Charmonman)
Chairman

(Air Marshal Dr. Chulit Meesajjee)
Dean and Co-advisor

(Asst.Prof.Dr. Vichit Avatchanakorn)
Member

(Assoc.Prof. Somchai Thayarnyong)
MUA Representative

March 2001

ABSTRACT

Auto Repair Order Information System is created for a medium size auto repair shop, Japanese Car Repair Co., Ltd. The business provides two main services one is engine repair and the other is body and paint repair and it provide services for both car owner and cars under insurance claim. The nature of the business requires a tremendous amount of data to be collected on customers, cars, and insurance claims. Along with that numerous documents have to be prepared in order to collect payments from insurance companies.

Currently all processes are done manually and are time consuming. Files are kept in file cabinets, which is hard to search for. The same information must be written many times for different documents, that is redundant work. Overloaded work cause workers to do over time, which increases operation expenses for the company. Customers are complaining about the company service because workers are too busy with their paper work. And with the time it takes to prepare payment requisition documents, payments are made a month after job delivery. This causes problem in the company cash flow.

The proposed system will use computerized information system with client and server LAN connecting each computer in the company. All data will be kept in a database using MS Access as its application creating a user-friendly interface. Information can easily be retrieved in lesser time. Document and report preparation can also be prepared in lesser time as well. It solves the problem of the existing system and provides better information support for management.

ACKNOWLEDGEMENTS

The writer would like to express her sincere gratitude to her advisor, Assoc.Prof.Dr. Suphamit Chittayasothorn, for his continuous advice, guidance, and encouragement throughout this project.

She would also like to thank the MS(CIS) committee for their guidance on the initial proposal, their attendance during oral examination, and all their advice on the project.

Her sincere and warm appreciation is also expressed to all staff of Japanese Car Repair Co., Ltd. who where kind enough to provide information that greatly contributed to this project.

She deeply appreciates all the knowledge and skill that her previous instructors have given her throughout her studies at Assumption University. Lastly, she is deeply grateful to her family and friends for their love, support, encouragement, and everything they have done for her.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

1.1 Background of the Project

Due to the increase in automobile population in Thailand, many businesses big and small have sprung up to support them. One of these businesses is an auto repair business, which are either owned by a well-established company known as a car dealer owned by individuals or so called family business.

In the past these small auto repair shops have developed themselves from a small garage to a more standardized business by developing their infrastructure and equipment. However, it does not seem to be enough to stay competitive since the development in the industry does not only concern equipment and tools used for repair functions but also to improve in customer services and information support for management. This indicates the need for individually owned segment of the industry to take other steps in its business development.

Japanese Car Repair is one of those auto repair shops that are individually owned. The main service of the business can be categorized into body repair and engine repair. All processes involved in the operation are done manually. But the accumulated customer data, overloaded paperwork, and increase in affiliate contracts with insurance companies has resulted in inefficient and ineffective operations that can no longer be tolerated. The company needs an information system that effectively supports its auto repair orders. This trigger the initiation of this project

1.2 Objectives of the Project

This project is to create an auto repair order information system that achieves the following objectives:

(1) To eliminate duplicate work and reduce paperwork by 70%.

(2) To reduce the time needed for auto repair order processing by 55%.

(3) To reduce the time needed for searching auto repair record by 90%.

(4) To reduce the time needed for management report preparation by 90%.

(5) To increase the security and the efficiency of auto repair information by 60%.

1.3 Scope of the Project

This project is aimed to create a repair order information system for Japanese Car Repair Co., LTD. It covers all operations involving repair order, including management reports and documents that are derived from repair order. It does not cover accounting and inventory area since its main purpose is to create and keep a record of repair order and every transaction that occurs in the business operation. It should be able to create a repair order in printed form. Other than that, it should be able to create associated documents use in day to day operation especially documents required from the insurance company, such as payment requisition. Apart from the day to day operation it should be able to give management a clearer view of the business performance. Using information collected from creating repair order, it can generate reports that can help management in their decision making.

1.4 Deliverables

The project deliverables include the following report documents or interfaces:

1.4.1 Screen Interface for database maintenance such as create, update, and delete.

(1) Customer Database

(2) Car Database

(3) Insurance Database

(4) Job Database

(5) Parts Database

1.4.2 Documentation used in operation. (Screen interfaces and Paper documents)

(1) Repair Order

(2) Parts Used by Repair Order

(3) Repaired Job by Repair Order

(4) Claim Repair Order Quotation

(5) Requisition for Price Agreement

(6) Requisition for Payment

1.4.3 Management Reports (Screen Interfaces and Paper Document)

(1) Customer Services Report

(2) New Customer Report

(3) Car in for Repair Report

(4) Car under Repair Report

(5) Job Delivered Report

(6) Repair Time Estimation Report

(7) Late Job Delivery Report

(8) Revenue Report

(9) Revenue and VAT Report

(10) Revenue Graph of Engine versus Body Department

(11) Payment Requisition Report

1.5 Project Plan

This purposed project takes a total of four months time, with one and a half-month of analysis of existing system and three weeks of analysis and design of the proposed system, and two months of implementation of the proposed system. The detail plan of this project is shown in Figure 1.1.

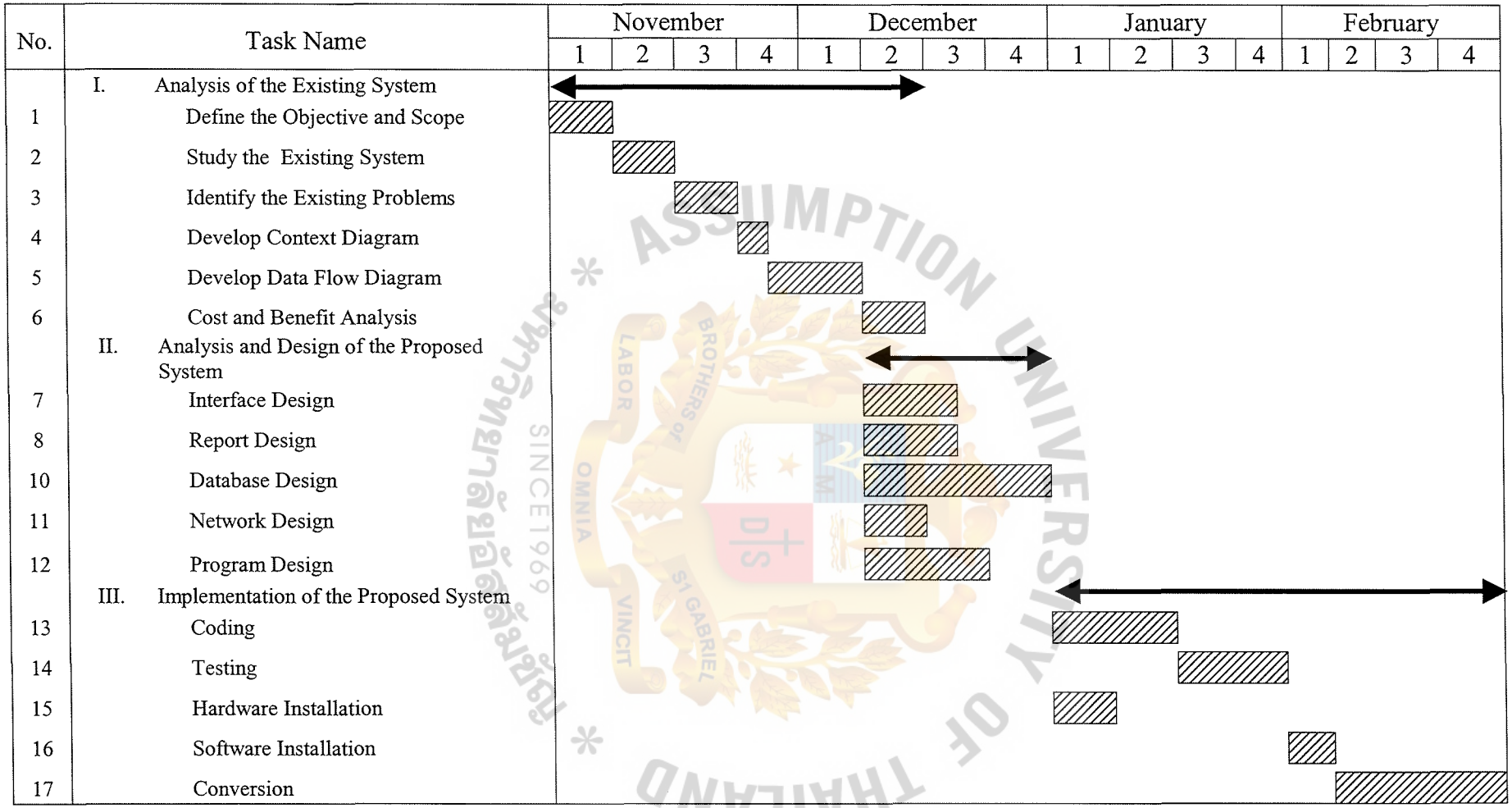


Figure 1.1. Project Plan of Auto Repair Information System.

II. THE EXISTING SYSTEM

2.1 Background of the Organization

Japanese Car Repair was established in November 1993. It is situated on Navamin Road Bangkok. It provides automobile repair service, which can be categorized into two categories. Working areas of these two sections are located on different areas of the plant. However their profit and losses are calculated together.

The first section is engine repair section, specializing on Japanese cars. Services in this section include Tune-Ups, Oil Change, Engine Repairs, Brake, Clutch, Transmission, Suspension, and etc.

The other section is automobile body repair section, which also include auto paint. Japanese Car Repair also serves under contract with leading car insurance companies such as Viriya Insurance, Thai Insurance, Tipaya Insurance, and Arkanay Insurance company.

Japanese Car Repair is under its owner's close supervision and can be considered a family business since a family member manages it. Organizational structure of the business is flat with a wide base in the lower level. Other than the two-service sections already described we can also divide the organization into another section, the customer service section. This section will be responsible for coordinating between customers and mechanics as well as being responsible for keeping records and documents of the business operation. Organization Structure is illustrated in Figure 2.1.

Other business functions such as accounting is done by an outsource company. To control cost and investment the company does not keep any inventory of supply parts so it does not need an inventory department or a purchase department. Whenever spare

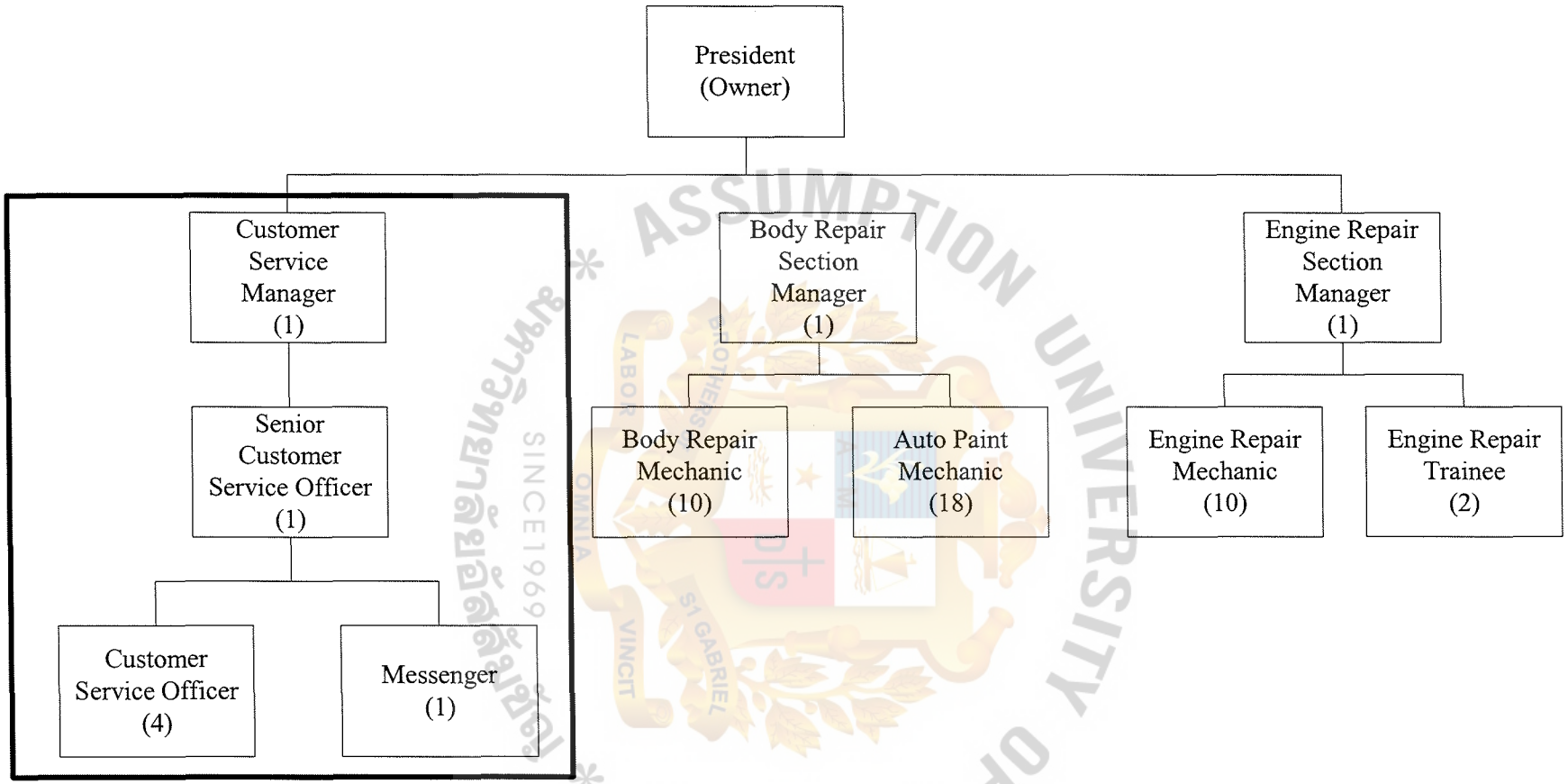


Figure 2.1. The Organization Chart of Japanese Car Repair Co., Ltd.

parts or other materials are needed customer service officer will inform our messenger to purchase it.

2.2 Existing Business Function

Auto repair order is the major document used in the business operation. It is a three-copy form with information about customer, car being repaired, repair list and labor charge, spare parts used and its price, and the total amount charged for that repair order transaction. Existing system repair order is illustrated in Appendix A.1. The first copy of the form is given to customers when they leave their car for repair. The second copy is for customers when all jobs are done and delivered to them, it also serves as a receipt. The third copy of the form is kept in the file cabinet for future references and performance reports.

Currently auto repair orders are written manually and kept in a file cabinet. Files are separated according to car brands and within each file each repair order is filed alphabetically based on car license numbers. Occasionally files are taken out to look at customer's historical records.

When a customers request a repair order they are to fill out the repair order form, even if he or she is a current customer. Engine repair and body section manager inspects the car, then they report the inspection to customer service. A quotation is made and informed customer through verbal communication.

In case where the repair order is part of an insurance claim, a claim slip from the insurance company is required. The claim slip contains information about each claim and is needed to prepare further documents. Claim slip is illustrated in Appendix A.2. Quotations are not given to customer but to insurance company for approval. When a quotation is approved, the price is final.

Payments for the repair order are collected directly from the customer. For repair orders under insurance contract, money are not collected immediately but rather collected from insurance company after the job is delivered. To collect these payments several documents have to be prepared. Claim Repair Order Processes are illustrated in Figure 2.2.

(1) Quotation

The report listed all the damages on the car. The damages are listed in code set by the insurance companies. These codes specified how much damaged has been done. It also tells what is needed to be repaired of replaced. From this same form the insurance company will use it to prepare spare parts needed for the repair order. Other than the lists of damages it also gives information on the car such as its license number, insurance claim identification number, and etc. Existing System Quotation Form is illustrated in Appendix A.3.

(2) Quotation Approval

A quotation approval is given from the insurance company and it specified the amount of money that the insurance company is willing to pay.

(3) Part Invoices

In case where spare parts are purchased by Japanese Car Repair an invoice of these parts need to be attached to the document also.

(4) Payment Requisition

This document containing lists of claims that the repair shop is requesting for payment in that month. Existing System Payment Requisition is illustrated in Appendix A.4.

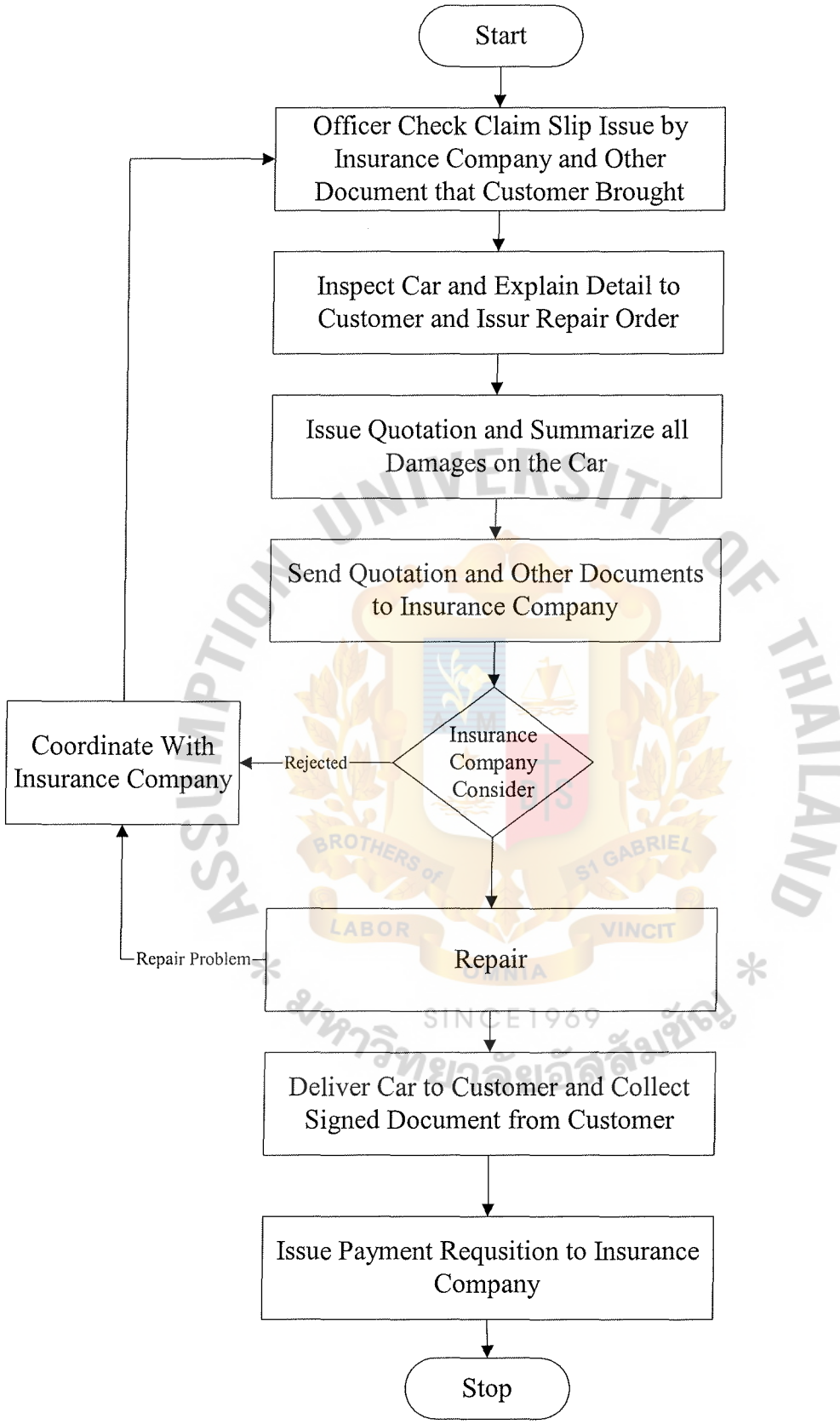


Figure 2.2. Claim Repair Order Process.

(5) Repair Order Form

To collect payments a repair order form that is signed by the customer needs to be attached to the quotation approval.

2.3 Current Problems and Areas for Improvements

Due to the increase in competition in the area, the owner of Japanese Car Repair now is looking for a way to improve the business as a whole. Observing worker, competitor, and customer reaction to the business we came up with the following lists of problems.

(1) Workers take a long time to retrieve customer historical data.

(2) Customers wanted a report of the entire repair job they've done on their car.

(3) Documents are often lost and misplaced.

(6) Issuance of payment requisition is late due to the overloaded paper work.

(7) Increase in overtime payment because of limited staff and overloaded work

(8) Duplicated paper work and documentation.

(9) Workers require a long time to prepare management reports.

(10) Customers complain about the amount of time needed to prepare repair order form.

(11) Hand written documents are sometime difficult to read.

(12) Worker does not have time to give service to customer and follow up on repair order because they're busy with document work.

From the observation and analysis there are also some additional areas, other than solving the existing problem listed above, that needed improvement. The following improvements will help the company stay competitive in the market.

(1) Customer retention program will help the business retain its customer. This can be done with the use of customer repair records.

(2) Lack of statistical data to support decision-making.

(3) Improvement in customer database will allow the business to conduct follow up and reminder programs.

(4) Management needs more supporting information to keep track of the business operation and to determine action plan.

(5) Improve in report preparation with a systematic collection and analysis of information can reduce worker workload in report preparation and also give management up to date information.

(6) Improvement in customer information support.

(7) Lack of control and monitoring in business operation.

(8) Reduce the duplicated documentation and work load by using computer – based processing data.

(9) A protective data entry will help eliminate errors in documentation.

III. THE PROPOSED SYSTEM

3.1 System Specification

From observing the company's current system we found several problems and areas that need improvement. We will use these problems and areas of improvement as a basis for developing the new proposed system. The proposed system should have the following abilities:

(1) Create repair order in both computer interface format and printed format.

(2) Create a relational database for sharing data among several subsystems simultanously.

(3) Create database to store and maintain information collected during business operation.

(4) Retrieving information from database to create business documents.

(5) Reduce record retrieval time for worker.

(6) Gather information to analyze and generate performance report.

(7) Create repair order in both computer interface format and printed format.

(8) Reduce the time it takes to prepare management report.

(9) Able to create reports and documents that is up to date with the operation.

(10) Provide a secure system that helps reduce miscellaneous errors and unauthorized users.

3.2 System Design

3.2.1 Database and File Design

The proposed system will include the following entities to store a detailed record of Customer, Car, Job, Spare Part, and Repair Order. The details of each database are presented in Appendix B, Database Structure is in Appendix C, Data Dictionary. Figure

3.1 illustrates the Fully Attributed Data Model of the proposed system in 5th normal form. Entity relationship diagram shows the interaction between each database.

3.2.2 Dataflow Design

(1) Context Diagram

The context diagram illustrated in Figure 3.2 shows the macro view of the information system. It shows the scope and the interaction of the system as a whole with its external environment represented by external entity.

(2) Functional Decomposition Diagram

The decomposition diagram of Auto Repair Information system shows a top-down view of the system functional structure starting from the system itself and decomposing it into subsystem and finally to each subsystem processes. The decomposition diagram is illustrated in Figure 3.3. There are altogether six subsystems. Each subsystem has its own data flow and processes illustrated in Appendix D, process specification is illustrated in Appendix E.

(a) Customer Registration Subsystem

It is responsible for maintaining the customer database. The subsystem consists of the following processes.

(1) Read Customer Record

(2) Check Customer Record

(3) Add New Customer Record

(4) Edit Customer Record

(5) Delete Customer Record

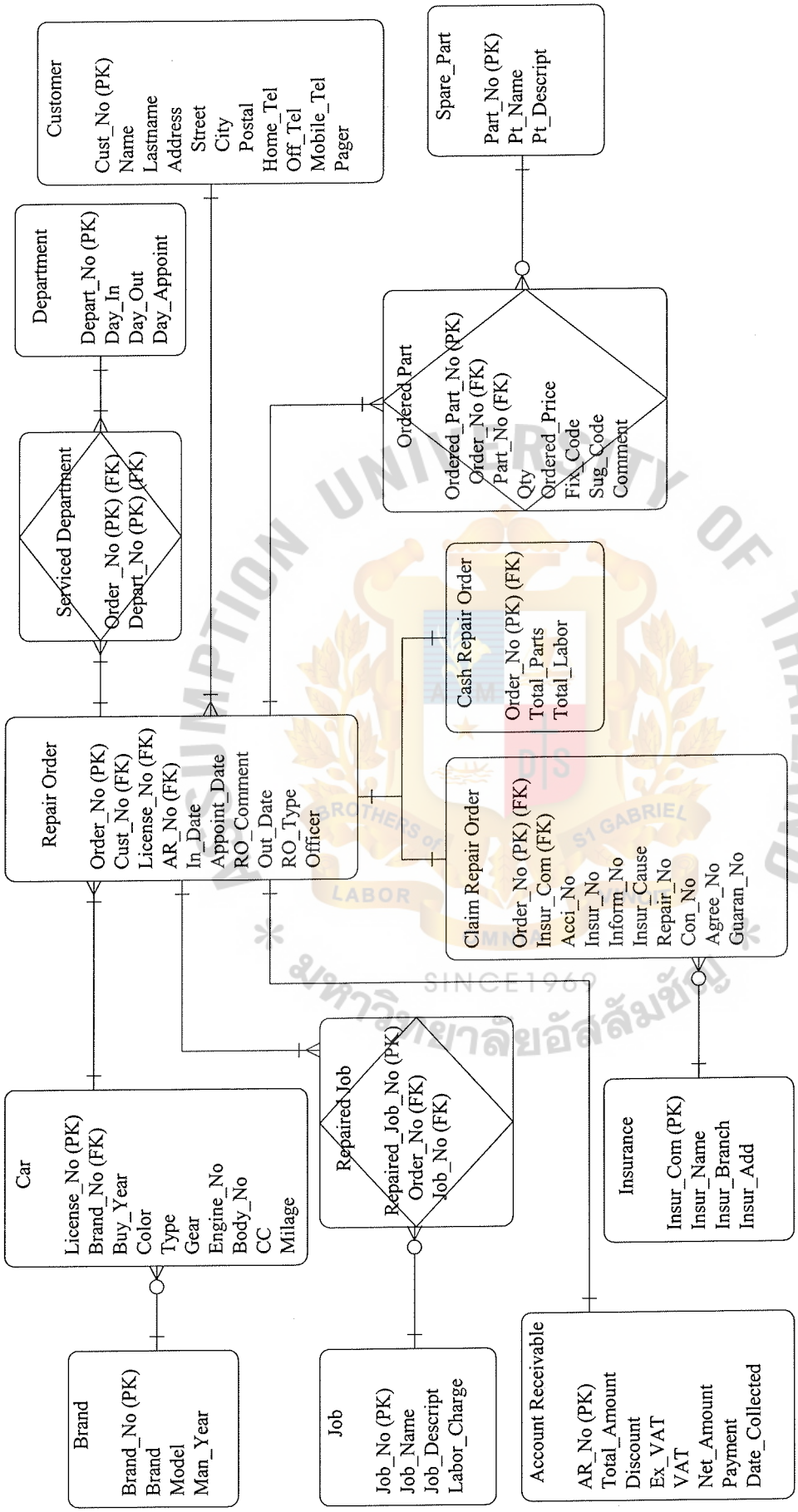


Figure 3.1. Fully Attributed Data Model of Auto Repair Order Information System.

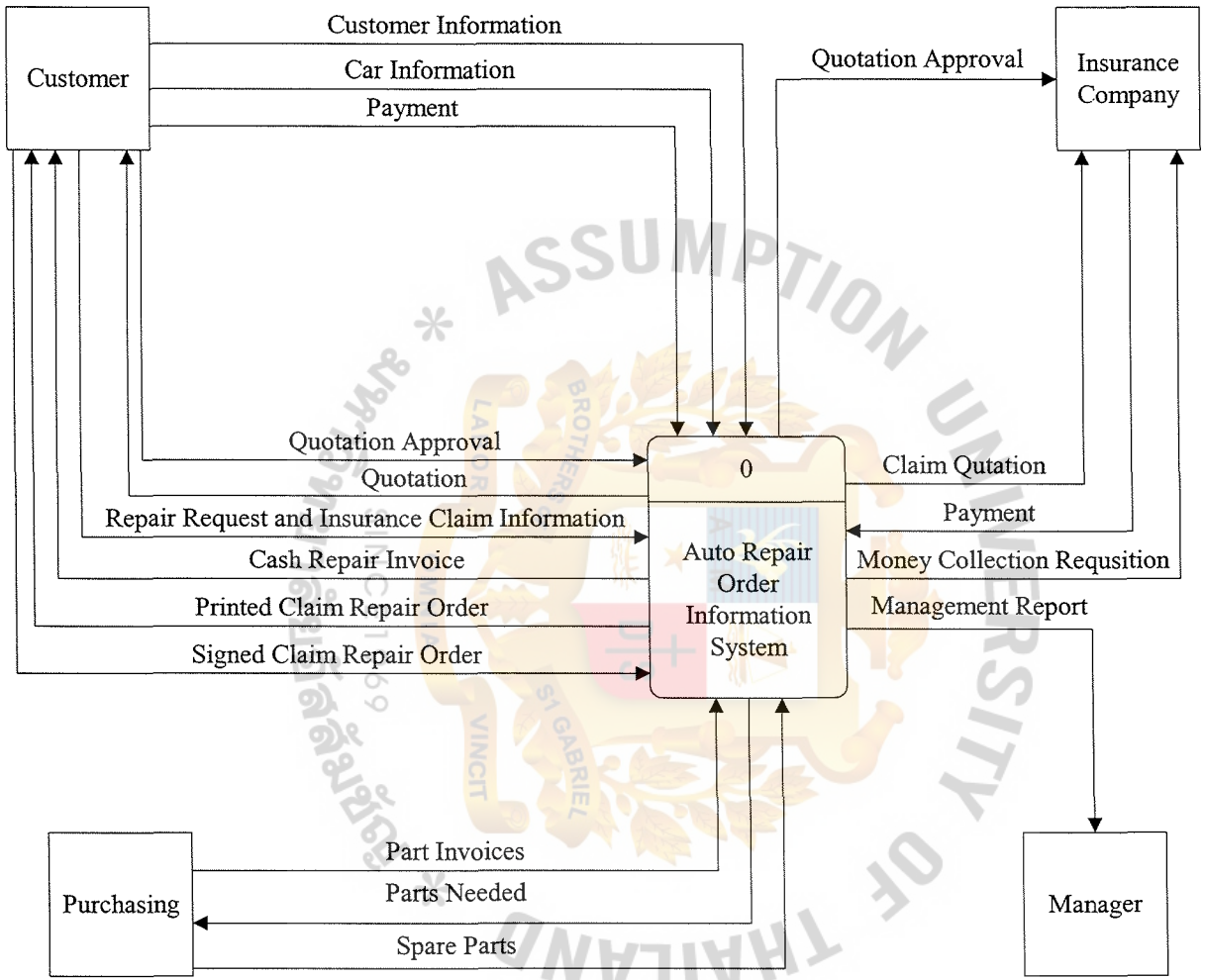


Figure 3.2. Context Diagram of Auto Repair Order Information System.

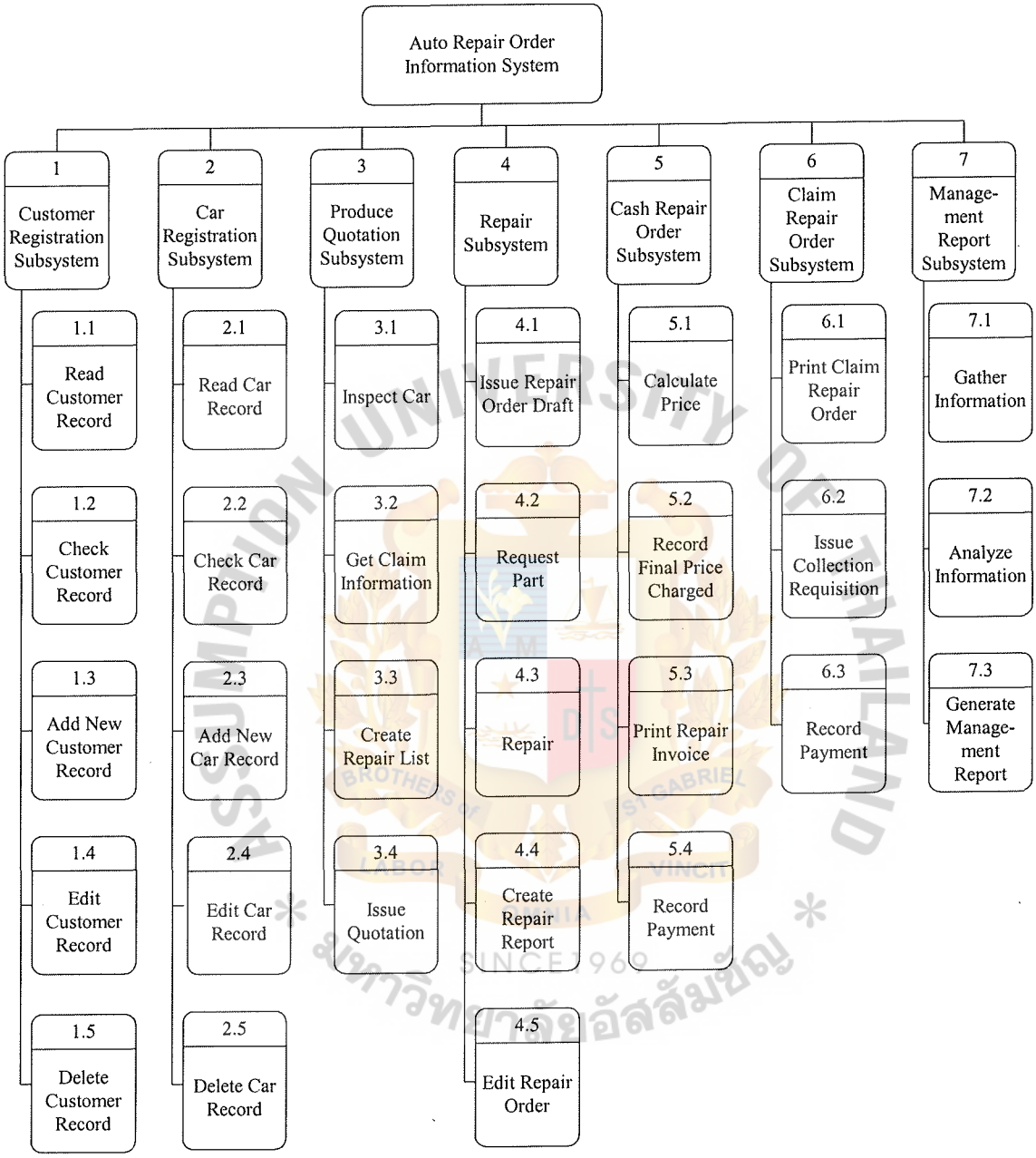


Figure 3.3. Decomposition Diagram of Auto Repair Order Information System.

(b) Car Registration Subsystem

This subsystem is responsible for maintaining car database, it consists of the following processes.

(1) Read Car Record

(2) Check Car Record

(3) Add New Car Record

(4) Edit Car Record

(5) Delete Car Record

(c) Produce Quotation Subsystem

It is responsible for producing quotations for customers and insurance company approval of the repair order. It is initiated by customer's repair request.

(1) Inspect Car

(2) Get Claim Information

(3) Create Repair List

(4) Issue Quotation

(d) Repair Subsystem

This subsystem is mostly performed by humans and it deals with the core service of the business, car repair. Repair subsystem consists of the following processes.

(1) Issue Repair Order Draft

(2) Request Part

(3) Repair

(4) Create Repair Report

(5) Edit Repair Order

(e) Cash Repair Order Subsystem

Cash Repair Order is a repair order that can be collected immediately after job delivery. Its process is different from claim repair order and therefore requires its own process flow and subsystem. Cash repair order subsystem consisted of the following processes.

(1) Calculate Price

(2) Record Final Price Charged

(3) Print Repair Invoice

(4) Record Payment

(f) Claim Repair Order Subsystem

Similar to the Cash Repair Order Subsystem is the Claim Repair Order Subsystem, which deals with claim repair order. For this type of repair order, payment is collected from insurance company after job has been delivered. This subsystem consists of the following processes.

(1) Print Claim Repair Order

(2) Issue Collection Requisition

(3) Record Payment

(g) Management Report Subsystem

This subsystem uses information collected from other subsystems and generated management reports, which will be discussed in Input and Output Design. This subsystem consists of the following processes.

(1) Gather Information

(2) Analyze Information

(3) Generate Management Report

3.2.3 Input and Output Design

The input and output design of this project will consist of both screen interfaces and printed documents. Input Screens are illustrated in Appendix E. Input and output design can be categorized into four types of interface.

(1) Startup Menu

After logging into the system an interface menu will appear. The menu will contain links to Repair Order screen interfaces and other submenus in the system. Menus are illustrated in Appendix F.1 - Appendix F.4.

(2) Documents

This category of input and output deal with creating document used in everyday operation. Each interface consists of both screen interfaces to enter and read record and printed document. It consists of the following screen interfaces form.

(a) Repair Order Form (Appendix F.5 – Appendix F.11)

(b) Claim Repair Order Quotation Form (Appendix F.12)

(c) Repair Conclusion Request Form (Appendix F.13)

(d) Payment Requisition Form (Appendix F.14)

It consists of the following printed document.

(a) Repair Order Document (Appendix G.1.)

(b) Claim Repair Order Quotation (Appendix G.2.)

(c) Repair Conclusion Request (Appendix G.3.)

(d) Payment Requisition (Appendix G.4.)

(3) Management Report

Management reports are those reports that require information to be gathered, processed, and presented in an easy to understand format. These reports are to help management in their decision making. A screen interface is created for each report as a way for user to interact with the system and put in the criteria of each report. There are altogether eleven management reports. Reports are illustrated in Appendix G.

(a) Customer Repair Services Report (Appendix G.5)

This report will present management a list of the entire car in the database that has not done a specific job within a specific period. User are required to put in the starting date and the specific job that they want to look at, jobs can be entered in a form of job code or job name (See Appendix F.15). This report can be used to conduct reminder program such as list of customer that haven't had their oil changed within three months.

(b) Customer Report (Appendix G.6)

This report will present a list of customers, with his or her record, that have registered within a specified period. Users are required to put in the specific period using dd/mm/yy format (See Appendix F.16). Management can use this report to see the performance of the business by looking at how many new customers the business has gained and the percentage of old versus new customers. If there is a low percentage of old customers then it can be suggested that the business is having trouble with retaining its customers.

(c) Car in For Repair Report (Appendix G.7)

This report presents lists of cars that were in for repair including those still under repair and those that have already been delivered. Users are required to enter specific period in dd/mm/ff format (See Appendix F.17). Management can use this report to see the performance of each department.

(d) Car under Repair Report (Appendix G.8)

This report will present a list of cars that are still under repair on a specific date stated by the user (See Appendix F.18). Management can use this report to see the current status of cars in the shop.

(e) Repair Job Delivery Report (Appendix G.9)

This report gives a list of cars that has been delivered according to a specific period and department stated by the user (See Appendix F.19). The purpose of this report is to see the amount of repair orders that has been given to each type of customer (Type of customer is for example different insurance companies.)

(f) Average Repair Time Report (Appendix G.10)

This report gives a list of repair orders within a specified period and based on the type or repair order (Type of repair order is for example heavy engine repair or heavy body repair.) Users are required to enter period and type of repair orders they want the report to list (See Appendix F.20).

(g) Late Job Delivery Report (Appendix G.11)

This report gives a list of repair orders that has been delivered after the appointed date. Users are required to enter the period and the

department they want the report to list (See Appendix F.21). Management can use this report to see the performance of each department whether they meet their targeted date.

(h) Income Report (Appendix G.12)

When generated, this report gives a list of repair orders within a period specified by the user (See Appendix F.22). At the end of the list the report will calculate the total revenue and the revenue from each department and its percentage. Management can use this report to see the performance of each department based on revenue generated.

(i) VAT Report (Appendix G.13)

This report gives a list of repair orders with VAT. Similar to income report, user must enter a specified period in a screen interface (See Appendix F.23). At the bottom, the report will show the total amount, the total amount excluding VAT, and VAT, and the total amount including VAT. This report is to help prepare documents for outsource accounting company.

(j) Graph of Engine versus Body Department Revenue (Appendix G.14)

A graphical presentation of income generated by each department. Users are required to enter the specified period in mm-yy format (See Appendix F.24). Management can use this report to see the long-term performance of each department according to its revenue.

(k) Insurance Payment Report (Appendix G.15)

This report presents a list of claim repair orders with total revenue calculation and an average time it takes from job delivery date

to payment date. Users are required to enter the period that they want the report to list (See Appendix F.25). The purpose of this report is to help management get a clearer view the company account receivable status.

(4) Database Maintenance

Its purpose is to allow user to create, find, edit, and delete record in a database. There is altogether five screens interface in this categories.

(a) Customer Database Maintenance Form (Appendix F.26)

(b) Car Database Maintenance Form (Appendix F.27)

(c) Insurance Database Maintenance Form (Appendix F.28)

(d) Job Database Maintenance Form (Appendix F.29)

(e) Part Database Maintenance Form (Appendix F.30)

(f) Brand Database Maintenance Form (Appendix F.31)

3.2.4 Software Design

The proposed system software design is presented in structure chart illustrated in Appendix G. Structure charts show a top-down hierarchy of module from decomposed processes and will facilitate developing and maintaining computer programs. Some of the processes are decomposed further for easy reference and understanding.

3.3 Hardware and Software Requirement

3.3.1 Network Requirement

The proposed system will use Distributed Database Computing, a form of Client/Server Computing where data are stored on the server and all database access and commands instructions are executed on the server via business logic is executed on client computer. Each computer is connected to each other in a LAN using Star

Network Topology all clients are linked to a central controller, which in turn is linked to the server. Figure 3.4 illustrates the network configuration of the proposed system.

3.3.2 Hardware Requirement

Since the existing system does not have any computer, all hardware needed to implement the proposed system needs to be purchased. The hardware requirements of for the proposed system are as follows:

Table 3.1. The Hardware Specification for the Computer Server.

Hardware	Specification
CPU	Intel Pentium III 733 MHz
Cache	256 KB or higher
Memory	SDRAM 128 MB. PC 100 MHz
Hard Disk	20 GB or higher
CD-Rom Drive	40X or higher
Floppy Drive	1.44 MB
Network Adapter	Ethernet 10-Base T
Display	15" monitor
Display Adapter	SVGA card
UPS	600 VA
Tape Storage	SVGA card

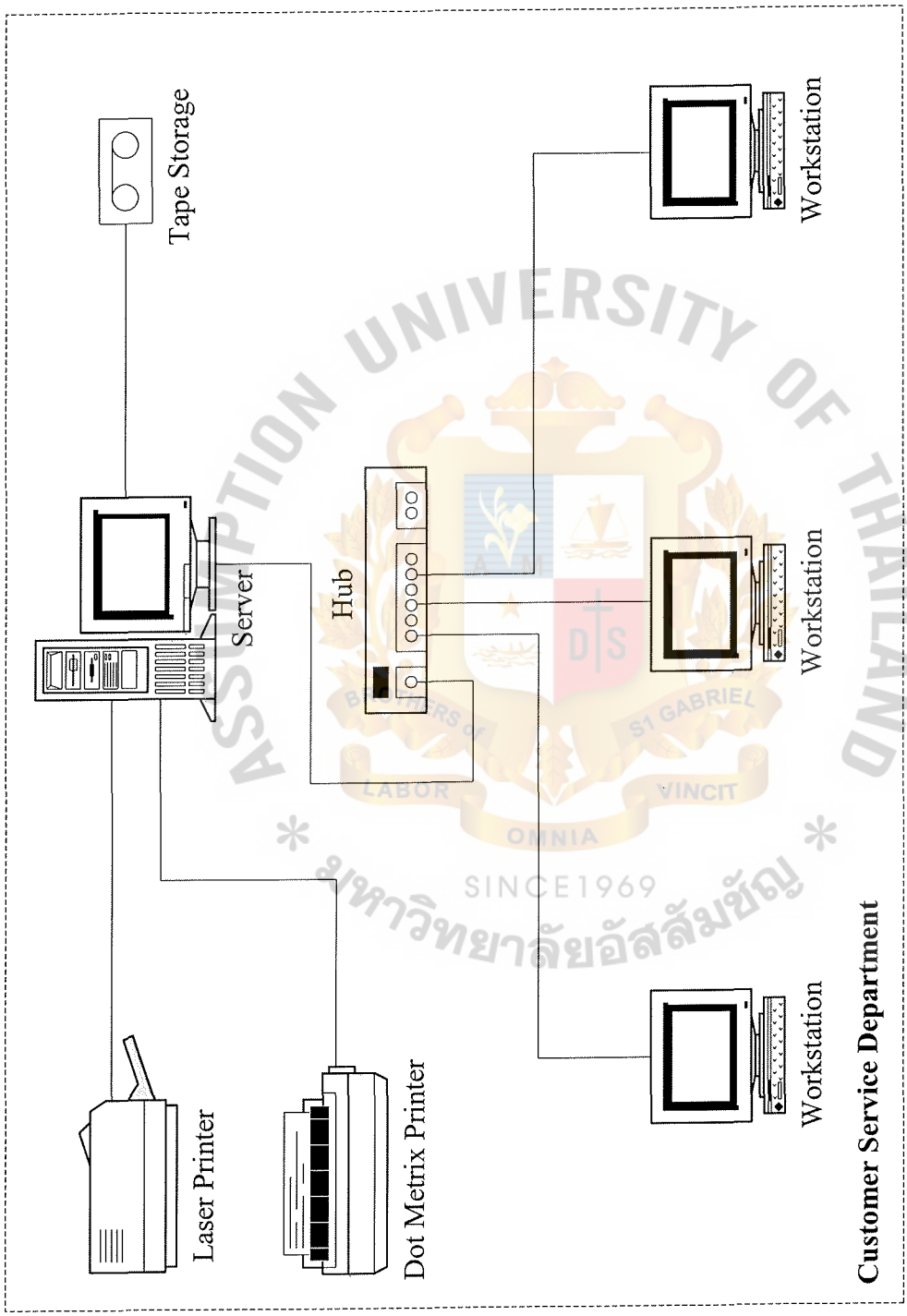


Figure 3.4. The Hardware Configuration of Auto Repair Order Information System.

Table 3.2. Peripheral Specification.

Hardware	Specification
Dot Matrix Printer	EPSON LQ 1070
Hub	10 Mbps 8 Ports or higher
Laser Printer	HP LaserJet 6L

Table 3.3. The Hardware Specification for Each Client Machine.

Hardware	Specification
CPU	Intel Celeron 566 MHz.
Memory	SDRAM 64 MB. PC 100 MHz
Hard Disk	4.3 GB or higher
CD-Rom Drive	40X or higher
Floppy Drive	1.44 MB
Network Adapter	Ethernet 10-Base T
Display	15" monitor
Display Adapter	SVGA card

3.3.3 Software Requirement

The software requirement of the proposed system includes operating system application program and database server. Other programs may be purchased, such as Microsoft Office 97, but are not required by the proposed system. Software Requirement is presented in Table 3.4 for server software requirement and Table 3.5 presents the client software requirement.

Table 3.4. The Software Specification for Computer Server.

Software	Specification
Operating System	Microsoft Window NT Server 4.0
Application Server	Microsoft Access 97
Database Server	Oracle

Table 3.5. The Software Specification for Each Client Machine.

Software	Specification
Operating System	Microsoft Window 97
Application Program	Microsoft Access 97
Database Server	Oracle

3.4 Security and Control

As a way to protect the customer and business information from unauthorized users and to control the integrity of these information, the proposed system will provide the following security and control.

(1) Login-Password

To enter into the system, users are asked to enter their login name and their password. This will keep unauthorized users from entering the system. In addition, each user with login name and password is authorized to different information, for example staff workers are not authorized to run some of the management report. Login Screen is illustrated in Appendix F.32.

(2) Integrity Control

To help check the integrity of the data, the proposed system will provide a self-checking system when data are inputted; such as character count or range of value that limits the value of the data.

(3) Back Up

To prevent the loss of data due to unpredictable events a backup system helps ensure the recovery of lost data. Databases are to be backed up daily on to a backup tape.

3.5 Cost and Benefit Analysis

3.5.1 Cost Analysis of Existing System

Table 3.6. Manual System Cost Analysis, Baht.

Cost items		Years				
		1	2	3	4	5
Fixed Cost						
Typewriter	1 unit @ 6,000	1,560.00	1,560.00	1,560.00	1,560.00	1,560.00
Calculator	4 units @ 1,000	800.00	800.00	800.00	800.00	800.00
Total Fixed Cost		2,360.00	2,360.00	2,360.00	2,360.00	2,360.00
Operating Cost						
Salary Cost:						
Senior Customer Service	1person@20,000	24,000.00	25,200.00	26,460.00	27,783.00	29,172.15
Customer Service	4persons@12,000	48,000.00	51,850.00	55,987.20	60,466.18	65,303.47
Estimated Overtime Payment		7,500.00	7,875.00	8,268.75	8,682.19	9,116.30
Total monthly salary Cost		75,500.00	81,315.00	87,583.95	97,342.60	101,629.55
Total Annual Salary Cost		906,000.00	975,780.00	1,015,007.40	1,132,111.24	1,219,554.55
Office Supplies & Miscellaneous Cost:						
Stationary	Per Annual	24,000.00	25,200.00	26,460.00	27,783.00	29,172.15
Paper	Per Annual	20,000.00	20,800.00	21,632.00	22,497.28	23,397.17
Utility	Per Annual	48,000.00	50,400.00	52,920.00	55,566.00	57,344.30
Miscellaneous	Per Annual	24,000.00	25,200.00	26,460.00	27,783.00	29,172.15
Total Annual Office Supplies & Miscellaneous Cost		1116,000.00	121,600.00	127,472.00	133,629.28	140,085.77
Total Annual Operating Cost		1,022,000.00	1,097,380.00	1,178,479.40	1,265,740.52	1,359,640.33
Total Manual System Cost		1,024,360.00	1,099,740.00	1,180,839.40	1,268,100.52	1,362,000.33

Salary Cost is estimated to increase by a rate of 8% each year, but Overtime Payment is expected to increase by 5% each year. Office Supplies and Miscellaneous Cost is expected to increase by a rate of 5% each year.

Table 3.7. Five Years Accumulated Manual System Cost, Baht.

Year	Total Manual Cost	Accumulated Cost
1	1,024,360.00	1,024,360.00
2	1,099,740.00	2,124,100.00
3	1,180,839.40	3,304,939.40
4	1,268,100.52	4,573,039.92
5	1,362,000.33	5,935,040.25
Total	5,935,040.25	–

3.5.2 Cost Analysis of Proposed System

The proposed system will require one Computer Server and 3 Clients Computers. Maintenance Cost is expected to start in the second year and accelerate 5% each year. All Hardware and Software Costs are divided equally into each year. Other Fixed Costs are calculated on the first year where the actual cost occurred. People Ware Cost is listed as Developer Cost. It includes one System Analysis hired for four months, one System Designer hired for three months, two System Builder hired for three months, and one Network Specialist hired for two months. Operating Cost is expected to increase by 5% each year including Salary Cost. Overtime Payment is no longer calculated since the proposed system is expected to help worker and reduce worker work and time to finish those works. And Office Supplies and Miscellaneous Cost is expected to increase at a rate of 2% each year.

Table 3.8. Computerized System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
Fixed Cost					
Hardware Cost:					
Computer Server Cost 1unit@50,000	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
Workstation Cost 3 units@25,000	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00
Laser Printer 1unit@28,000	5,600.00	5,600.00	5,600.00	5,600.00	5,600.00
Dot Matrix Printer 1unit@20,000	4,000.00	4,000.00	4,000.00	4,000.00	4,000.00
UPS 750VA	600.00	600.00	600.00	600.00	600.00
Backup Storage Device	2,000.00	2,000.00	2,000.00	2,000.00	2,000.00
LAN Card	960.00	960.00	960.00	960.00	960.00
Cable	800.00	800.00	800.00	800.00	800.00
HUB 8 Ports	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00
Total Hardware Cost	39,960.00	39,960.00	39,960.00	39,960.00	39,960.00
Maintenance Cost:					
Maintenance Cost	–	12,000.00	12,600.00	13,230.00	1,3891.50
Total Maintenance Cost	–	12,000.00	12,600.00	13,230.00	1,3891.50
Software Cost:					
Microsoft Windows NT	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00
Microsoft Access	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
Oracle	4,000.00	4,000.00	4,000.00	4,000.00	4,000.00
Total Software Cost	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00
Implementation Cost:					
Training Cost	15,000.00	–	–	–	–
File Conversion Cost	20,000.00	–	–	–	–
Total Implementation Cost	35,000.00	–	–	–	–
Office Equipment and Furniture Cost:					
Calculator 3 units @1,000	3,000.00	–	–	–	–
Computer Desk 4 units@6,000	24,000.00	–	–	–	–
Total Office Equipment Cost	27,000.00	–	–	–	–
Developer Cost					
System Analysis 1person@25,000	100,000.00	–	–	–	–
System Designer 1person@25,000	75,000.00	–	–	–	–
System Builder 2persons@25,000	150,000.00	–	–	–	–
Network Specialist 1person@25,000	50,000.00	–	–	–	–
Total Developer Cost	375,000.00	–	–	–	–
Total Fixed Cost	488,960.00	63,960.00	63,960.00	63,960.00	63,960.00
Operating Cost					
Personnel Cost:					
Senior Customer Service 1 person @ 20,000	20,000.00	21,000.00	22,050.00	23,152.50	24,310.13
Customer Service 3 person s@ 12,000	36,000.00	37,800.00	39,690.00	41,674.50	43,758.23
Total Monthly Salary Cost	56,000.00	58,800.00	61.740.00	64,827.00	68,068.35
Total Annual Salary Cost	672,000.00	705,600.00	740,880.00	777,924.00	816,820.20
Office Supplies & Miscellaneous Cost:					
Computer Supplies Per Annual	10,000.00	10,200.00	10,404.00	10,612.08	10,824.32
Stationary Per Annual	10,000.00	10,200.00	10,404.00	10,612.08	10,824.32
Paper Per Annual	12,000.00	12,240.00	12,484.00	12,734.50	12,989.19
Utility Per Annual	50,000.00	51,000.00	52,020.00	53,060.40	54,121.61
Miscellaneous Per Annual	18,000.00	18,360.00	18,727.00	19,101.74	19,483.22
Annual Office Supplies & Miscellaneous Cost	100,000.00	102,000.00	104,040.00	106,120.80	108,243.22
Total Operating Cost	772,000.00	807,600.00	844,920.00	884,044.80	925,063.42
Total Computerized System Cost	1,260,960.00	871,560.00	909,480.00	949,234..80	990,914..92

Table 3.9. Five Years Accumulated Computerized Cost, Baht.

Year	Total Computerized Cost	Accumulated Cost
1	1,260,960.00	1,260,960.00
2	871,560.00	2,132,520.00
3	909,480.00	3,042,000.00
4	949,234.80	3,991,234.80
5	990,914.92	4,982,149.72
Total	4,982,149.72	–

3.5.3 Break Even Analysis

A Break Even Analysis will compare the cost of the existing system with the proposed system to estimate where the cost of both systems becomes equal. Using the accumulated cost of both system and plotting it into a graph. Table 3.10 shows the comparison of the system costs and Figure 3.5 illustrate the comparison between manual and computerized system in a form of line graph. In the first year, cost of the proposed system will exceed the existing system but will gradually reduce and become less than the existing system. The two lines intersect at the end of year one. The point where the two lines intersect is considered a breakeven point.

Table 3.10. The Comparison of the System Cost, Baht.

Year	Accumulated Manual Cost	Accumulated Computerized Cost
1	1,024,360.00	1,260,960.00
2	2,124,100.00	2,132,520.00
3	3,304,939.40	3,042,000.00
4	4,573,039.92	3,991,234.80
5	5,935,040.25	4,982,149.72

3.5.4 Benefit Analysis

Benefits that are deprived from the proposed system comparing it with the existing system can be classified into tangible benefits and intangible benefits.

(1) Tangible Benefits

Tangible benefits are benefits that can be quantified and its value can easily be measured. The proposed system has the following tangible benefits.

(a) Reduction in office supplies expense 22,000 baht

(b) Reduction of personnel cost 144,000 baht
(1 Person @ 12,000 baht/month)

(c) Reduction in overtime payment 90,000 baht
(7,500 baht/month)

(d) Reduction in redundant work 71,808 baht
(1056 hours @ 68 baht/hour)

(e) Reduction in searching time 53,856 baht
(792 hours @ 68 baht/hour)

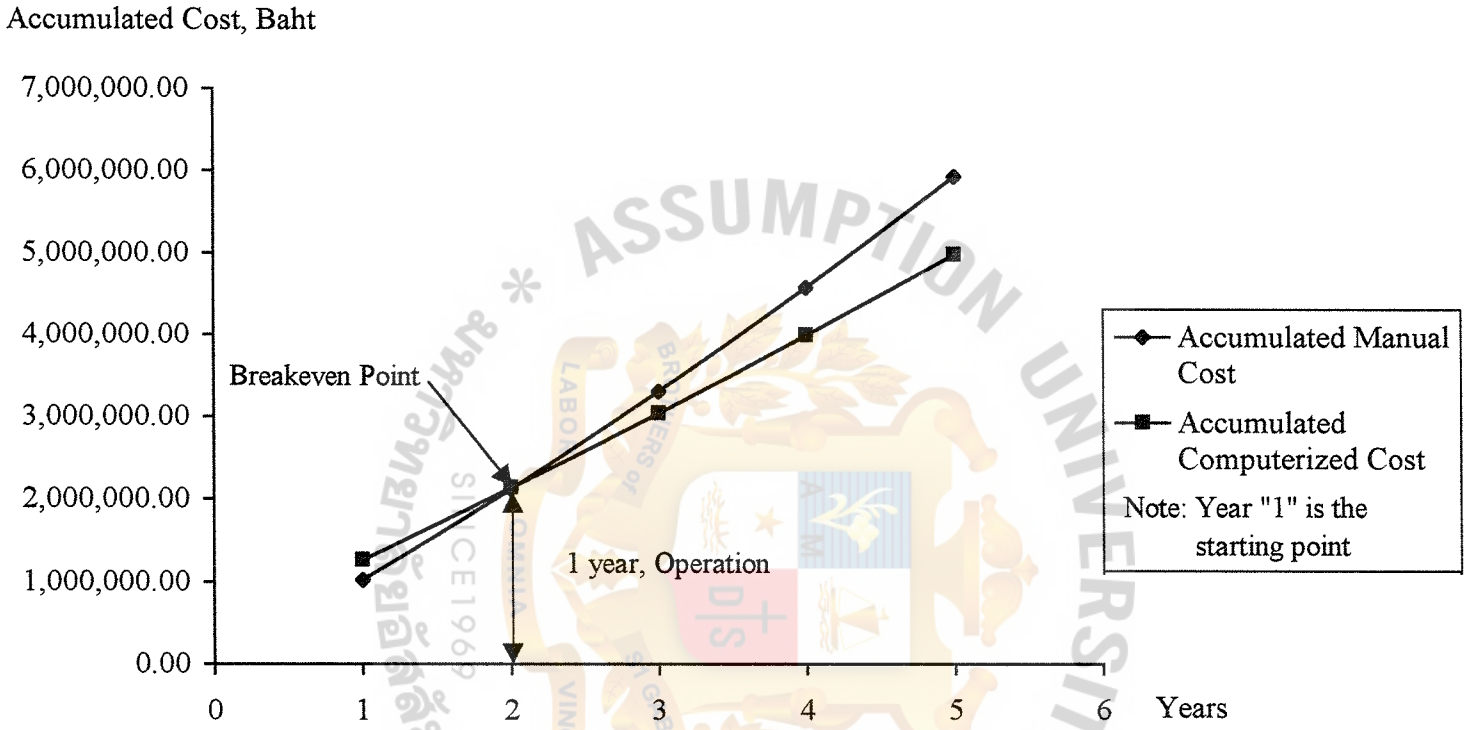


Figure 3.5. Cost Comparison between Manual and Computerized System.

(f)	Reduction in report preparation time	119,328 baht
	(1056 hours @ 113 baht/hour)	
(g)	Reduction in document preparation time	89,760 baht
	(1320 hours @ 68 baht/hour)	
(h)	Reduction in payment period	192,000 baht
	(6 months: 800,000 baht/month @ interest rate 4%)	
	Total Tangible Annual Saving	782,752 baht

(2) Intangible Benefits

Intangible costs are costs that are discrete and cannot be calculated into exact monetary value. By replacing the existing system with the proposed system, the company will gain the following intangible costs.

(a) Good image of the company.

(b) Better decision making by management generated from the system.

(c) Create repeat transactions due to satisfied information services.

(d) Reduce customer's dissatisfaction.

(e) Gain new customers due to promotion plan made from the usage of information generated.

Using the proposed system's cost and benefit analysis, a payback analysis can be conducted to determine when the proposed system will eventually pay for itself. Payback period formula is presented below. Table 3.11 shows the Accumulated Lifetime Time-adjusted Cost + Benefit of the proposed system in Figure 3.6 these values are plotted in line graph. The payback period is three years and eleven months.

$$\text{Payback period} = \text{Last year of negative cash flow} + \frac{\text{Cumulative difference last negative year}}{\text{Absolute value of cumulative difference (last negative plus first positive year)}} \text{ Difference}$$

$$\text{Payback period} = 3 + \frac{223{,}891.27}{223891.27 + 38{,}040.52}$$

$$= 3 \text{ Years } 11 \text{ Months}$$

$$\text{Net Present Value} = 4{,}648{,}045.36 - 4{,}245{,}089.99$$

$$= 402{,}955.38 \text{ Baht}$$

$$\text{ROI} = \frac{4{,}648{,}045.36 - 4{,}245{,}089.99}{4{,}245{,}089.99} * 100$$

$$= 9.49\%$$

Table 3.11. Payback Period Analysis of Auto Repair Order Informaiton System, Baht.

Cost Items	Years					
	0	1	2	3	4	5
Development Cost:	-488,960.00	0.00	0.00	0.00	0.00	0.00
Operation & Maintenance Cost *:	0.00	-772,000.00	-807,600.00	-844,920.00	-884,044.80	-925,063.42
Discount Factors for 4%	1.00	0.96	0.92	0.89	0.85	0.82
Time-adjusted Costs (adjusted to present value):	-488,960.00	-742,307.69	-746,671.60	-751,130.80	-755,685.20	-760,334.70
Cumulative Time-adjusted Costs Over Lifetime:	-488,960.00	-1,231,267.69	-1,977,939.29	-2,729,070.09	-3,484,755.29	-4,245,089.99
Benefits Derived From Operation of New System:	0.00	782,752.00	900,164.80	1,035,189.52	1,190,467.95	1,369,038.14
Discount Factors for 4%	1.00	0.96	0.92	0.89	0.85	0.82
Time-adjusted Benefits (adjusted to present value):	0.00	752,646.15	832,252.96	920,279.71	1,017,616.99	1,125,249.56
Cumulative Time-adjusted Benefits Over Lifetime:	0.00	752,646.15	1,584,899.11	2,505,178.83	3,522,795.82	4,648,045.38
Cumulative Lifetime Time-adjustedCosts + Benefits:	-488,960.00	-478,621.54	-393,040.18	-223,891.27	38,040.52	402,955.38

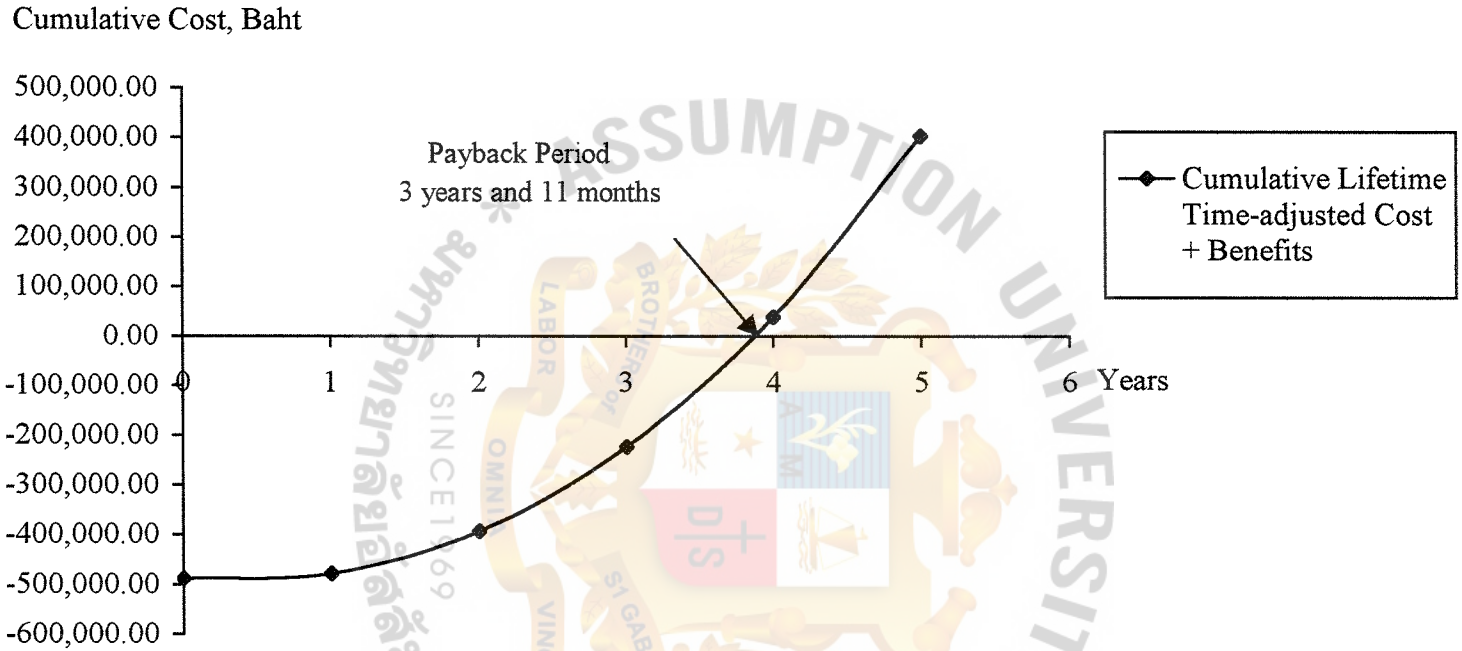


Figure 3.6. Payback Analysis of Auto Repair Order Information System.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

After system analysis and design, the next process is to implement the system and launch it into actual operation. Since the system will affect many people in the organization, it is important to set up a plan to provide an orderly system turnover.

4.2 Hardware and Software Acquisition

From the system requirement of hardware and software, purchases are made. It is not necessary for all purchases to be made at the same time and at the beginning but software is the first thing needed to be purchased because it needed to be programmed before actual usage.

4.3 Construction of System

System designer will start programming the new system. The proposed system Microsoft Access, is used to manage the database. In the construction process, system designer is to build and test database, program, and networks. This also involves building system interfaces.

4.4 Testing

Even though programs, database, and network has already been tested individually, they also needed to be tested together as a system to ensure that they all work together. If anything goes wrong, an adjustment is needed to be made.

4.5 Installation

For the actual conversion to the new system, a parallel conversion approach will be used. With this approach both systems will operate together as the word parallel implied. This will cause duplicate work but it is only to make sure that nothing goes wrong when the proposed system is in actual operation. During the parallel operation, if

anything goes wrong a modification can be made with out disturbing the business operation.

After building and testing database, the actual launch of the proposed system database installation must be made. In this case a part-time worker may be hired to key in the information that was previously recorded on paper documents and kept in the file cabinet.

4.6 Training

The company's customer service department needs to be trained since they are the main users of the system. Training should cover all topics of the program operation, all the forms, documents, and reports. Because of the small number of staffs, training should not be as difficult as training a large department. But the company staffs have little knowledge of computer, so great consideration on the how to train them is important. Other than training, printed material is required so that if any problems occur they can refer to the manual.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Japanese Car Repair Co., Ltd., is an auto repair business located in Bangkok. Its service includes repairing car engines and cars body or paint. Its customers can be categorized into car owners and insurance companies.

Currently the company is undergoing some operation inefficiency due to redundant work, overloaded paper work, and lack of management information support. The operating cost has increased and to couple with that, some customers have complained about information support. Having these in mind the proposed system is aimed to solve these inefficiencies better yet to improve the operation of the business by using information technology as the main tool to implement the project.

Developing the proposed system will incur costs for the company. The proposed system costs will exceed the existing costs during the first year of operation but will gradually reduce and eventually provide cost savings for the company. The two systems will breakeven in the beginning of the second year of operation. The payback period for the proposed system is at three years and eleven months with an estimated average annual ROI of 1.90%. From the conducted cost and benefits analysis the proposed system rationalized its usage.

With the use of a computerized system, the workflow of the company will dramatically improve. Starting with the input process, information is now shared among different files and therefore reduces the redundant data entry. In addition, some fields are set with a control that prevents users from entering invalid data. Data processing time will be reduced. It will reduce the time it takes to, retrieve, inquiry, of data. The proposed system will reduce the time it takes to prepare these documents and reports.

Information Technology used in the proposed system is two-tier client/server computing, using a Local Area Network with a star topology to connect computers in the system. Microsoft Access is used as an application program for the system, providing a RDBMS with a user-friendly interface. In addition the system is designed to provide a secure environment with backup and recovery.

The proposed system will directly benefit workers in the customer service department. At first they may not use the computerized system, but in a short time they will find that much of their work are reduced. The managers will get a better report in a more timely matter that can better facilitate their decision making and provide them with a more thorough look at the operation and to have greater control. In addition, they can use information in the database as a tool to easily retrieve information that will enable the business to conduct other projects such as loyalty program or customer reminder program. Another direct beneficiary of the system is the customer, who will get better and faster services from workers and does not need to repeatedly fill out their information each time that they receive services. The system can also reduce the time it takes to prepare documents for collecting payment from insurance companies and provide greater cash flow for the company. Table 5.1 shows achievements of the proposed project over the existing system.

(1) Customer Register Process

Customer does not need to repeat each time they receive services. Registered customer information can easily be retrieved from the system.

(2) Car Register Process

Car information does not need to be repeatedly written each time it come for services. Registered car information can easily be retrieved from the system.

(3) Produce Quotation Process

Worker does not need to write down or list the job in the quotation. They can retrieve it from the system by using a list box.

(4) Repair Process

The time it takes to draft repair orders and to update repair orders can edit repair orders after repairs will be reduced.

(5) Cash Repair Order Process

Price calculation can be done automatically with the new system.

(6) Claim Repair Order Process

Document preparation can be done easily since some of the information are shared with other document already entered into the system.

(7) Management Report Process

Workers do not need to gather information from different documents. The system will automatically select those information from a shared database and organize it into a report format for them.

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

Process	Existing System	Proposed System
Customer Register Process	10 minutes	5 minutes
Car Register Process	15 minutes	8 minutes
Produce Quotation Process	25 minutes	10 minutes
Repair Process (Documentation)	20 minutes	10 minutes
Cash Repair Order Process	15 minutes	5 minutes
Claim Repair Order Process	35 minutes	15 minutes
Management Report Process	60 minutes	15 minutes

5.2 Recommendations

Because the environment is always changing both inside and outside the company, there will be time when the proposed system will need modifications to cope with these changes. Other than solving existing system problems, there are some recommendations that should be kept in mind for future modification.

(1) Claim repair order on-line information transfer with insurance company.

(2) Transfer digital image of claim repair order to insurance company for repair quotation.

(3) Create a smart card to register, easy record retrievals and prevent error in data entry.

(4) Create a smart card that keeps a record on each car as it is moved through each repair process. When workers are asked on the status of the car under repair, they can key in the car license code and retrieve the car repair status.

(5) Creation of new reports that can help management in their decision making.

APPENDIX A

SOURCE DOCUMENTS

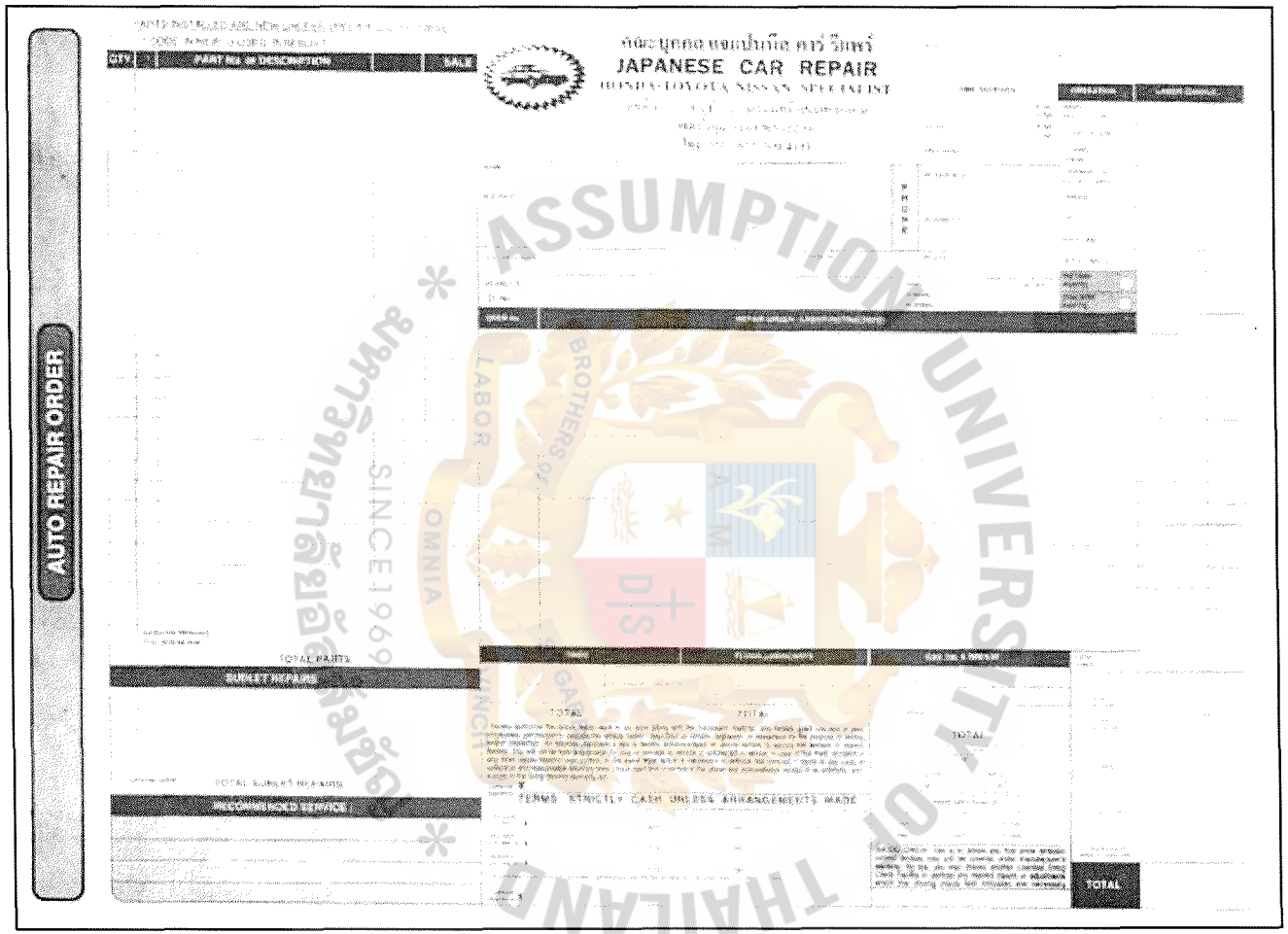
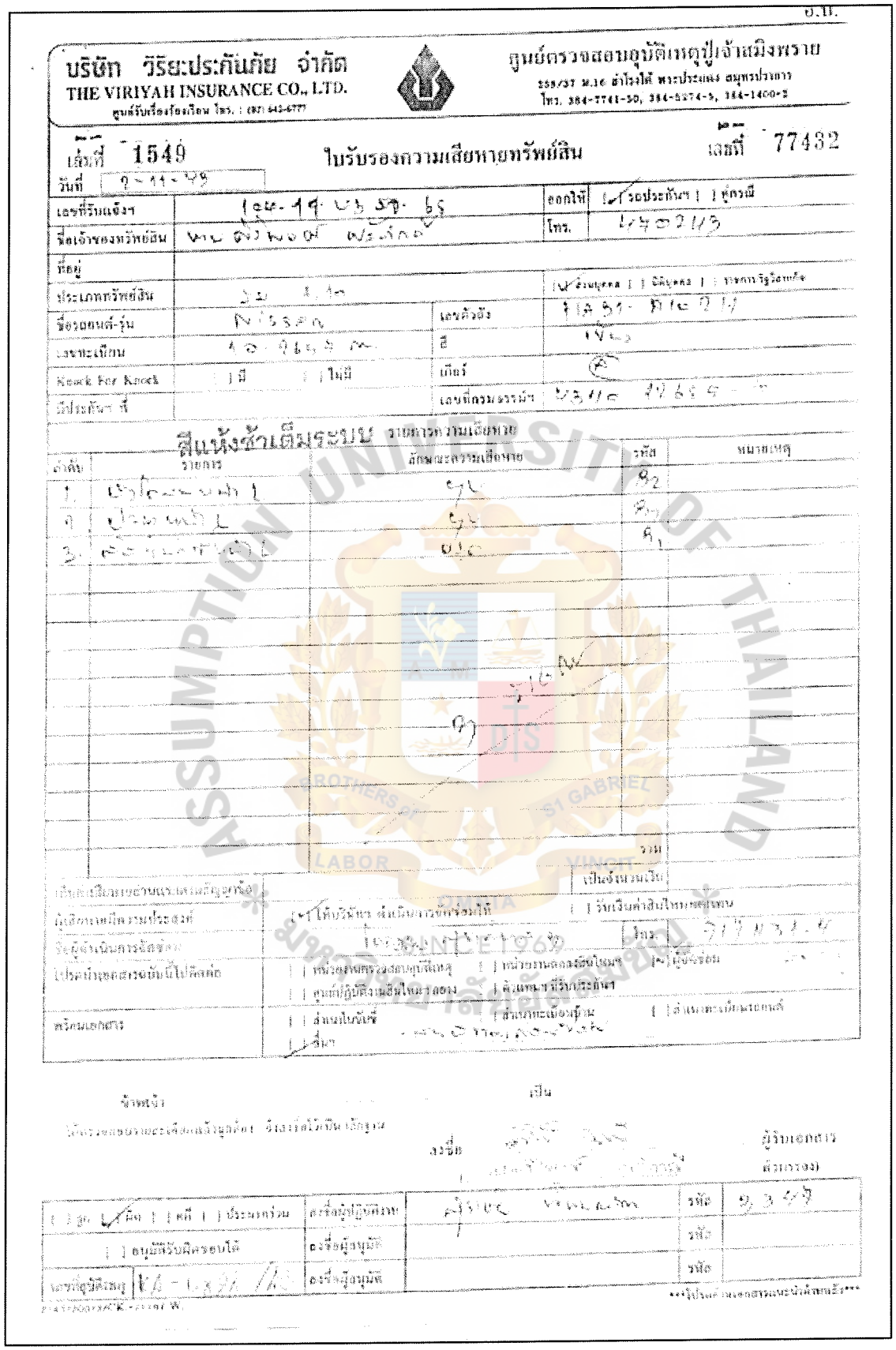
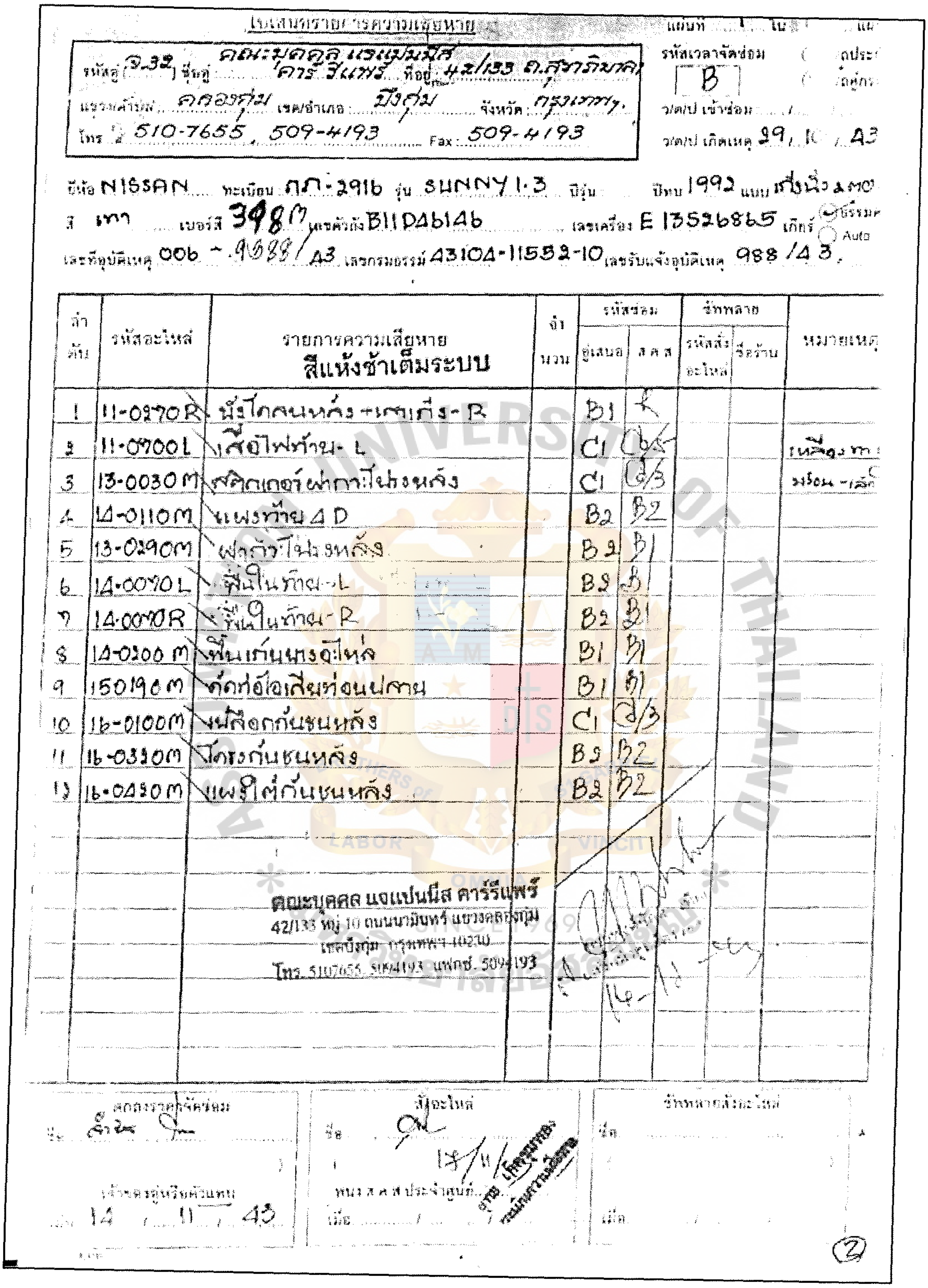


Figure A.1. Existing Repair OrderRepair Order.


บริษัท วิริยะประกันภัย จำกัด
THE VIRIYAH INSURANCE CO., LTD.
ศูนย์ตรวจสอบอุบัติเหตุปู่เจ้าสมิงพราย
ใบรับรองความเสียหายทรัพย์สิน
สีแห้งช้าเติมระบบ



ใบเสนอรายการความเสียหาย

รหัสอู่ (9-32) ชื่ออู่ คณะบุคคล แจแปนนีส คาร์ รีแพร์ ที่อยู่ 42/133 ถ.สุขาภิบาล

แขวง/ตำบล คลองกุ่ม เขต/อำเภอ บึงกุ่ม จังหวัด กรุงเทพฯ

โทร 510-7655, 509-4193 Fax 509-4193

รหัสเวลาจัดซ่อม B

ว/ด/ป เกิดเหตุ 29/10/43

ยี่ห้อ NISSAN ทะเบียน กภ-2916 รุ่น SUNNY 1.3 ปีผลิต 1992

สี เทา เบอร์สี 398M เลขตัวถัง B11D46146 เลขเครื่อง E13526865 เกียร์ ธรรมดา / Auto

เลขที่อุบัติเหตุ 006-96881/43 เลขกรมธรรม์ 43104-11552-10 เลขรับแจ้งอุบัติเหตุ 988/43

ลำดับ	รหัสอะไหล่	รายการความเสียหาย สีแห้งช้าเต็มระบบ	จำนวน	รหัสซ่อม อู่เสนอ	รหัสซ่อม ส ค ส	ช่างพลาย รหัสสั่งอะไหล่	ช่างพลาย ชื่อร้าน	หมายเหตุ
1	11-0270R			B1				
2	11-0700L			C1				
3	13-0030M			C1	C/3			
4	14-0110M			B2	B2			
5	13-0290M			B2	B1			
6	14-0070L			B2	B			
7	14-0070R			B2	B1			
8	14-0200M			B1	B1			
9	150190M			B1	B1			
10	16-0100M			C1	C/3			
11	16-0330M			B2	B2			
12	16-0450M			B2	B2			

คณะบุคคล แจแปนนีส คาร์รีแพร์
42/133 หมู่ 10 ถนนนวมินทร์ แขวงคลองกุ่ม
เขตบึงกุ่ม กรุงเทพฯ 10240
โทร. 5107655, 5094193 แฟกซ์. 5094193

14/11/43

Figure A.3. Existing System Quotation Form.

บริษัท วิริยะประกันภัย จำกัด
THE VIRIYAH INSURANCE CO., LTD.

223-0851, 223-0996, 224-0059

รายการตั้งเบิกใบสั่งซ่อม

ลงวันที่ 31 เดือน มกราคม พ.ศ. 2544

จ่ายให้ คณะบุคคล [illegible] คาร์ [illegible] เช็คธนาคาร .... เลขที่ ....

ลำดับที่	เลขเคลม	กรมธรรม์เลขที่	ใบสั่งซ่อมเลขที่		จำนวนเงิน			หมายเหตุ
			ประกัน	คู่กรณี	ค่าแรง	ค่าอะไหล่	VAT	
1	IC3-3815/43	42109-27128-10	I200582	-	747.66	-	52.34	800.-
2	IC3-8527/43	42100-25903-10	I200482	-	10093.46	-	706.54	10,800.-
3	IC3-11305/43	42101-35511-10	I200585	-	5514.02	-	385.98	5,900.-
4	IC3-11906/43	43101-07362-10	I200415	-	4859.81	-	340.19	5,200.-
5	IC3-11908/43	43101-07362-10	I200416	-	7102.80	-	497.20	7,600.-
6	IC3-12479/43	43109-08876-10	I200493	-	11495.33	-	804.67	12,300.-
7	IC3-198/44	43501-18672-10	I200583	-	4672.90	-	327.10	5,000.-
8	IC3-382/44	43110-02616-10	I200417	-	9813.08	-	686.92	10,500
9	IC3-475/44	43108-09476-10	I200617	-	7289.72	-	510.28	7,800.-
10	IC3-489/44	43101-26633-10	I200594	-	5420.56	-	379.44	5,800.-
11	IC3-532/44	43103-01679-10	I200652	-	7009.35	-	490.65	7,500.-
12	IC3-545/44	43104-19048-10	I200619	-	6355.14	-	444.86	6,800.-
					80,373.83	-	5,626.17	86,000.-

Figure A.4. Existing System Payment Requsition.

APPENDIX B

DATABASE DESIGN

DATABASE DESIGN

Table B.1. Database Design of Account Receivable Table.

AR_No	Total_Amount	Discount	Ex_VAT	VAT

Net_Amount	Payment	Date_Collected

Table B.2. Database Design of Brand Table.

Brand_No	Brand	Model	Man_Year

Table B.3. Database Design of Car Table.

Licnese_No	Brand_No	Buy_Year	Color	Type	Gear

Engine_No	Body_No	CC	Milage

Table B.4. Database Design of Cash Repair Order Table.

Order_No	Total_Parts	Total_Labor

Table B.5. Database Design of Claim Repair Order Table.

Order_No	Insur_Com	Acci_No	Insur_No	Inform_No	Repair_No

Con_No	Agree_No	Guaran_No	Insur_Cause

Table B.6. Database Design of Customer Table.

Cust_No	Name	Lastname	Address	Street	City

Postal	Home_Tel	Off_Tel	Mobile_Tel	Pager

Table B.7. Database Design of Department Table.

Depart_No	Day_In	Day_Out	Day_Appoint

Table B.8. Database Design of Insurance Table.

Insur_Com	Insur_Name	Insur_Branch	Insur_Add

Table B.9. Database Design of Job Table.

Job_No	Job _Name	Job_Descript	Labor_Charge

Table B.10. Database Design of Ordered Part Table.

Ordered_Part_No	Order_No	Part_No	Qty	Ordered_Price

Fix_Code	Sug_Code	Comment

Table B.11. Database Design of Repaired Job Table.

Repaired_Job_No	Order_No	Job_No

Table B.12. Database Design of Repair Order Table.

Order_No	Cust_No	License_No	AR_No	In_Date	Out_Date

Appoint_Date	RO_Type	Officer

Table B.13. Database Design of Serviced Department Table.

Order_No	Depart_No

Table B.14. Database Design of Spare_Part Table.

Part_No	Pt_Name	Pt_Descript

APPENDIX C

DATA DICTIONARY

DATA DICTIONARY

Table C.1. Data Dictionary of Auto Repair Order Database.

Field Name	Meaning
Address	Address of customer, compose of street city and postal
Acci_No	The accident code for a claim repair order, given by the insurance company
Agree_No	Agreement code given by the insurance company
Appoint_Date	The appointed date when the repair order will be deliver
AR_No	Account receivable identification code
Body_No	Automobile body's identification code
Brand	Automobile brand name
Brand_No	Brand entity's identification code
Buy_Year	The year the car was brought
CC	The amount of CC that the automobile has
City	The city that customer live in
Color	The color of the automobile
Con_No	Conclusion code given by the insurance company
Comment	Comment on fix code and suggested fix code
Cust_No	Customer's identification code
Date_Collected	The actual date that amount owe was collected
Day _Appoint	The day that the car was appointed to be delivered by a department
Day_In	The day that a department receive the car for repair
Day_Out	The day that a department delivered the car after repair
Depart_No	The code of the department that provide services
Discount	The amount of discount given in an repair order
Engine_No	Engine identification code
Ex_VAT	Charge amount before VAT
Fix_Code	Describe how spare parts are to be fix or replace given by the insurance company
Guaran_No	Guarantee accident code given by insurance company
Gear	The type of gear the automobile has
Home_Tel	Customer home telephone number
In_Date	The date the car was in for repair
Inform_No	Inform code of an insurance claim, given by the insurance company
Insur_Branch	The insurance company branch
Insur_Cause	State whether the claim repair order was from the insurer or other
Insur_Com	Identification number of an insurance company
Insur_Add	Insurance company contact address and telephone number
Insur_Name	Insurance company name
Insur_No	The insurance code of an automobile, given by the insurance company
Job_No	Job's identification code
	A brief description of job

Table C.1. Data Dictionary of Auto Repair Order Database (Continued).

Field Name	Meaning
Job_Descript	The name of the job
Job_Name	The name of the job
Labor_Charge	The labor charge for a specific repair job
Lastname	Customer's last name
License_No	Automobile license plate number
Man_Year	The year that the car was manufacturer
Milage	The kilometer that the car has driven
Mobile_Tel	Customer mobile phone number
Model	The model of the brand named automobile
Name	Customer name
Net_Amount	Total amount including value added tax
Off_Tel	Customer office telephone number
Officer	Name of officer who's in charge of the repair order
Order_No	Repair order identification code
Ordered_Part_No	Ordered part identification code
Ordered_Price	Actual price charge for an ordered spare part
Out_Date	The actual date the repair order was delivered
Pager	Customer pager number
Part_No	Spare part identification code
Payment	The payment status of a repair order
Postal	Postal number of customer
Pt_Descript	A brief description of spare part
Pt_Name	Spare part name
Qty	The quantity of spare parts ordered
Repair_Job_No	Repair job identification code
Repair_No	The identification code of a claim repair order given and used by the insurance company
RO_Type	The type or category of a repair order
Street	The street and address that customer live on
Sug_Code	Suggestion on how spare parts are to be fix or replace given to insurance company
Total_Amount	The total amount charge for a specific repair order
Toal_Labor	The total amount of labor charge in a repair order
Total_Parts	The total amount charge on spare parts used in a repair order
Type	The type of the automobile
VAT	Value added tax of a repair order

APPENDIX D

DATA FLOW DIAGRAM

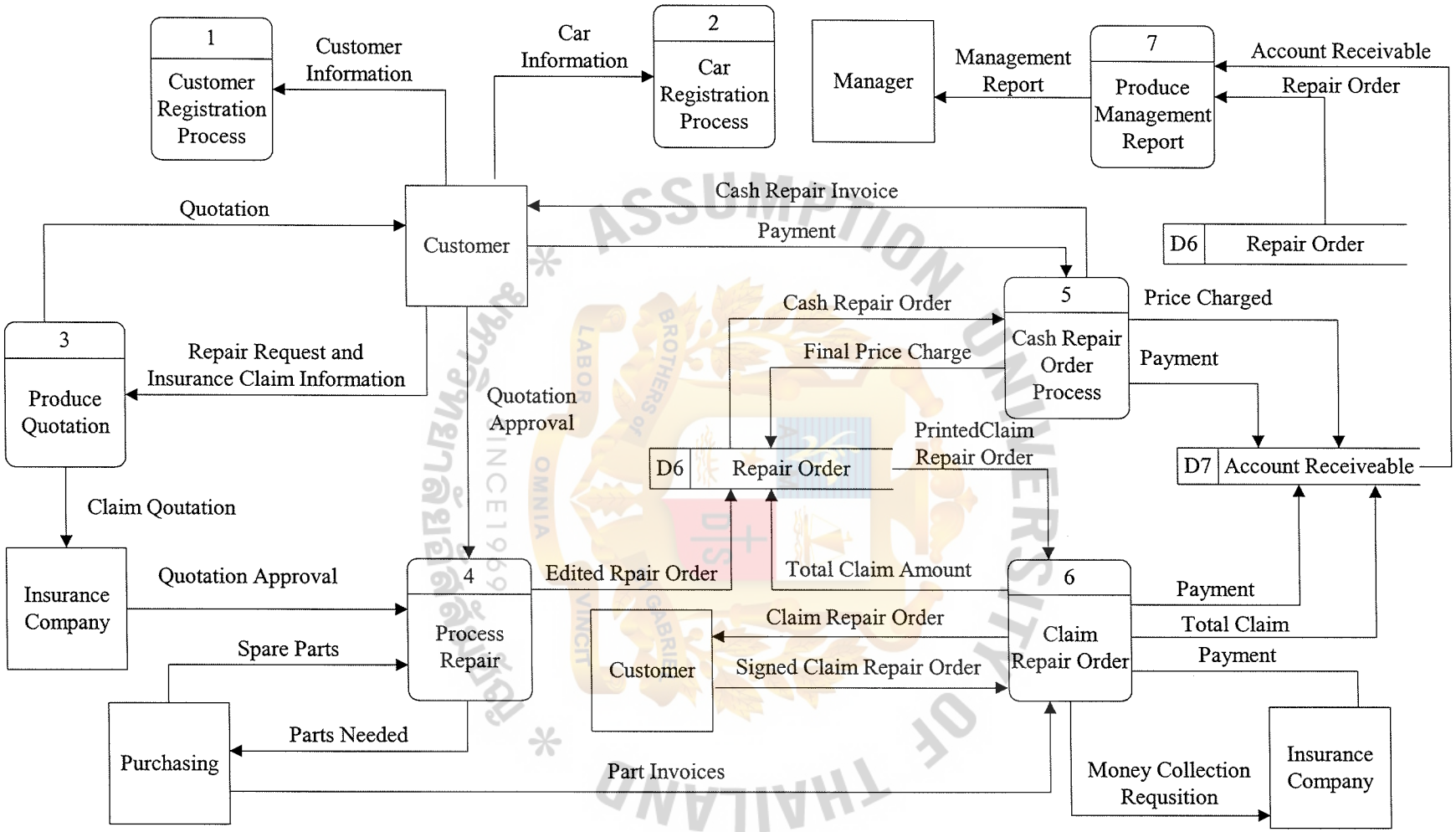


Figure D.1. Level 1 Data Flow Diagram of Auto Repair Order Information System.

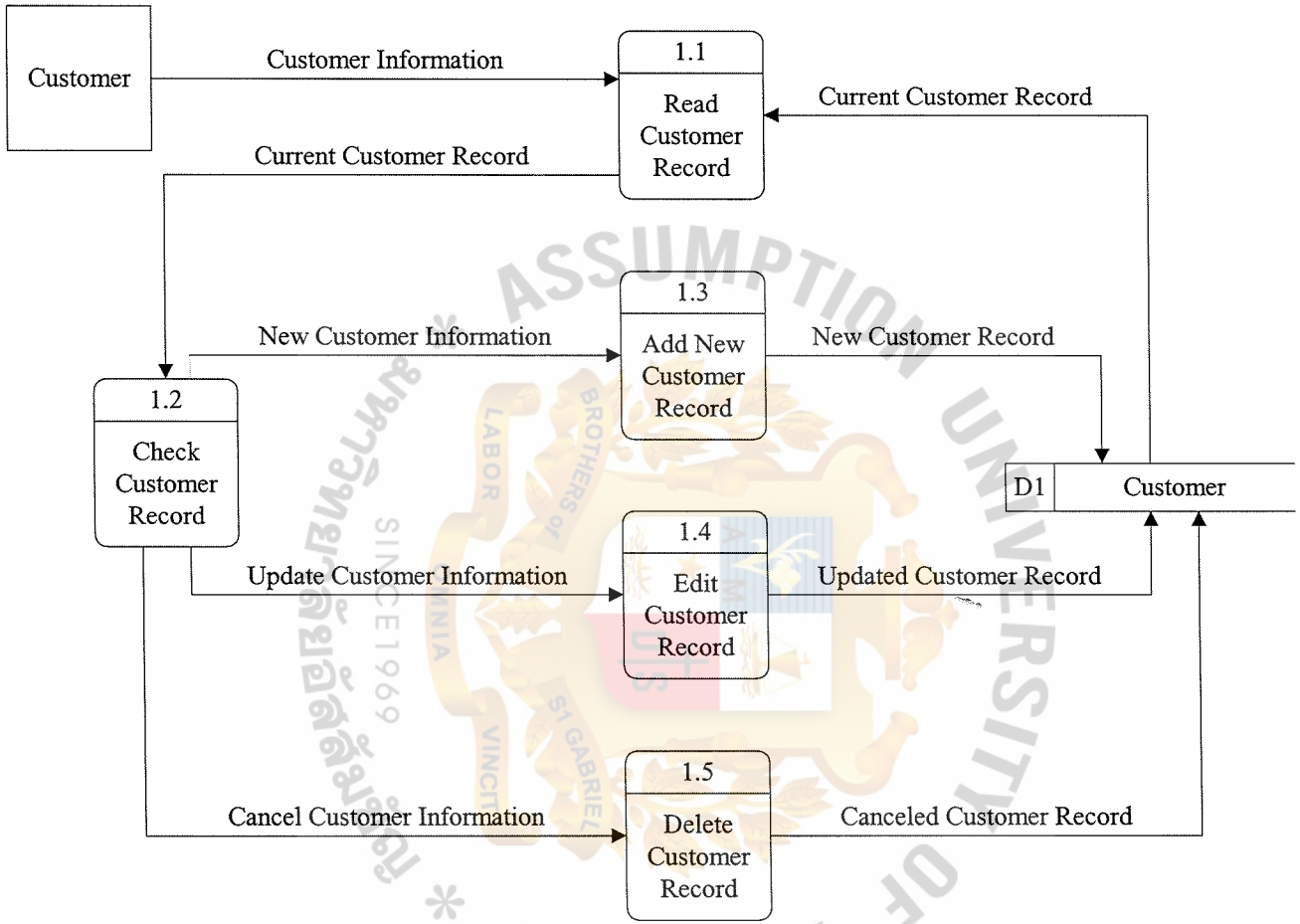


Figure D.2. Level 2 Data Flow Diagram of Customer Registration Subsystem of Auto Repair Order Information System.

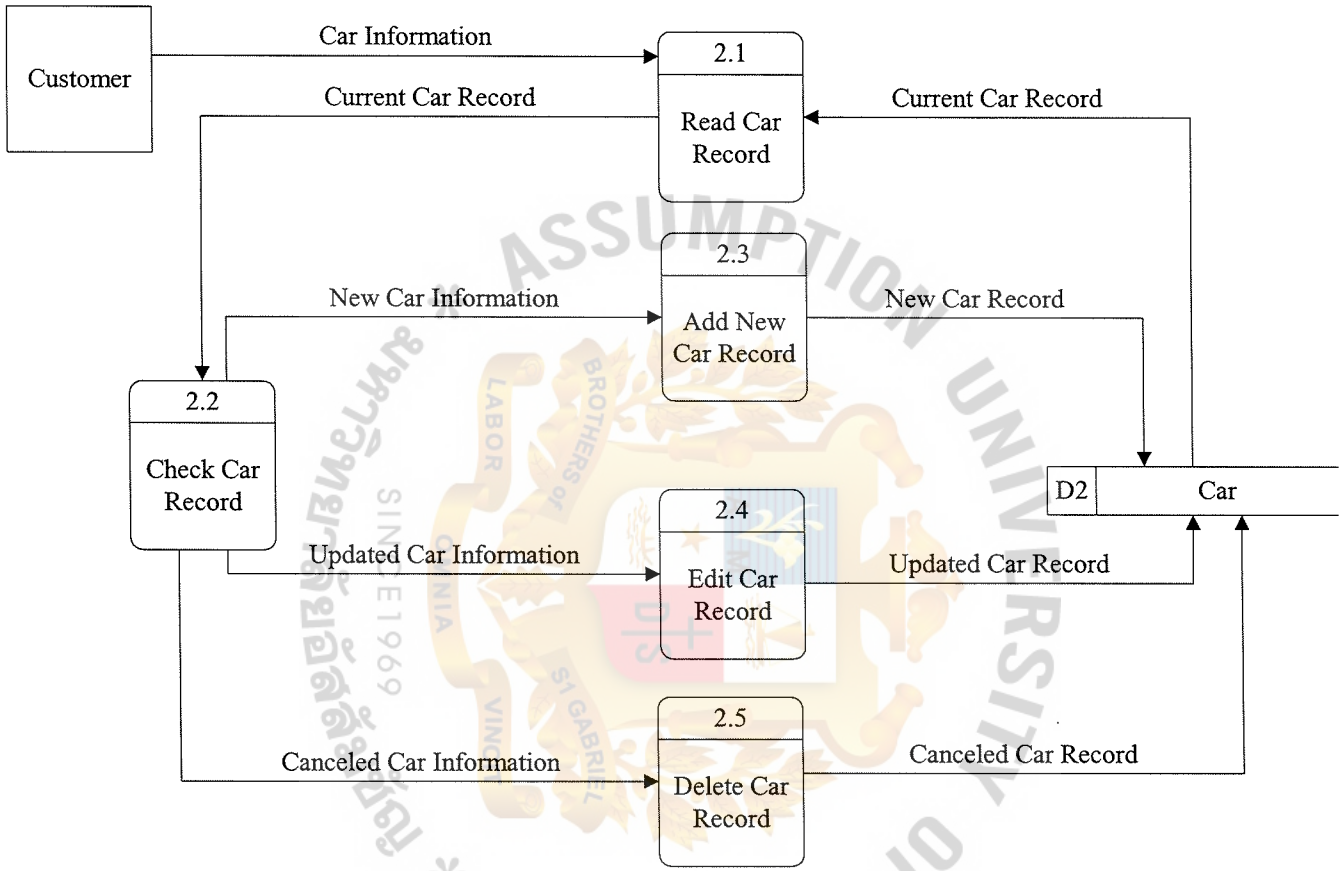


Figure D.3. Level 2 Data Flow Diagram of Car Registration Subsystem of Auto Repair Order Information System.

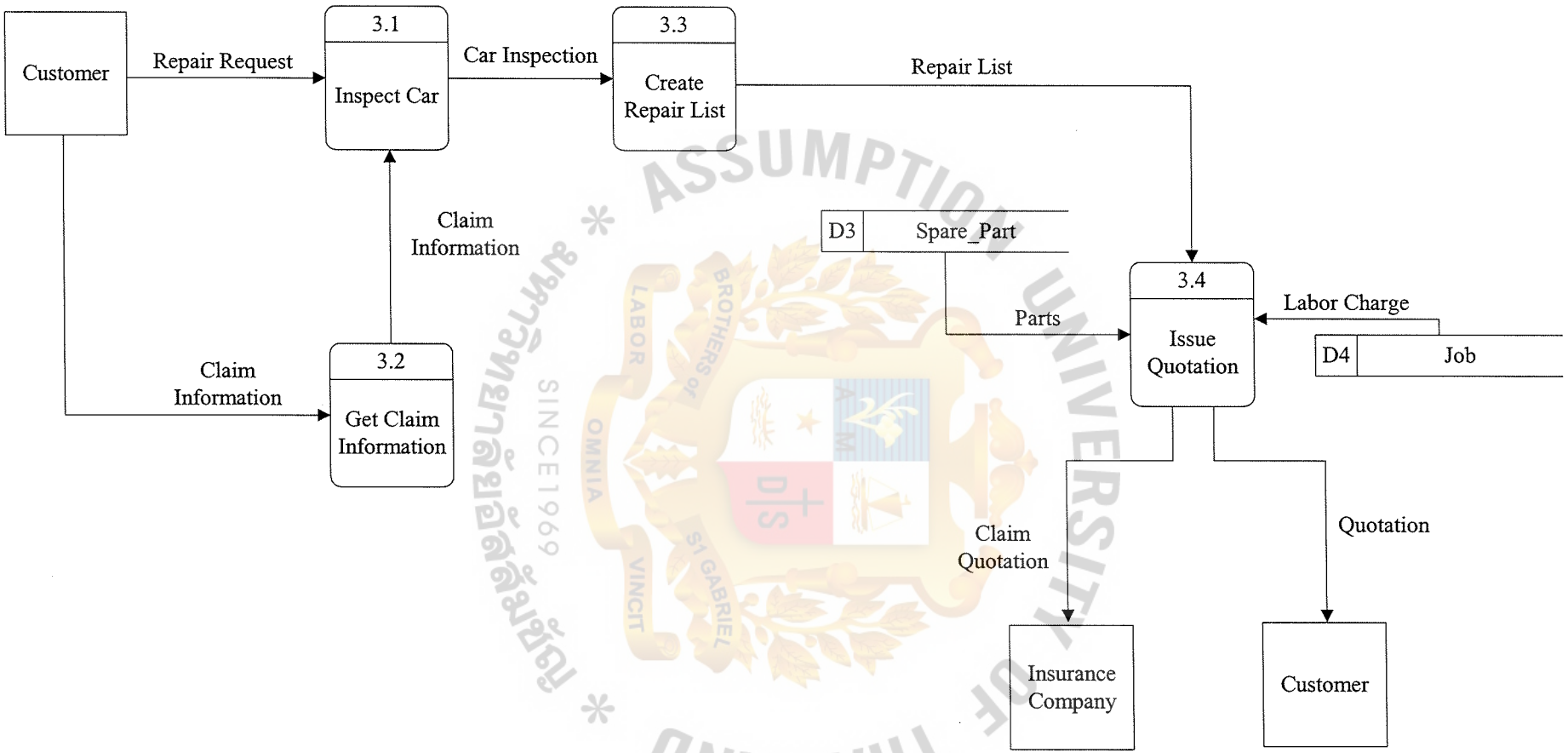


Figure D.4. Level 2 Data Flow Diagram of Produce Quotation Subsystem of Auto Repair Order Information System.

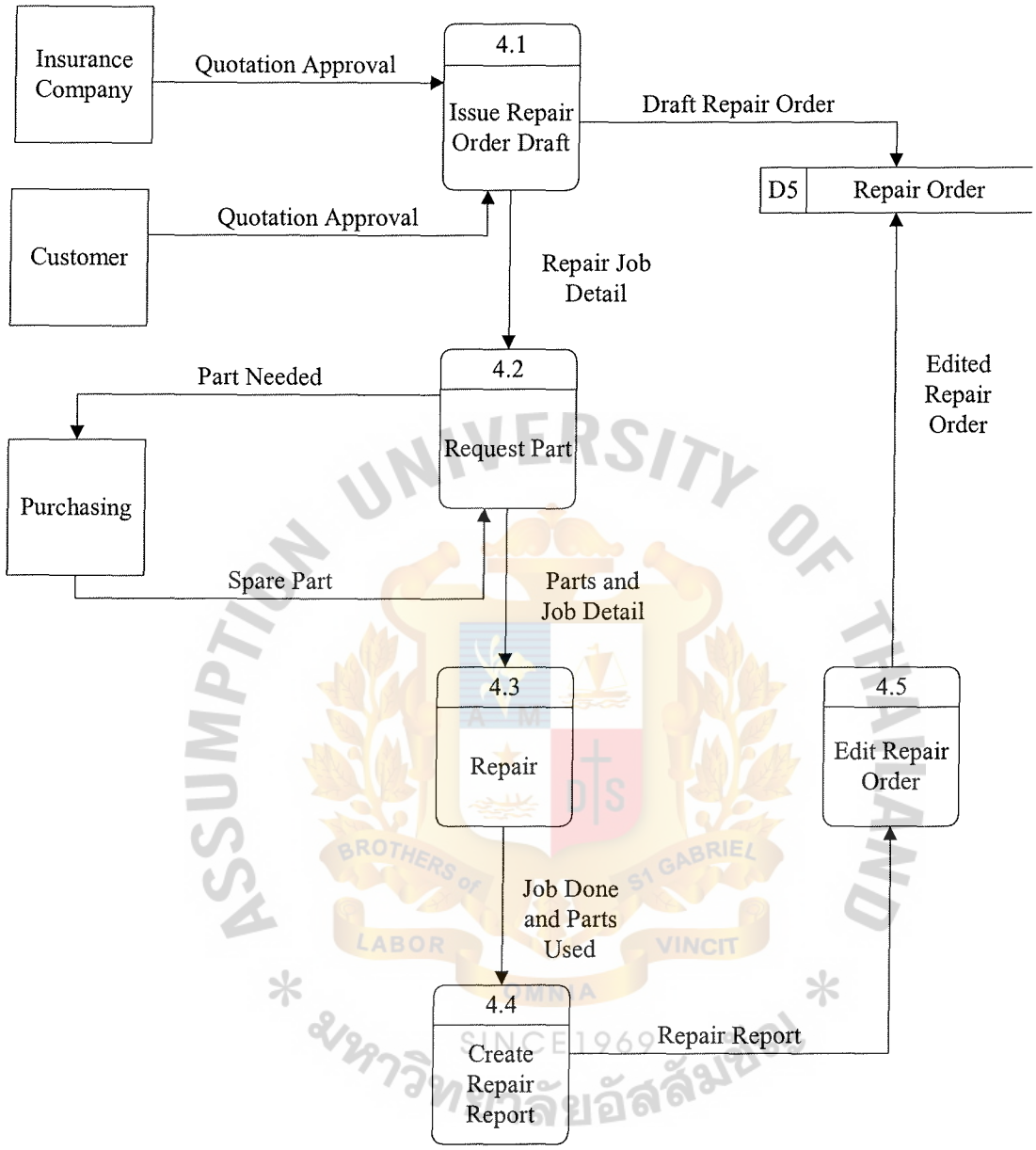


Figure D.5. Level 2 Data Flow Diagram of Repair Subsystem of Auto Repair Order Information System.

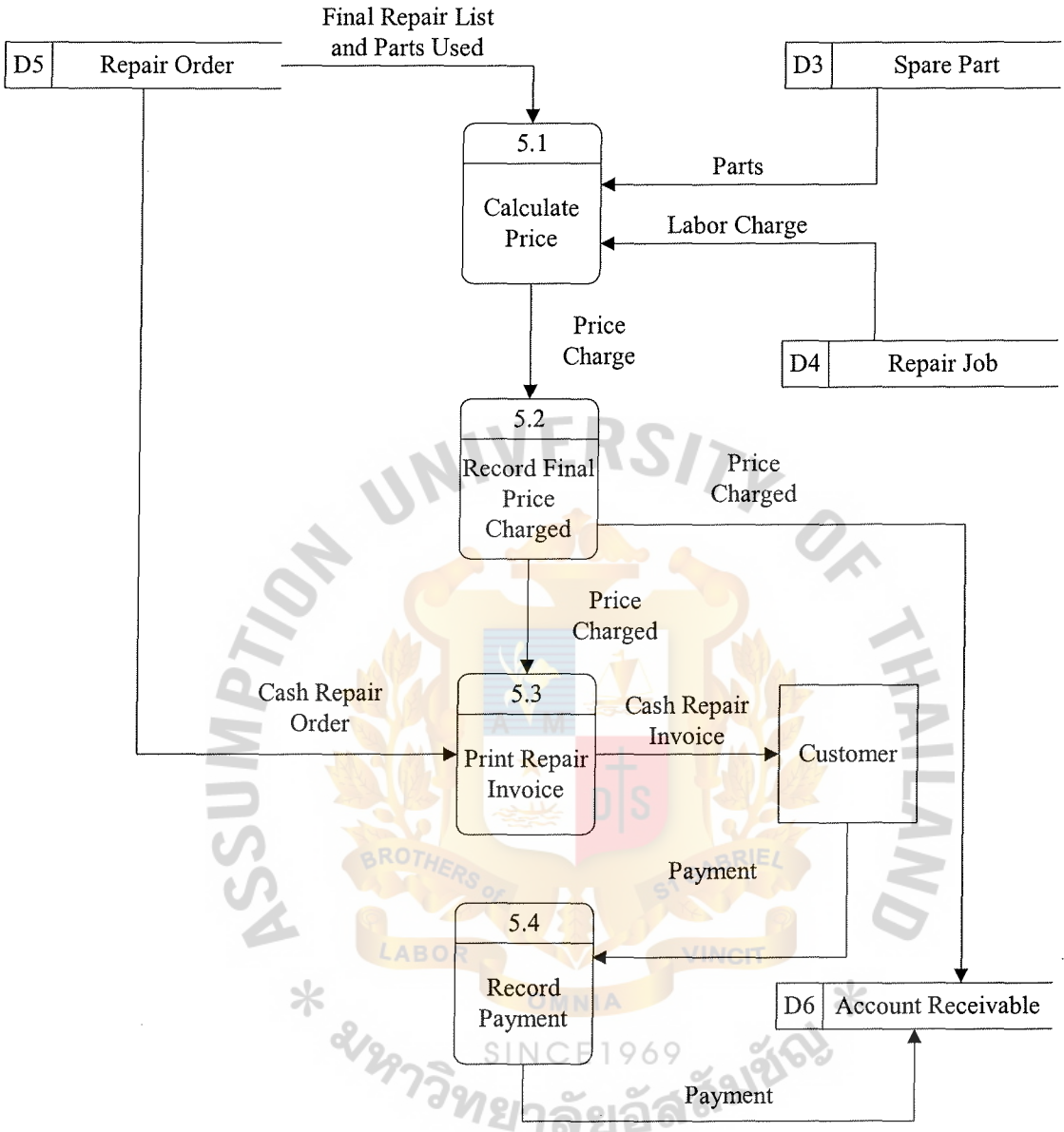


Figure D.6. Level 2 Data Flow Diagram of Cash Repair Order Subsystem of Auto Repair Order Information System.

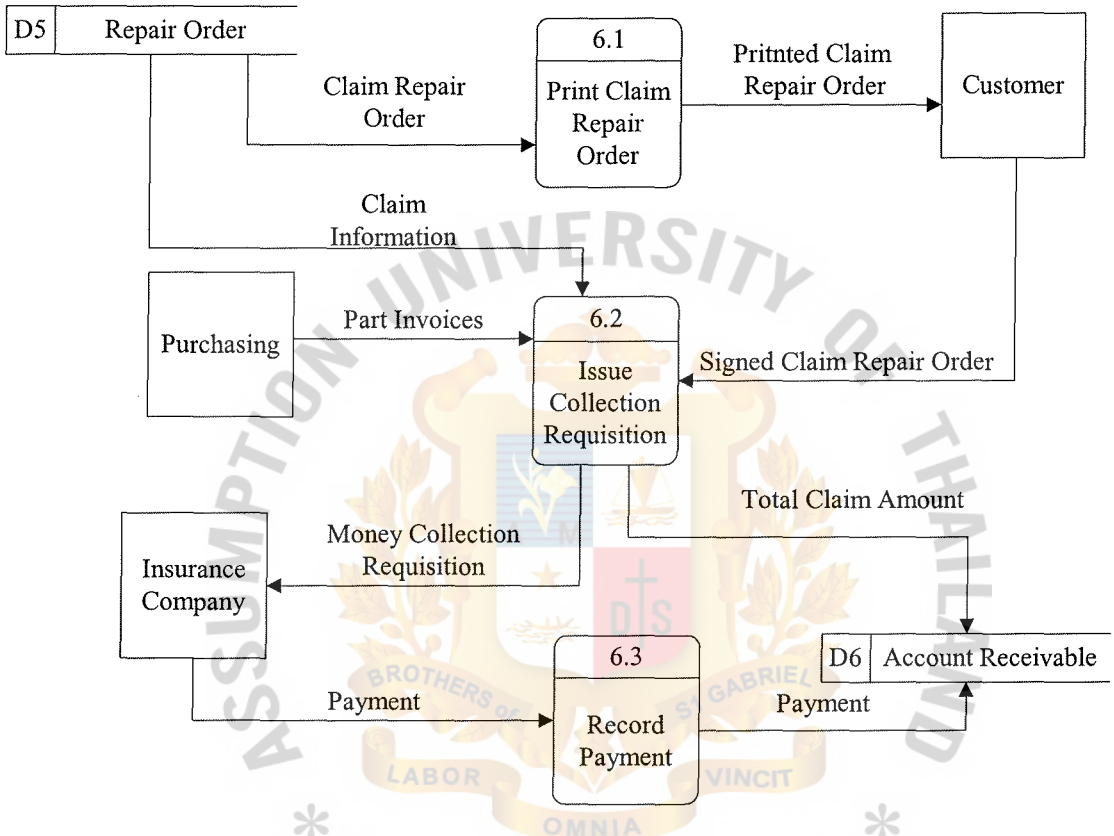


Figure D.7. Level 2 Data Flow Diagram of Claim Repair Order Subsystem of Auto Repair Order Information System.

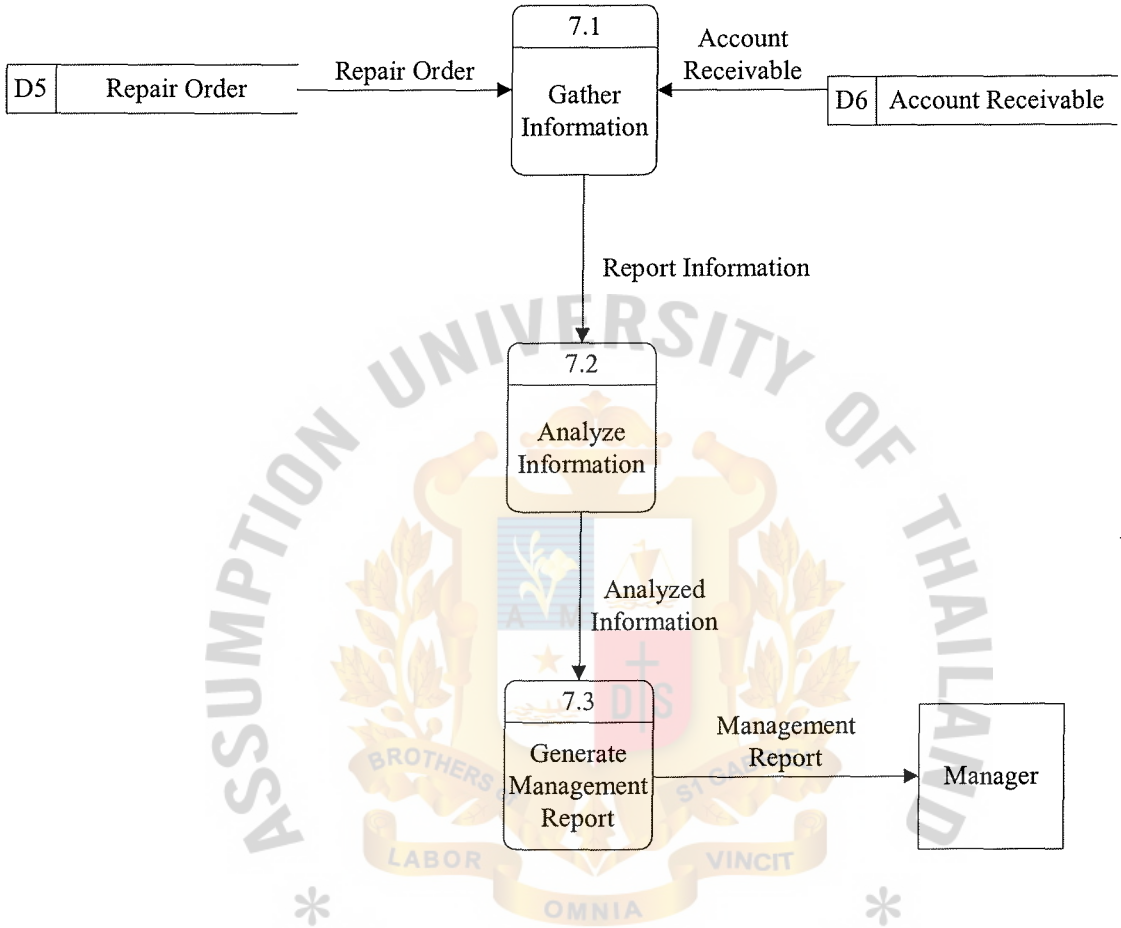


Figure D.8. Level 2 Data Flow Diagram of Management Report Subsystem of Auto Repair Order Information System.

APPENDIX E

PROCESS SPECIFICATION

PROCESS SPECIFICATION

Table E.1. Process Specification of Process 1.1.

Process Name:	Read Customer Record
Data In:	Customer Information
Data Out:	Current Customer Record
Process:	(1) Get necessary customer data, customer name, address, phone number, etc. (2) Look up customer information in Customer Data store
Attachment:	(1) Customer (2) Data Store D1 (3) Process 1.2 (Check Customer Record)

Table E.2. Process Specification of Process 1.2.

Process Name:	Check Customer Record
Data In:	Current Customer Record Customer Information
Data Out:	New Customer Information Update Customer Information Cancel Customer Information
Process:	(1) Get current customer record (2) Get customer information (3) Check and compare current customer record and customer Information (4) Identify new customer record, update customer record, and cancel customer record
Attachment:	(1) Process 1.1 (Read Customer Record) (2) Process 1.3 (Add New Customer Record) (3) Process 1.4 (Edit Customer Record) (4) Process 1.5 (Delete Customer Record)

Table E.3. Process Specification of Process 1.3.

Process Name:	Add New Customer Record
Data In:	New Customer Information
Data Out:	New Customer Record
Process:	(1) Get new customer information (2) Create new customer record from new customer information (3) Write new customer record in customer data store
Attachment:	(1) Process 1.2 (Check Customer Record) (2) Data Store D1

Table E.4. Process Specification of Process 1.4.

Process Name:	Edit Customer Record
Data In:	Update Customer Information
Data Out:	Updated Customer Record
Process:	(1) Get update customer information (2) Create updated customer record form update customer information (3) Write updated customer record in customer data store
Attachment:	(1) Process 1.2 (Check Customer Record) (2) Data Store D1

Table E.5. Process Specification of Process 1.5.

Process Name:	Delete Customer Record
Data In:	Cancel Customer Information
Data Out:	Canceled Customer Record
Process:	(1) Get cancel customer information (2) Delete canceled customer record in customer data store
Attachment:	(1) Process 1.2 (Check Customer Record) (2) Data Store D1

Table E.6. Process Specification of Process 2.1.

Process Name:	Read Car Record
Data In:	Car Information
Data Out:	Current Car Record
Process:	(1) Get necessary car data, license number, year manufactured, brand, etc. (2) Look up car information in Car data store
Attachment:	(1) Car (2) Data Store D2 (3) Process 2.2 (Check Customer Record)

Table E.7. Process Specification of Process 2.2.

Process Name:	Check Customer Record
Data In:	Current Car Record Car Information
Data Out:	New Car Information Update Car Information Cancel Car Information
Process:	(1) Get current car record (2) Get car information (3) Check and compare current car record and car Information (4) Identify new car record, update car record, and cancel car record
Attachment:	(1) Process 2.1 (Read Car Record) (2) Process 2.3 (Add New Car Record) (3) Process 2.4 (Edit Car Record) (4) Process 2.5 (Delete Car Record)

Table E.8. Process Specification of Process 2.3.

Process Name:	Add New Car Record
Data In:	New Car Information
Data Out:	New Car Record
Process:	(1) Get new car information (2) Create new car record from new car nformation (3) Write new car record in car data store
Attachment:	(1) Process 2.2 (Check Car Record) (2) Data Store D2

Table E.9. Process Specification of Process 2.4.

Process Name:	Edit Car Record
Data In:	Update Car Information
Data Out:	Updated Car Record
Process:	(1) Get update car information (2) Create updated car record form update car information (3) Write updated car record in car data store
Attachment:	(1) Process 2.2 (Check Car Record) (2) Data Store D2

Table E.10. Process Specification of Process 2.5.

Process Name:	Delete Car Record
Data In:	Cancel Car Information
Data Out:	Canceled Car Record
Process:	(1) Get cancel car information (2) Delete canceled car record in car data store
Attachment:	(1) Process 2.2 (Check Car Record) (2) Data Store D2

Table E.11. Process Specification of Process 3.1.

Process Name:	Inspect Car
Data In:	Repair Request Claim Information
Data Out:	Car Inspection
Process:	(1) Get repair request from customer (2) Get Claim Information for claim repair request (3) Mechanic check car (4) Mechanic report what's broken and need to be fix to officer
Attachment:	(1) Customer (2) Process 3.2 (Get Claim Information) (3) Process 3.3 (Create Repair List)

Table E.12. Process Specification of Process 3.2.

Process Name:	Get Claim Information
Data In:	Claim Information
Data Out:	Claim Information
Process:	(1) Get claim information from customer (2) Officer checks if necessary claim information is given. (3) Send to mechanic to inspect car
Attachment:	(1) Customer (2) Process 3.1 (Inspect Car)

Table E.13. Process Specification of Process 3.3.

Process Name:	Create Repair List
Data In:	Car Inspection
Data Out:	Repair List
Process:	(1) Get car inspection from mechanic (2) Officer creates a repair list from the car inspection. (3) Officer list spare parts that need to be change
Attachment:	(1) Process 3.1 (Inspect Car) (2) Process 3.4 (Issue Quotation)

Table E.14. Process Specification of Process 3.4.

Process Name:	Issue Quotation
Data In:	Repair List Parts Labor Charge
Data Out:	Quotation
Process:	(1) Get list of spare part needed from the repair list (2) Get spare parts from spare part data store (3) Get list of repair job from the repair list (4) Check labor charge from job data store (5) Create quotation from list of spare parts needed, repair list, labor charge, and the total price.
Attachment:	(1) Process 3.3 (Create Repair List) (2) Data Store D3 (3) Data Store D4 (4) Insurance Company (5) Customer

Table E.15. Process Specification of Process 4.1.

Process Name:	Issue Repair Order Draft
Data In:	Quotation Approval
Data Out:	Draft Repair Order
Process:	(1) Get quotation approval from customer or insurance company (2) Put information from the quotation approval (repair list, spare part, and etc.) in a repair order form.
Attachment:	(1) Customer (2) Insurance Company (3) Data Store D5 (4) Process 4.2 (Request Part)

Table E.16. Process Specification of Process 4.2.

Process Name:	Request Part
Data In:	Repair Job Detail Spare Part
Data Out:	Parts and Job Detail
Process:	(1) Get repair job detail (2) Identify the spare part needed (3) Request spare part from purchasing (4) Receive necessary spare part from purchasing (5) Send spare part for repair
Attachment:	(1) Process 4.1 (Issue Repair Order Draft) (2) Purchasing (3) Process 4.3 (Repair)

Table E.17. Process Specification of Process 4.3.

Process Name:	Repair
Data In:	Parts and Job Detail
Data Out:	Job Done and Parts Used
Process:	(1) Get Parts and Job Detail (2) Repair according to the job detail (3) Change spare part according to the parts given
Attachment:	(1) Process 4.2 (Request Part) (2) Process 4.4 (Create Repair Report)

Table E.18. Process Specification of Process 4.4.

Process Name:	Create Repair Report
Data In:	Job Done and Parts Used
Data Out:	Repair Report
Process:	(1) Get job done and list of parts used (2) Summarize all job done and all parts changed (3) Create a repair report
Attachment:	(1) Process 4.3 (Repair) (2) Process 4.5 (Edit Repair Order)

Table E.19. Process Specification of Process 4.5.

Process Name:	Edit Repair Order
Data In:	Repair Report
Data Out:	Edited Repair Order
Process:	(1) Get repair report (2) Compare repair report with the draft repair order from the create draft repair report process (3) Update the repair order according to the repair report
Attachment:	(1) Process 4.4 (Create Repair Report) (2) Data Store D5

Table E.20. Process Specification of Process 5.1.

Process Name:	Calculate Price
Data In:	Final Repair List and Parts Used Parts Price Labor Charge
Data Out:	Price Charge
Process:	(1) Get final repair list and parts used (2) Check price of parts used in Spare Part data store (3) Check labor charge in job data store (4) Add labor charge and price of parts used to get price charge
Attachment:	(1) Data Store D3 (2) Data Store D4 (3) Data Store D5 (4) Process 5.2 (Record Final Price Charged)

Table E.21. Process Specification of Process 5.2.

Process Name:	Record Final Price Charged
Data In:	Price Charged
Data Out:	Price Charged
Process:	(1) Get price charged (2) Write price charged in Account Receivable data store
Attachment:	(1) Data Store D5 (2) Data Store D6 (3) Process 5.3 (Print Repair Invoice)

Table E.22. Process Specification of Process 5.3.

Process Name:	Print Repair Invoice
Data In:	Price Charged
Data Out:	Cash Repair Invoiced
Process:	(1) Get price charged (2) Get cash repair order from repair order data store (3) Print cash repair order (4) Give to Customer
Attachment:	(1) Data Store D5 (2) Process 5.2 (Record Final Price Charged) (3) Customer

Table E.23. Process Specification of Process 5.4.

Process Name:	Record Payment
Data In:	Payment
Data Out:	Payment
Process:	(1) Receive payment from customer (2) Check payment (3) Record in account receivable data store
Attachment:	(1) Customer (2) Data Store D6

Table E.24. Process Specification of Process 6.1.

Process Name:	Print Claim Repair Order
Data In:	Claim Repair Order
Data Out:	Printed Claim Repair Order
Process:	(1) Get Claim Repair Order (2) Print Claim Repair Order (3) Give to Customer
Attachment:	(1) Data Store D5 (2) Customer

Table E.25. Process Specification of Process 6.2.

Process Name:	Issue Collection Requisition
Data In:	Claim Information Part Invoices Signed Claim Repair Order
Data Out:	Money Collection Requisition Total Claim Amount
Process:	(1) Get Claim Information (2) Put Claim Information in Money Collection Requisition form (3) Get Part Invoices (4) Get Signed Claim Repair Order (5) Attach Part Invoices with Money Collection Requisition form (6) Give to Insurance Company (7) Record total claim amount in Account Receivable data store
Attachment:	(1) Data Store D5 (2) Purchasing (3) Customer (4) Insurance Company (5) Data Store D6

Table E.26. Process Specification of Process 6.3.

Process Name:	Record Payment
Data In:	Payment
Data Out:	Payment
Process:	(1) Receive payment form Insurance Company (2) Check payment amount (3) Record payment in Account Receivable data store
Attachment:	(1) Insurance Company (2) Data Store D6

Table E.27. Process Specification of Process 7.1.

Process Name:	Gather Information
Data In:	Repair Order Account Receivable
Data Out:	Report Information
Process:	(1) Get Repair Order from data store (2) Get Account Receivable from data store (3) Summarize information
Attachment:	(1) Data Store D5 (2) Data Store D6

Table E.28. Process Specification of Process 7.2.

Process Name:	Analyze Information
Data In:	Report Information
Data Out:	Analyzed Information
Process:	(1) Get report information (2) Analyze information according to set criteria
Attachment:	(1) Process 7.1 (Gather Information) (2) Process 7.3 (Generate Management Report)

Table E.29. Process Specification of Process 7.3.

Process Name:	Generate Management Report
Data In:	Analyzed Information
Data Out:	Management Report
Process:	(1) Get analyzed information (2) Apply calculation (3) Generate management report
Attachment:	(1) Process 7.2 (Analyzed Information) (2) Manager

APPENDIX F

INPUT DESIGN

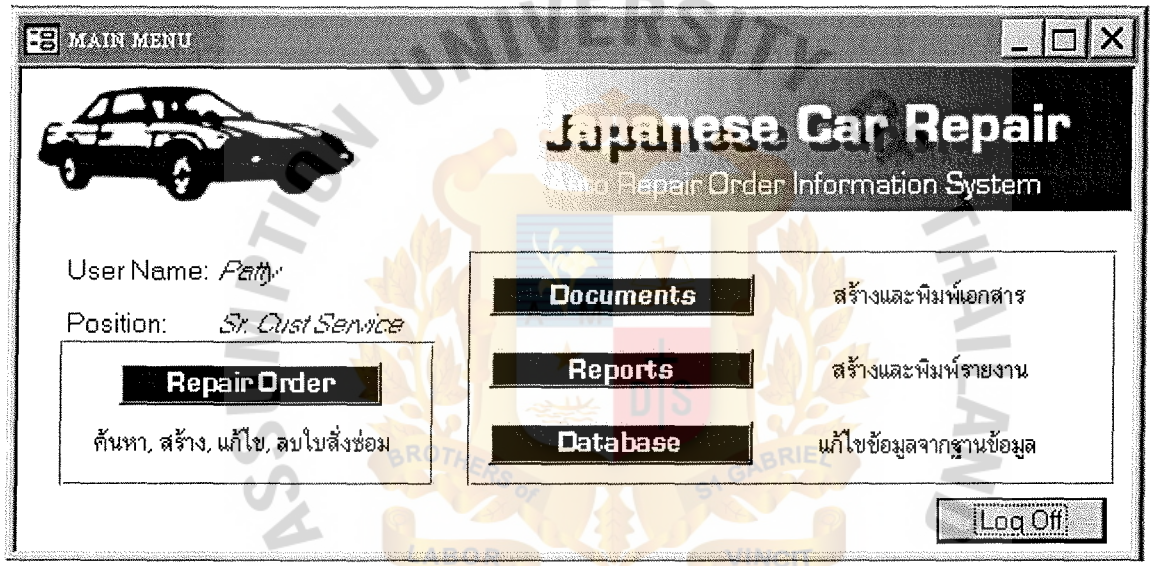


Figure F.1. Main Menu Form.

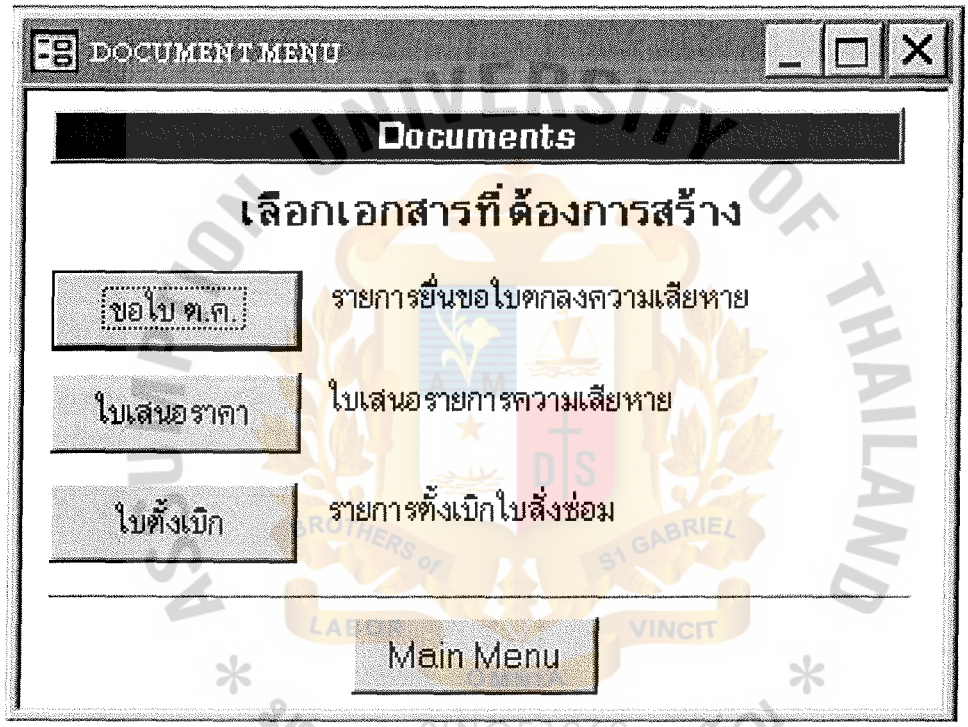


Figure F.2. Documents Menu Form.

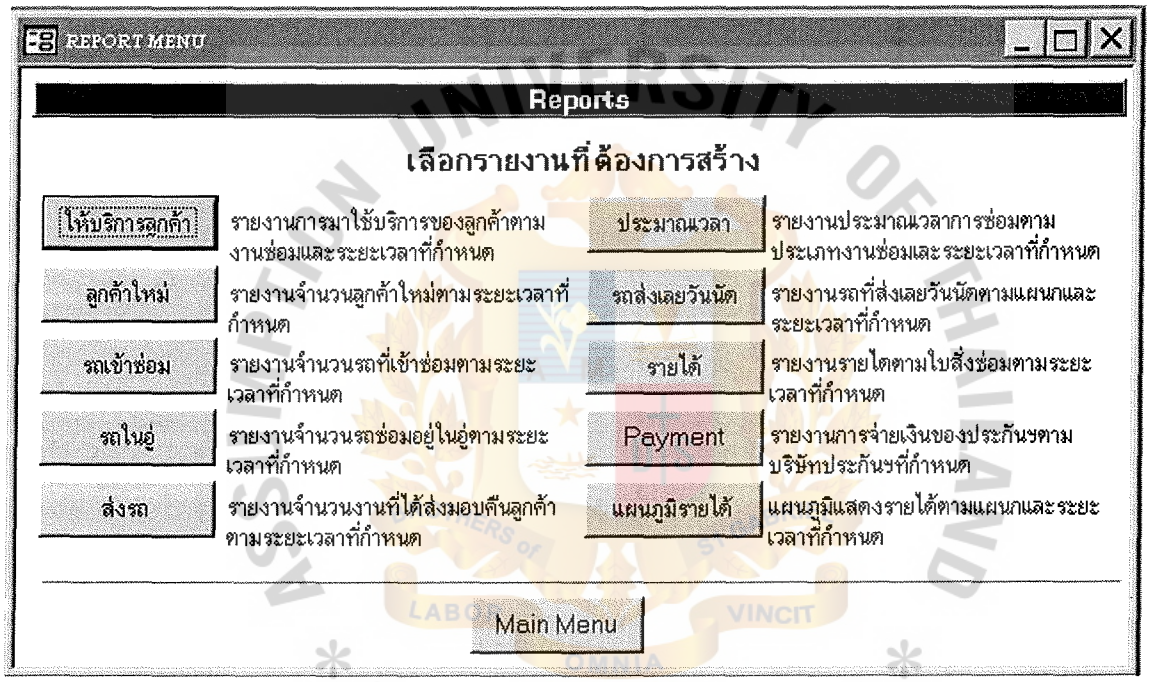


Figure F.3. Reports Menu Form.

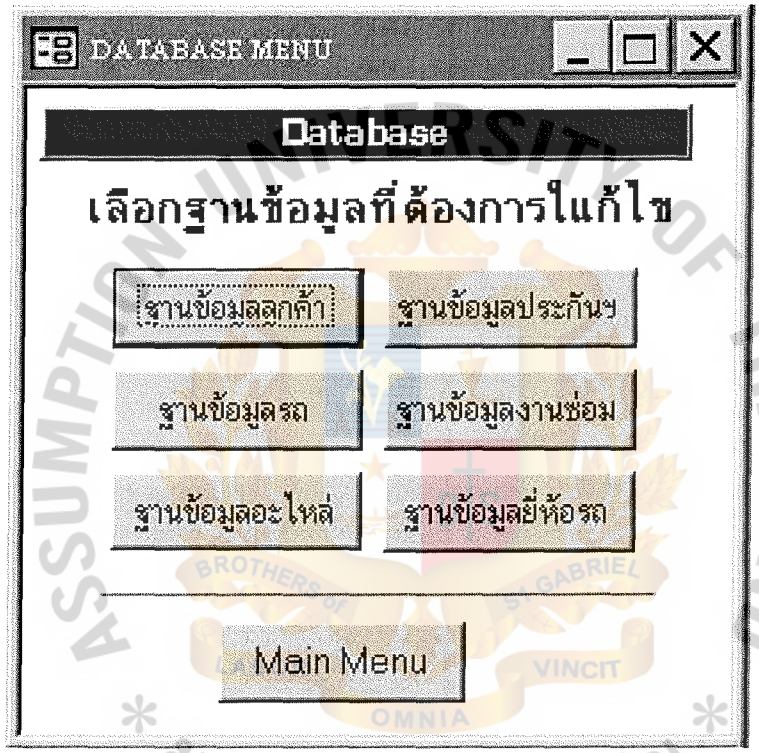


Figure F.4. Database Menu Form.

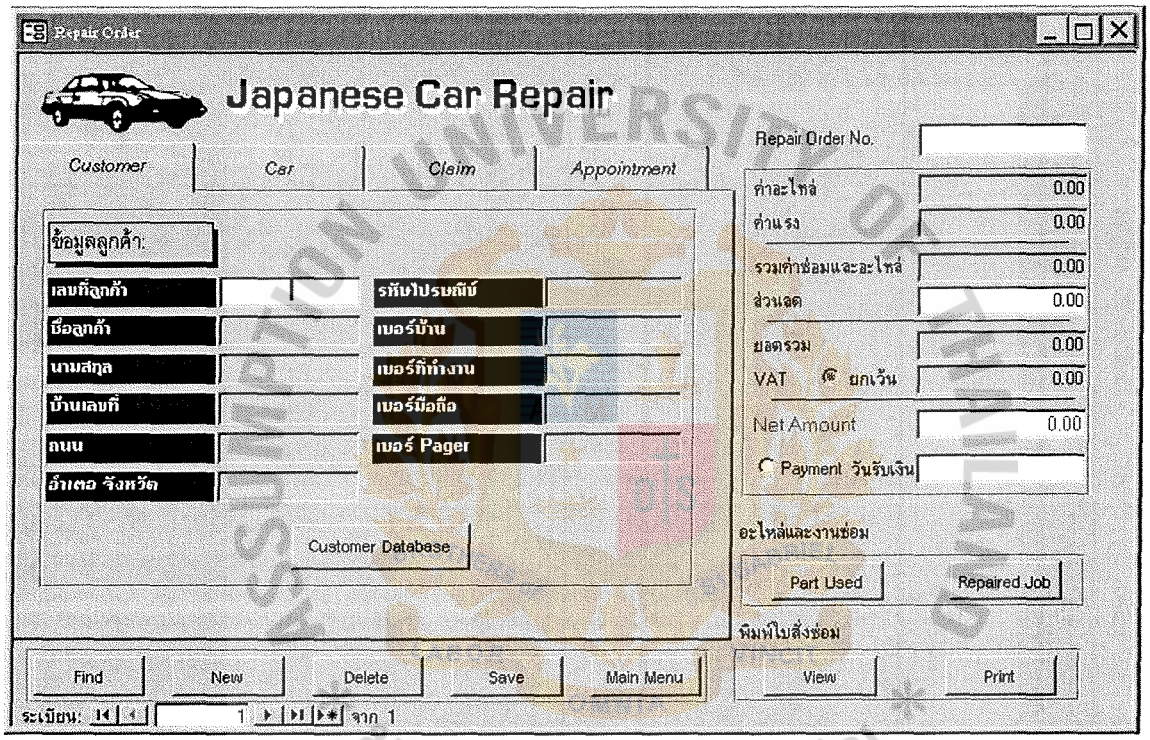


Figure F.5. Repair Order Form, Customer Tab.

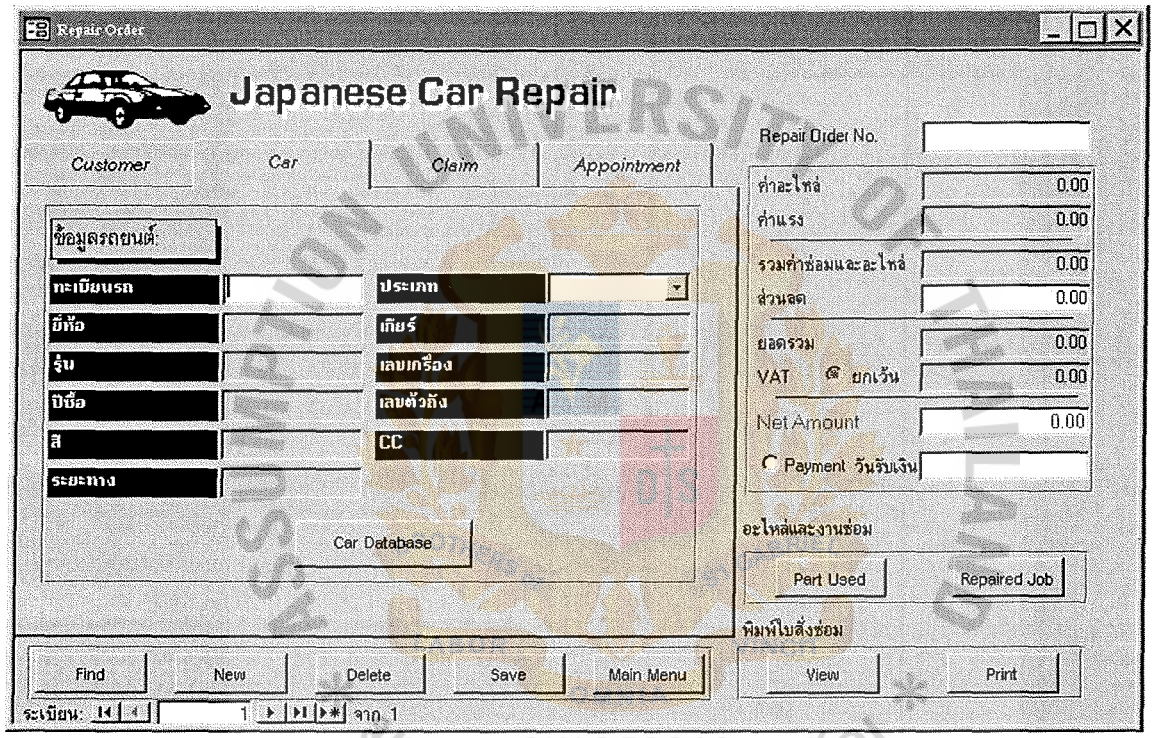


Figure F.6. Repair Order Form, Car Tab.

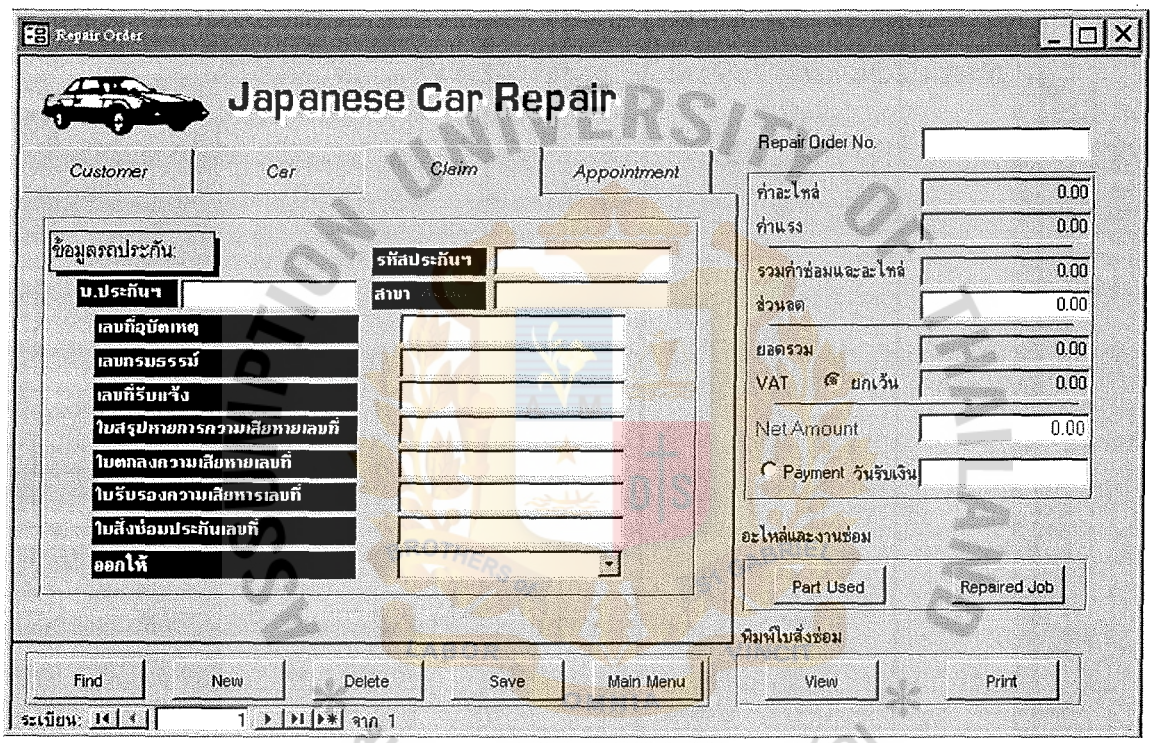


Figure F.7. Repair Order Form, Claim Tab.

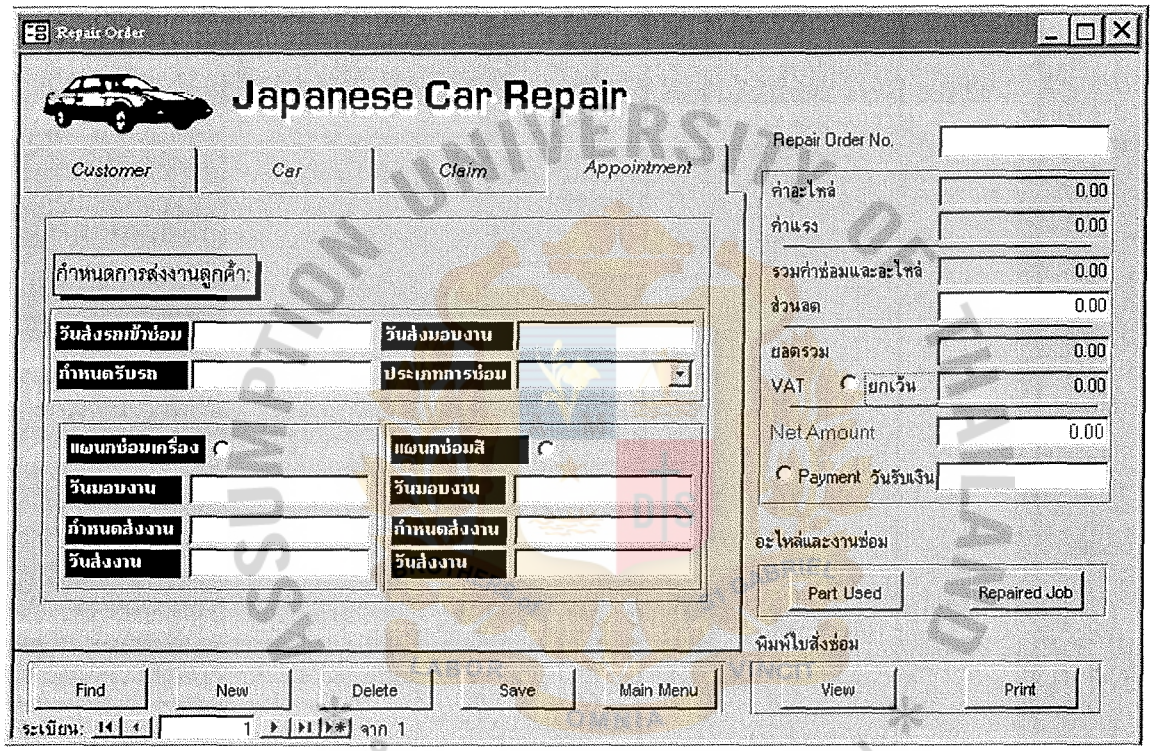


Figure F.8. Repair Order Form, Appointment Tab.

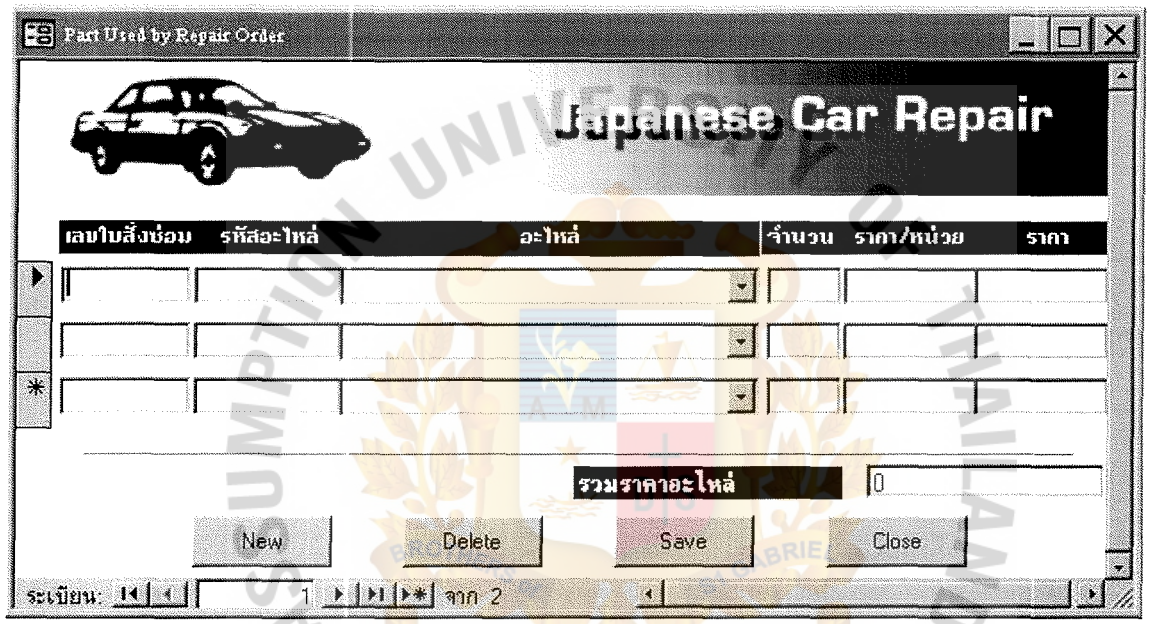


Figure F.9. Repair Order Form, Part Used by Repair Order Page.

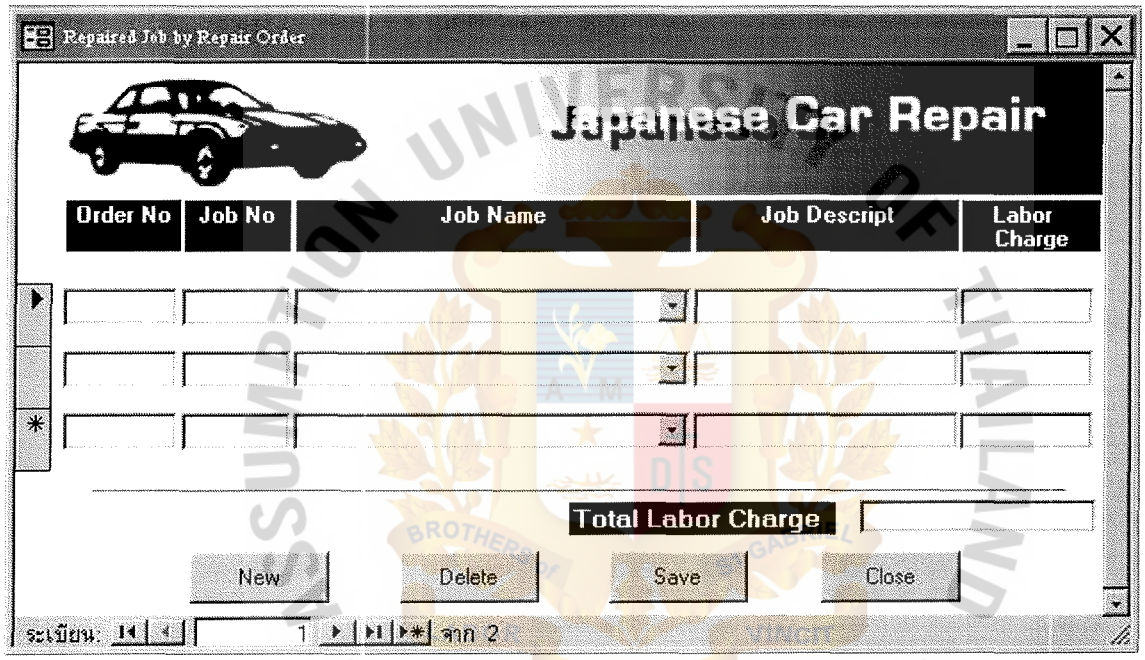


Figure F.10. Repair Order Form, Repaired Job by Repair Order Page.

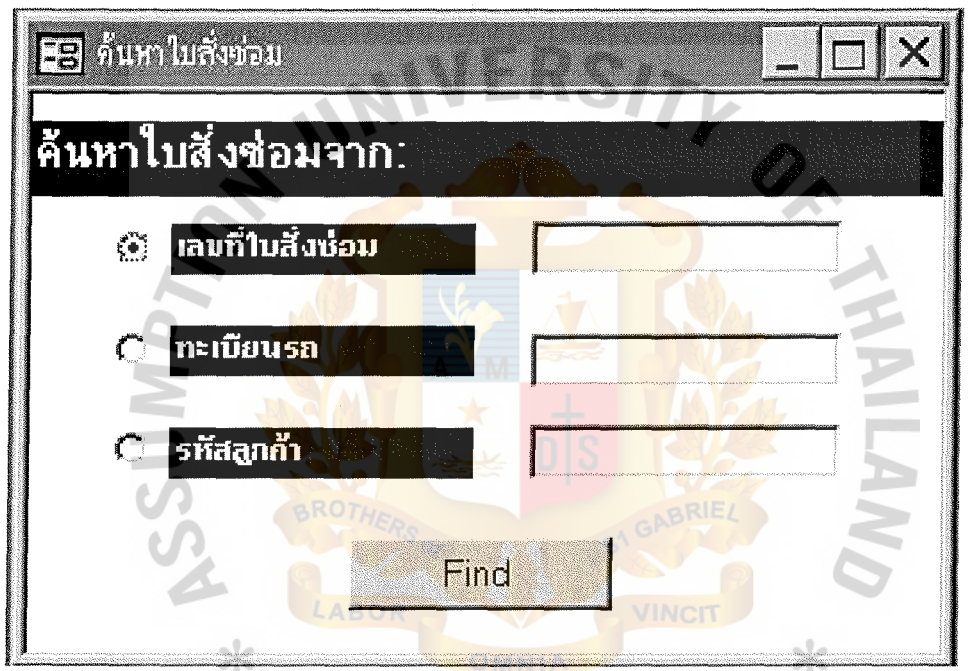


Figure F.11. Repair Order Query Form.

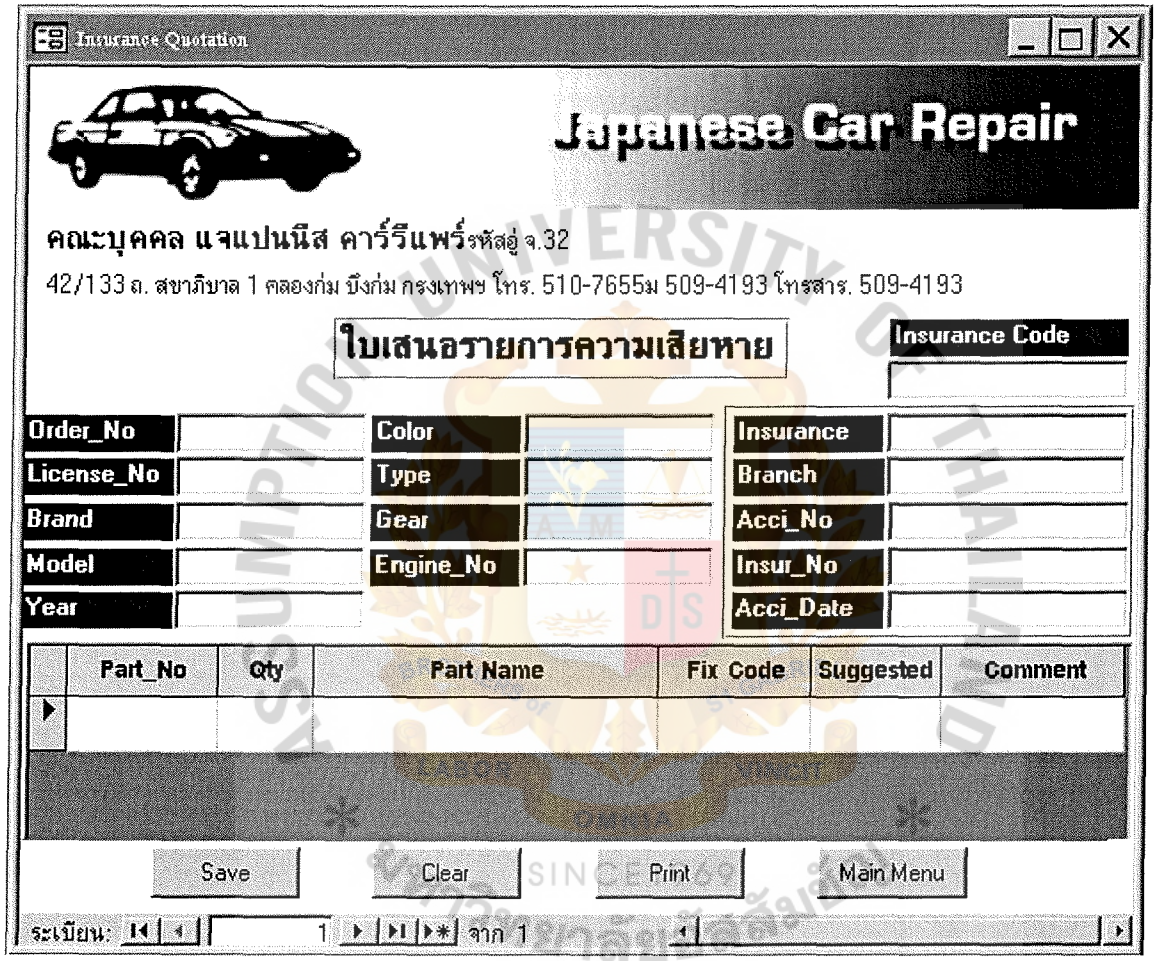


Figure F.12. Claim Repair Order Quotation From.

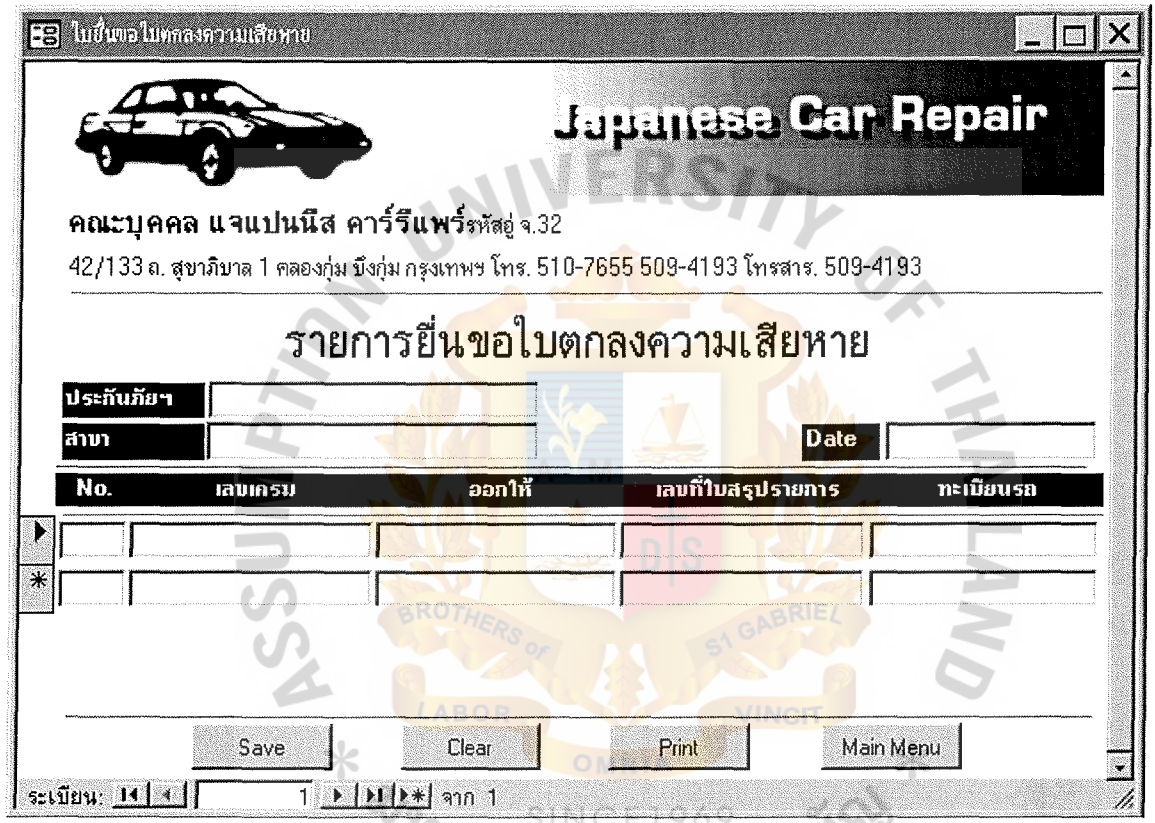


Figure F.13. Repair Conclusion Request Form.

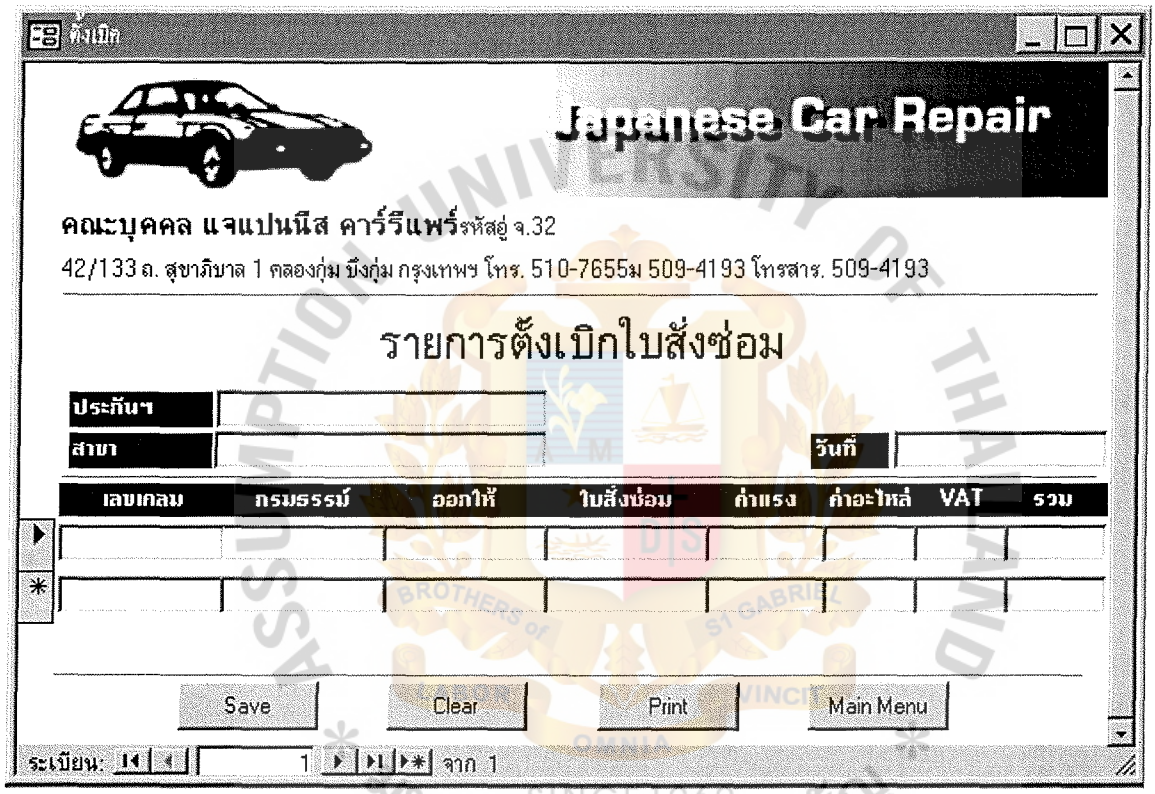


Figure F.14. Payment Requisition Form.

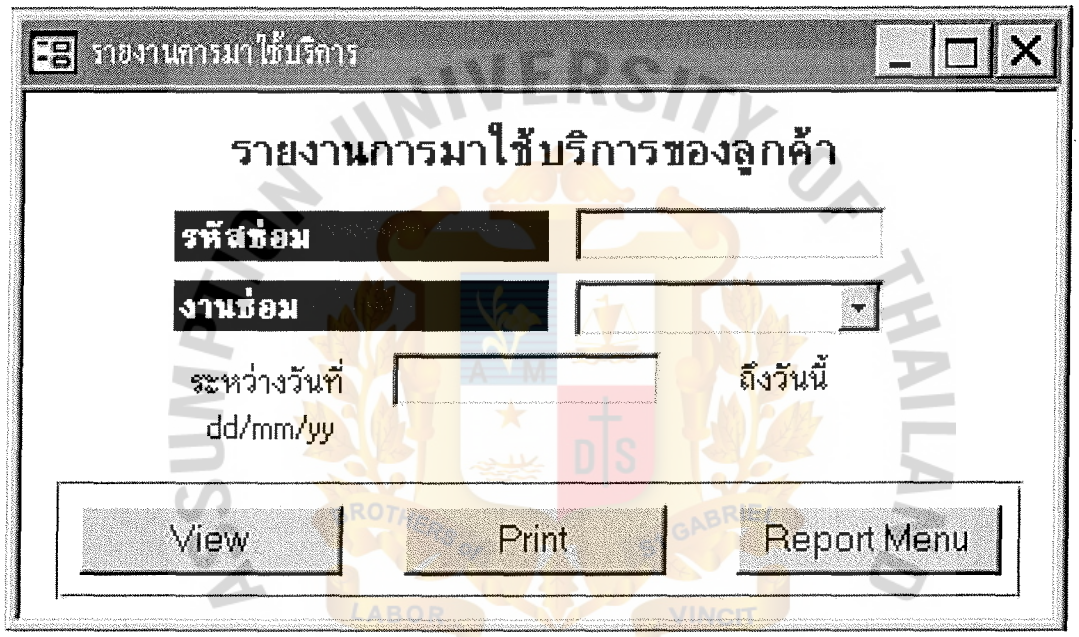


Figure F.15. Customer Services Report Query Form.

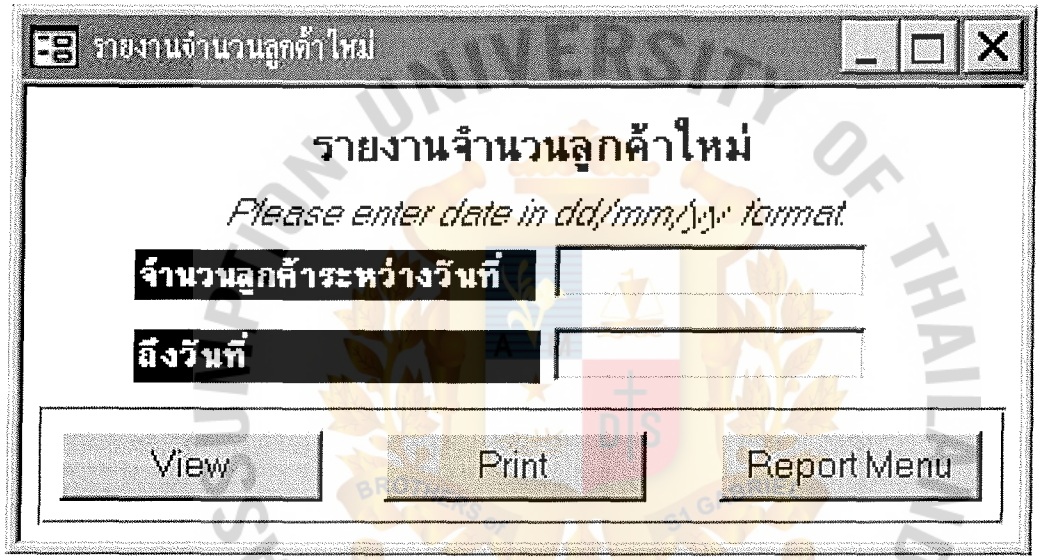


Figure F.16. Customer Report Query Form.

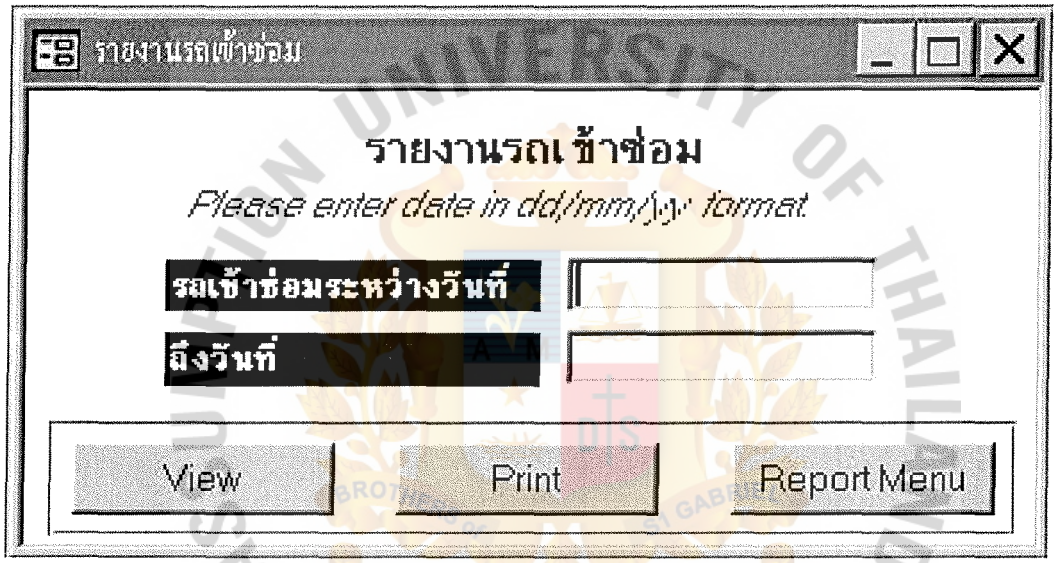


Figure F.17. Car in for Repair Report Query Form.

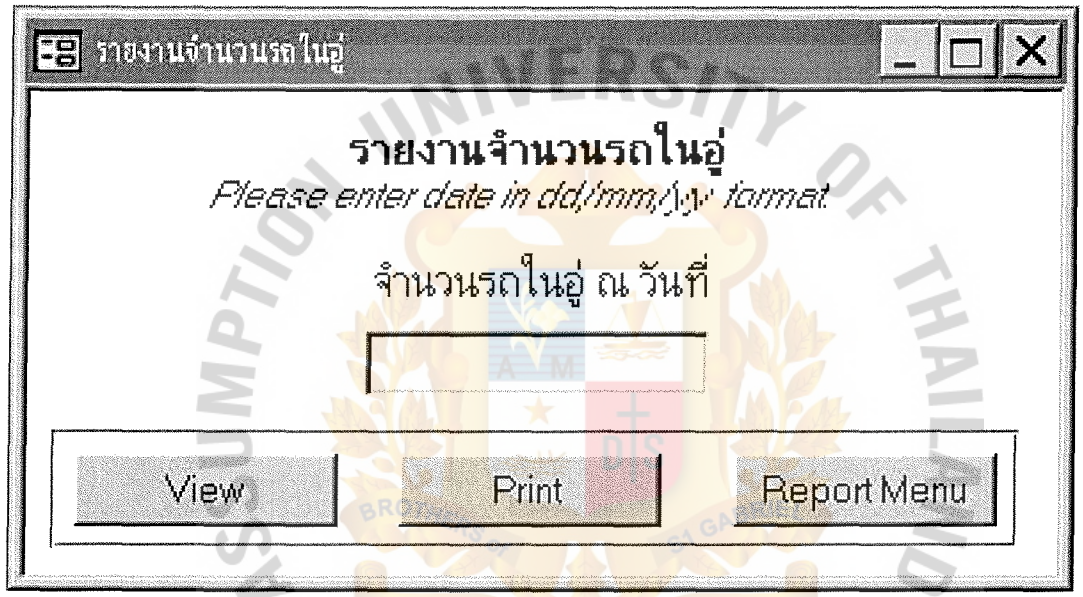


Figure F.18. Car under Repair Report Query Form.

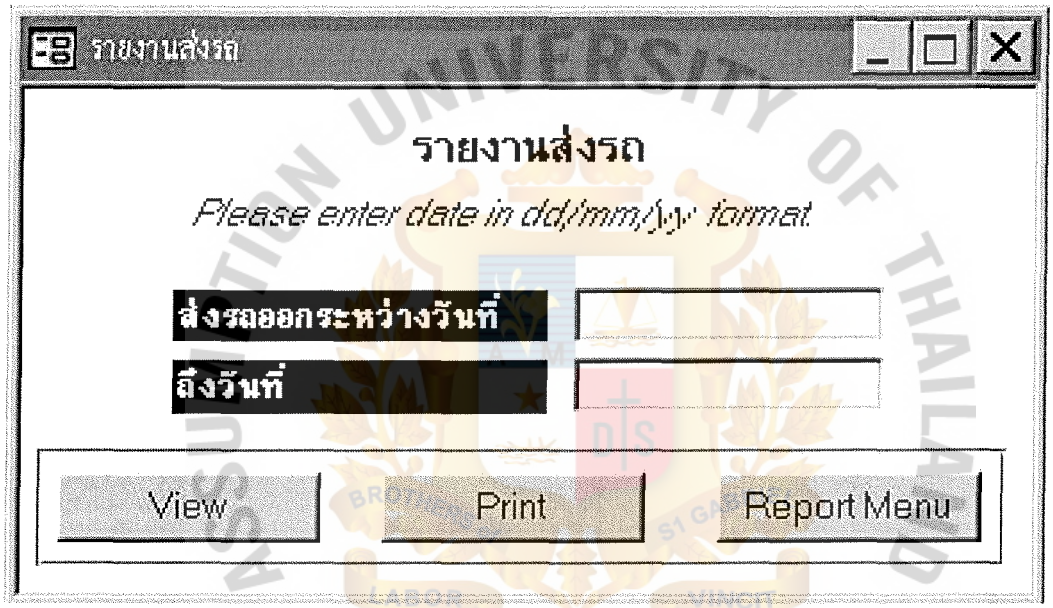


Figure F.19. Repair Job Delivery Report Query Form.

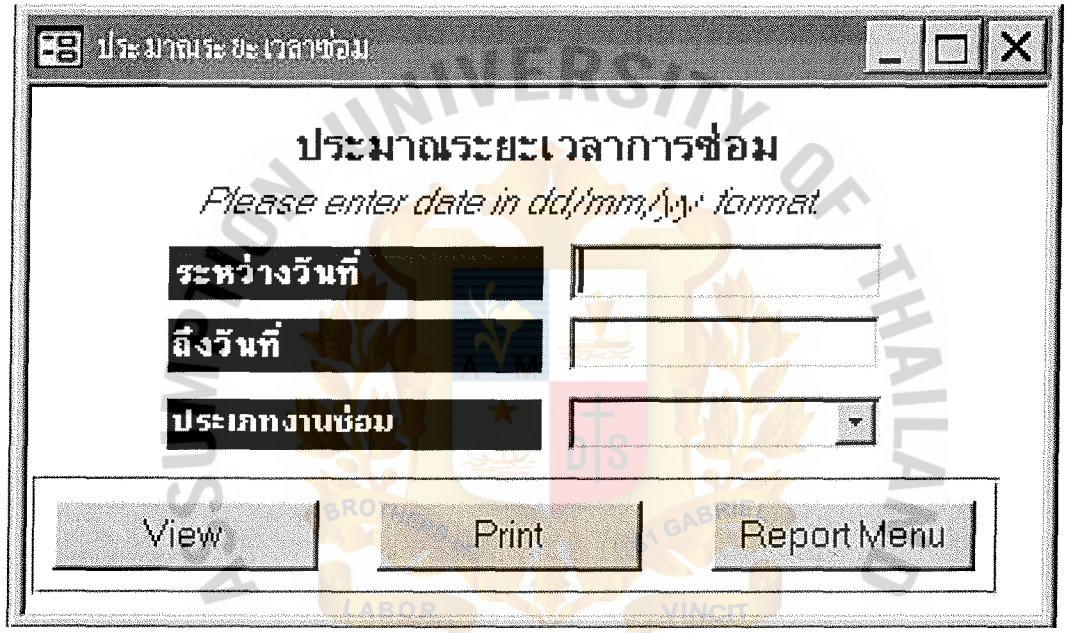


Figure F.20. Average Repair Time Report Query Form.

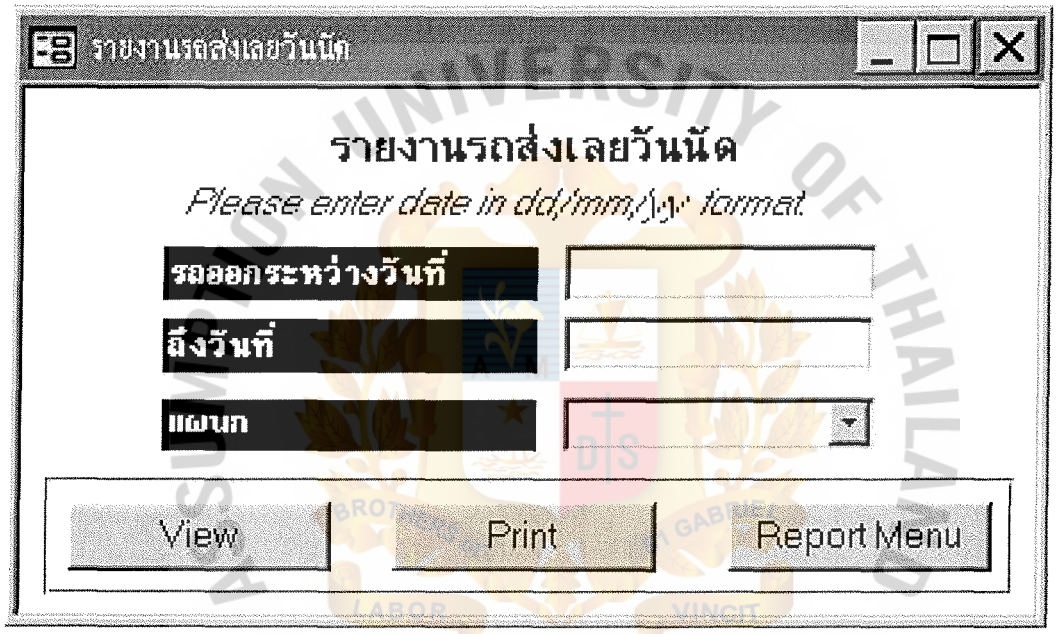


Figure F.21. Late Job Delivery Report Query Form.

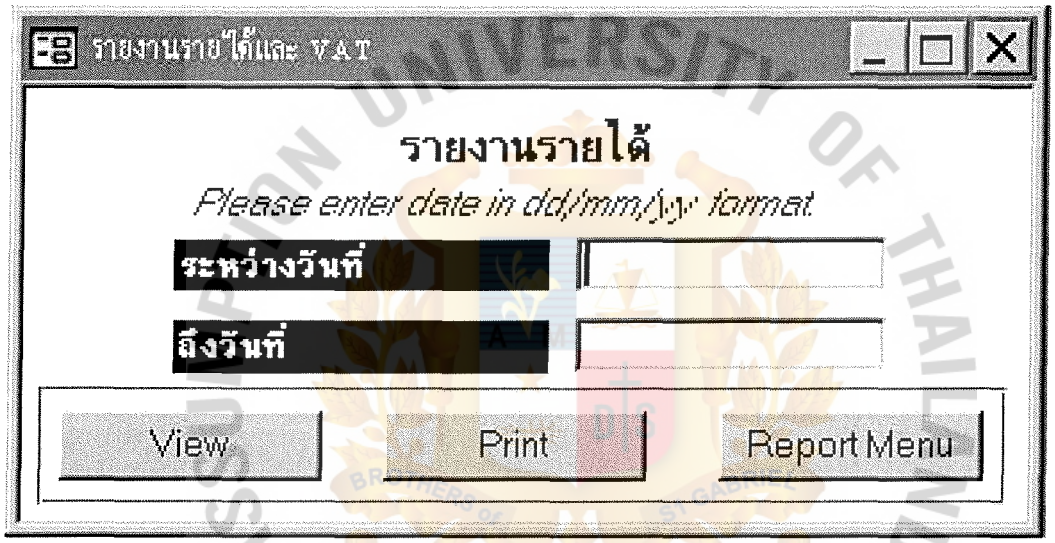


Figure F.22. Income Report Query Form.

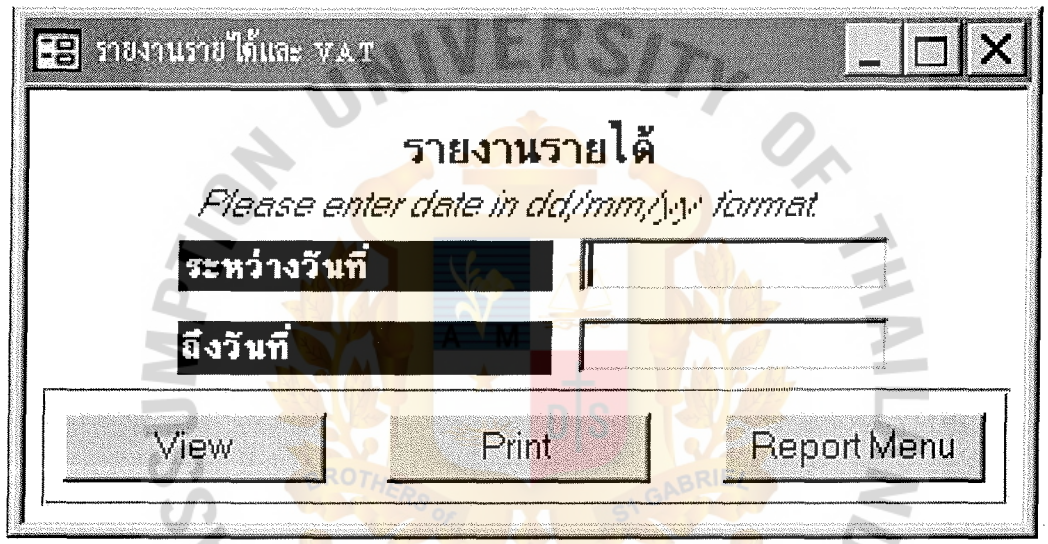


Figure F.23. VAT Report Query Form.

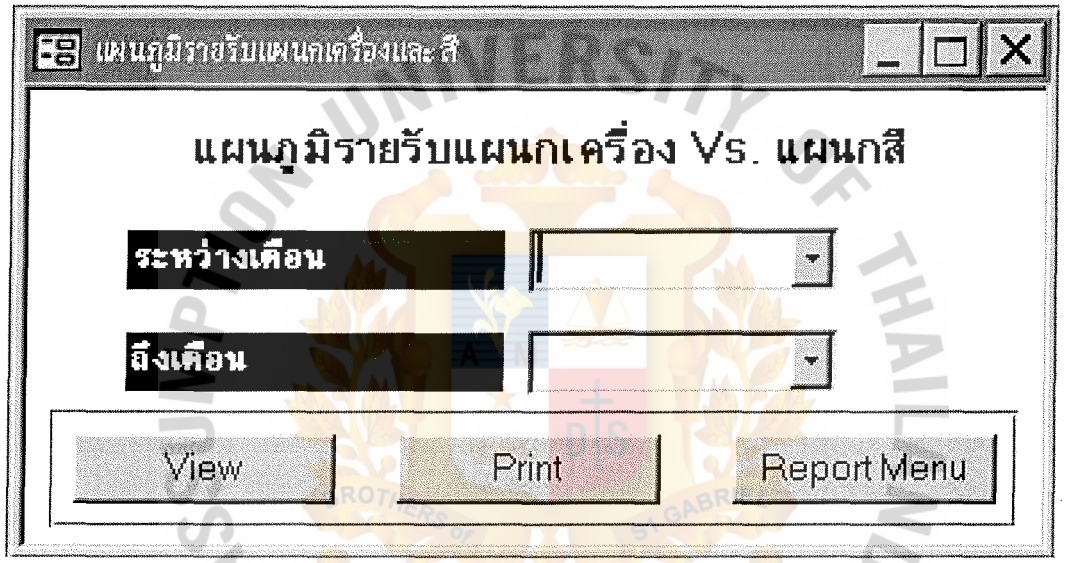


Figure F.24. Graph of Engine and Body Department Revenue Query Form.

Figure F.25. Insurance Payment Report Query Form.

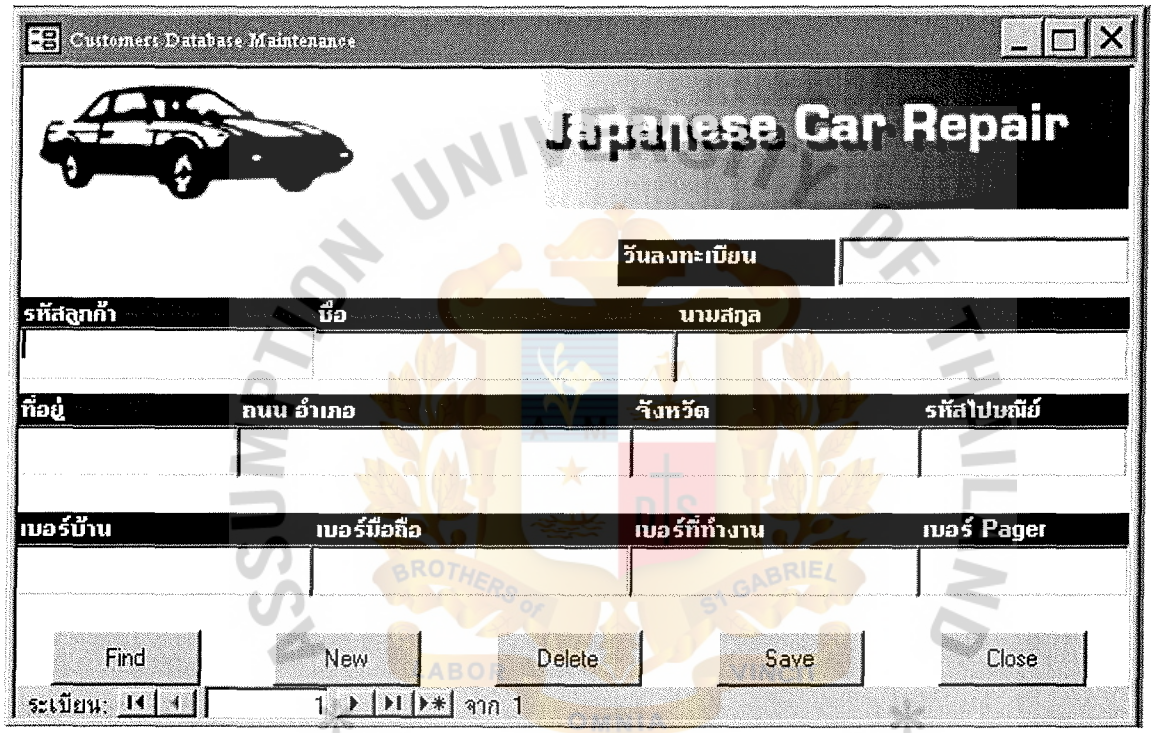


Figure F.26. Customer Database Maintenance Form.

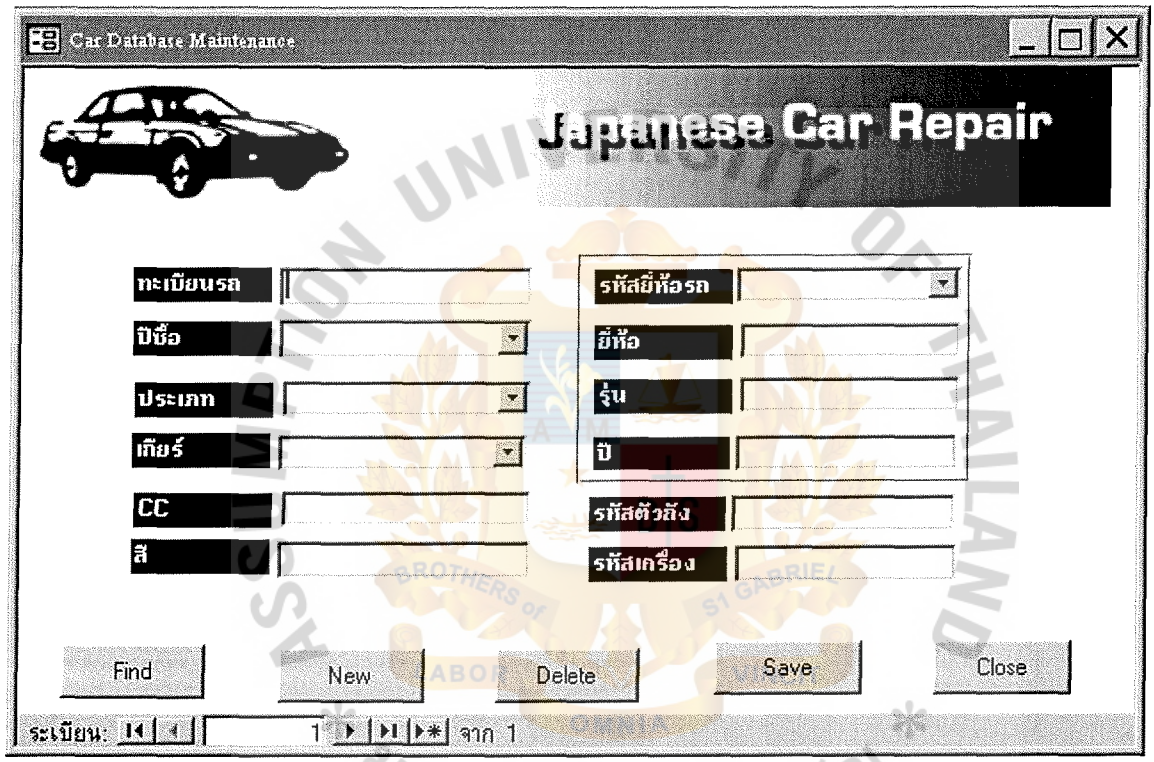


Figure F.27. Car Database Maintenance Form.

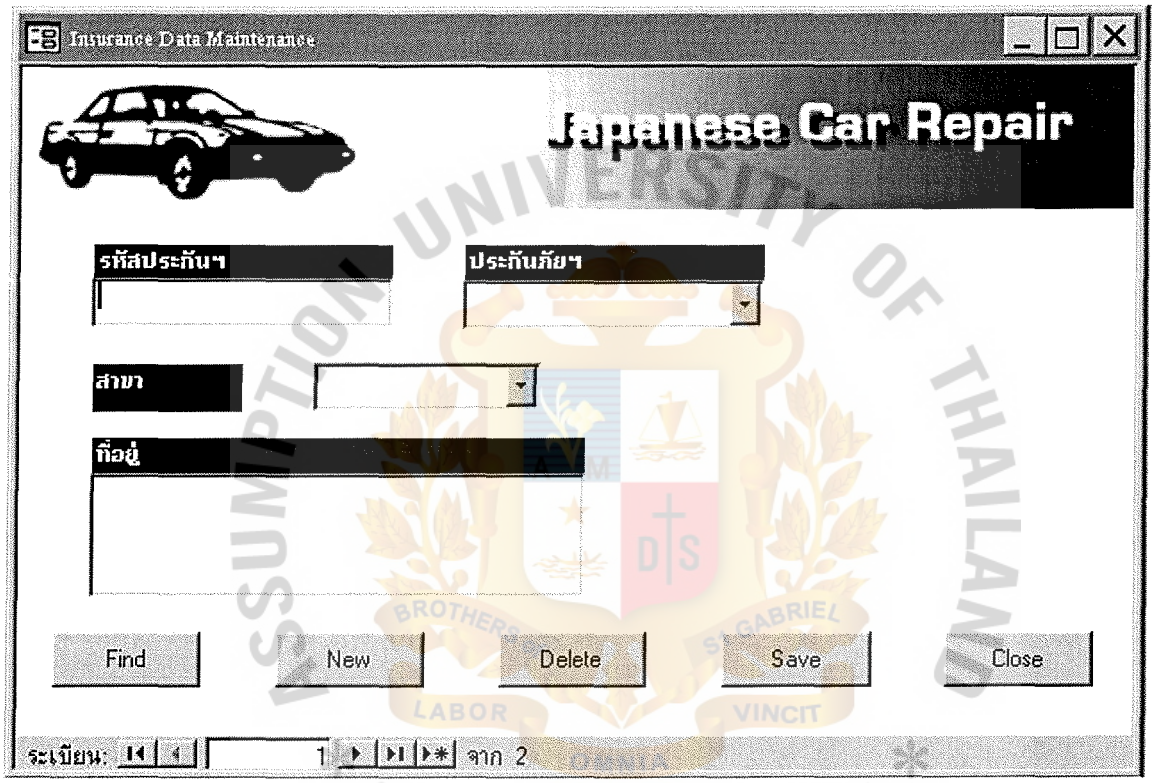


Figure F.28. Insurance Database Maintenance Form.

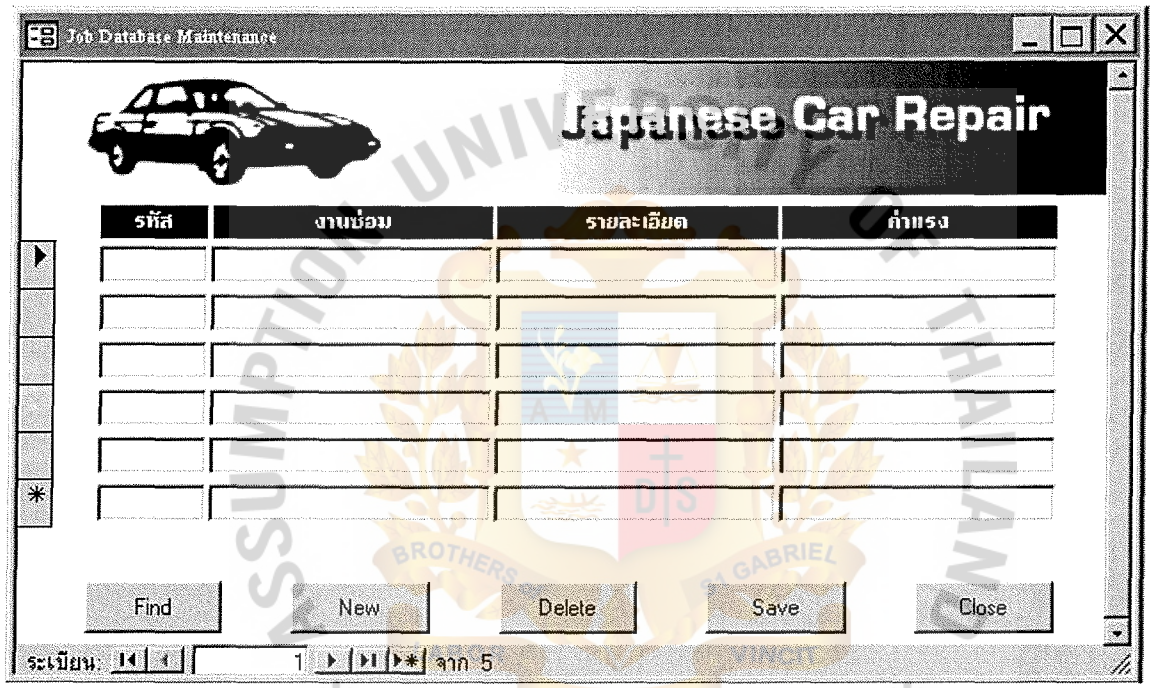


Figure F.29. Job Database Maintenance Form.

Figure F.30. Part Database Maintenance Form.

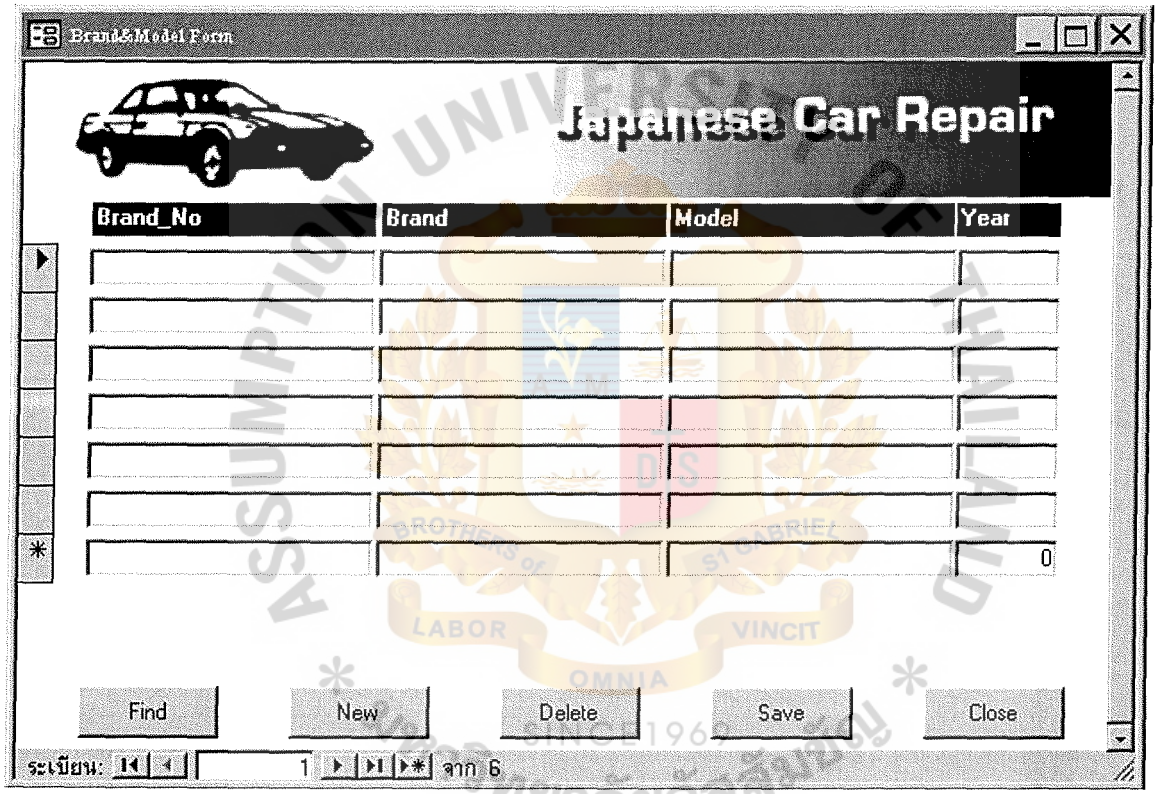


Figure F.31. Brand Database Maintenance Form.

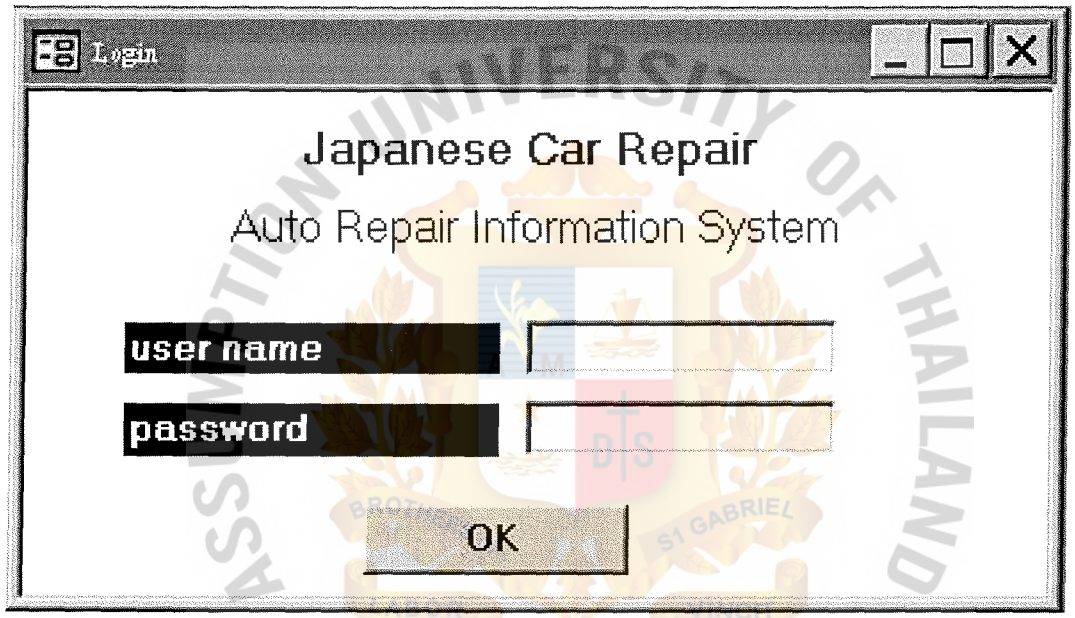


Figure F.32. Login Form.

APPENDIX G

OUTPUT DESIGN

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

ใบสั่งซ่อม

เลขที่ใบสั่งซ่อม:	100001	วันรถเข้า:	25/1/01
แผนก:	สีและตัวถัง	วันนัดรับรถ:	3/2/01
เจ้าหน้าที่:	เพลินจิตร	วันรถออก:	3/2/01

ข้อมูลรถ:	ทะเบียนรถ	ยี่ห้อ	รุ่น	ปีผลิต	สี
	1 อ-2677	Nissan	Cefiro	1992	เขียว
ประเภทรถ	เกียร์	รหัสเครื่อง	รหัสตัวถัง	CC	ระยะทาง
รถเก๋ง 2 ตอน	Auto	R20-S06767	HA31-A10211	1500	105721
ข้อมูลลูกค้า:	รหัสลูกค้า	ชื่อ	นามสกุล	ที่อยู่	ถนน
	10085	คุณจิตรา	นิมิตรวงศ์	14/587	รามคำแหง
จังหวัด	รหัสไปรษณีย์	เบอร์โทรบ้าน	เบอร์โทรที่ทำงาน	เบอร์โทรมือถือ	เบอร์ Pager
กทม.	10310	542-8576	719-3000	632-9675	--

Parts Used

รหัสอะไหล่	อะไหล่	จำนวน	ราคา
01-0630R	บังโคลนหน้า R	1	5,000
09-0480R	โครงประตูหน้าR	1	2,425
29-0280R	แม็กซ์หน้า R	1	11,500
รวมราคาอะไหล่	*	18,925	

Repair Job

รหัสซ่อม	งานซ่อม	ค่าแรง
B2	ซ่อมหนัก	5,000
B1	ซ่อมเบา	2,250
C1	เปลี่ยน	1,000
รวมค่าแรง	*	8,250

รวมค่าอะไหล่และค่าแรง	27,175
ส่วนลด	-
ยอดรวมก่อน VAT	27,175
VAT	1,902
ยอดรวม	29,077

ผู้ส่งรถ

...../...../.....

ผู้รับรถ

...../...../.....

Page 1 of 1

Figure G.1. Repair Order Document.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

ใบเสนอรายการความเสียหาย

รหัสใบสั่งซ่อม:	100001	วันเข้าซ่อม:	25/1/01
รถประกัน/คู่กรณี:	รถประกัน	วันเกิดเหตุ:	21/12/00
		วันรถออก:	3/1/01

ข้อมูลรถ:

ทะเบียนรถ	ยี่ห้อ	รุ่น	ปีผลิต	สี
1 อ-2677	Nissan	Cefiro	1992	เขียว

ประเภทรถ	เกียร์	รหัสเครื่อง	รหัสตัวถัง	CC	ระยะทาง
รถเก๋ง 2 ตอน	Auto	R20-S06767	HA31-A10211	1500	105721

ข้อมูลประกันฯ:

บริษัทประกันฯ	สาขา	เลขที่อุบัติเหตุ	เลขกรมธรรม์	เลขรับแจ้ง
วิริยะประกันภัย	บางนา	104-12878/43	43110-42685-10	68/43

รหัสอะไหล่	อะไหล่	จำนวน	อู่เสนอ	ส.ค.ส	หมายเหตุ
01-0630R	บังโคลนหน้า R	1	B2	B2	
09-0480R	โครงประตูหน้าR	1	B1	B1	
29-0280R	แม็กซ์หน้า R	1	B1	B1	

ตกลงราคาจัดซ่อม	สั่งอะไหล่	ซัพพลายสั่งอะไหล่
ชื่อ _____	ชื่อ _____	ชื่อ _____
( )	( )	( )
เจ้าของอู่หรือตัวแทน	พนง. ส.ค.ส. ประจำศูนย์	
เมื่อ ...../...../.....	เมื่อ ...../...../.....	เมื่อ ...../...../.....

Page 1 of 1

Figure G.2. Claim Repair Order Quotation.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

รายการยื่นขอใบตกลงความเสียหาย

ประกันภัยฯ:	วิริยะประกันภัย	พิพม์วันที่:	20/7/00
สาขา:	บางนา		

No.	เลขเคลม	ประกัน/คู่กรณี	ทะเบียนรถ	เลขที่ใบสรุปราคา	เลขรับแจ้ง
1	103-784/43	รถประกัน	6ฮ-2950	สค1056/43	23/43
2	103-3367/43	รถประกัน	6ฮ-2601	สค877/43	58/43
3	103-4872/43	รถประกัน	จฒ-4131	สค1155/43	89/42
4	103-5587/43	รถประกัน	7ว-4163	สค731/43	44/43
5	103-6270/43	รถประกัน	จฐ-6640	สค1148/43	15/43

Figure G.3. Repair Conclusion Request.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

รายการตั้งเบิก

ประกันภัยฯ: วิริยะประกันภัย

สาขา: บางนา

พิพม์วันที่: 12/1/01

No.	เลขเคลม	กรมธรรม์เลขที่	ใบสั่งซ่อมเลขที่ ประกัน	ใบสั่งซ่อมเลขที่ คู่กรณี	ค่าแรง	ค่าอะไหล่	VAT	รวม
1	103-3815/43	42109-07128-10	I200582	-	747.66	-	52.34	800.00
2	103-8527/43	42100-25903-10	I200482	-	10,093.46	-	706.54	10,800.00
3	103-11305/43	42101-35511-10	I200585	-	5,514.02	-	385.98	5,900.00
4	103-11906/43	43101-07362-10	I200415	-	4,859.81	-	340.19	5,200.00
5	103-6270/43	43101-07362-10	I200416	-	7,102.80	-	497.20	7,600.00
6	103-12479/43	43109-08876-10	I200483	-	11,495.33	-	804.67	12,300.00
7	103-198/44	43301-13672-10	I200583	-	4,672.90	-	327.10	5,000.00
8	103-382/44	43110-02616-10	I200417	-	9,813.08	-	686.92	10,500.00
9	103-475/43	43108-476-10	I200617	-	7,289.72	-	510.28	7,800.00
10	103-489/44	43101-26633-10	I200481	-	5,420.56	-	379.44	5,800.00

Page 1 of 1

Figure G.4. Payment Requisition.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

รายงานการมาใช้บริการของลูกค้า

รหัสซ่อม:	E00001	ตั้งแต่วันที่:	1/9/00
งานซ่อม:	เปลี่ยนน้ำมันเครื่อง	ถึงวันที่:	1/1/01

ทะเบียน	ยี่ห้อ	รุ่น	ชื่อ	นามสกุล	ที่อยู่	ถนน	จังหวัด	รหัสไปรษณีย์
1ธ-1125	Honda	Accord	คุณสุวรรณ	ลิขนะนัย	32/24	บางนา-ตราด บางนา พระโขนง	กทม	10260
1ว-4574	Toyota	Corona	คุณวิชัย	อภิรมย์	459	สุขุมวัท 101 บางจาก พระโขนง	กทม	10260
1ว-9656	Honda	Civic	คุณเจียมรัตน์	อภิรมย์รักษ์	66/69	สุขาภิบาล 1 คลองจั่น บางกะปิ	กทม	10240
2ธ-5846	Isuzu	Big M	คุณมาลี	แป้สกุล	194	รามคำแหง หัวหมาก บางกะปิ	กทม	10240
2ธ-3321	Toyota	Soluna	คุณสมหวัง	ยุทธบดีศร	4898/1	ลาดพร้าว 101 คลองจั่น บางกะปิ	กทม	10240
4ว-8895	Mitsubishi	Strada	คุณชาติชาย	สุวสวี	364	ลาดพร้าว 94 วังทองหลาง บางกะปิ	กทม	10310
5ง-4733	Nissan	Sunny	คุณวินัย	โลหะกิจไพบูลย์	2329	ลาดพร้าว 87วังทองหลาง บางกะปิ	กทม	10310
5ฐ-7412	Nissan	Sunny	คุณสมใจ	ใบเงิน	4924	รามคำแหง หัวหมาก บางกะปิ	กทม	10240
7ค-7581	Toyota	Corola	คุณน้ำฝน	พรรณราย	169	ลาดพร้าว 101 คลองจั่น บางกะปิ	กทม	10240
8ธ-9888	Honda	City	คุณพร	วโรดมะวิชญ	378	จันทราสุข วังทองหลาง บางกะปิ	กทม	10240
9ฐ-7841	Honda	CRV	คุณจันทร์	ศีรีกั้น	592	มหาดไทย วังทองหลาง บางกะปิ	กทม	10310
9ธ-4138	Toyota	Mighty X	คุณพรพรรณ	สีสุข	134/1	พระราม 4 คลองเตย คลองเตย	กทม	10110
อย-4871	Isuzu	Big M	คุณสุชิชัย	สวนนุช	819	เกษมสุวรรณ พระโขนง คลองเตย	กทม	10250

จำนวนรายการ: 13

Page 1 of 1

Figure G.5. Report of Customer Repair Services.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

รายงานจำนวนลูกค้าใหม่

ระหว่างวันที่:	1/9/00	พิมพ์วันที่:	1/9/00
ถึงวันที่:	31/12/00		

รหัสลูกค้า	วันลงทะเบียน	ชื่อ	นามสกุล	ที่อยู่	ถนน	จังหวัด	รหัสไปรษณีย์
100011	1/9/00	คุณสุวรรณ	ลิขนะนัย	32/24	บางนา-ตราด บางนา พระโขนง	กทม	10260
100043	5/8/00	คุณวิชัย	อภิรมย์	459	สุขุมวัท 101 บางจาก พระโขนง	กทม	10260
100044	6/8/99	คุณเจียมรัตน์	อภิรมย์รักษ์	66/69	สุขาภิบาล 1 คลองจั่น บางกะปิ	กทม	10240
100045	6/9/99	คุณมาลี	แป้สกุล	194	รามคำแหง หัวหมาก บางกะปิ	กทม	10240
100047	7/9/99	คุณสมหวัง	ยุทธบดีศร	4898/1	ลาดพร้าว 101 คลองจั่น บางกะปิ	กทม	10240
100048	12/4/00	คุณชาติชาย	สุวสวี	364	ลาดพร้าว 94 วังทองหลาง บางกะปิ	กทม	10310
100050	7/5/00	คุณวินัย	โลหะกิจไพบูลย์	2329	ลาดพร้าว 87 วังทองหลาง บางกะปิ	กทม	10310
100054	8/9/00	คุณสมใจ	ใบเงิน	4924	รามคำแหง หัวหมาก บางกะปิ	กทม	10240
100055	9/9/00	คุณน้ำฝน	พรรณราย	169	ลาดพร้าว 101 คลองจั่น บางกะปิ	กทม	10240
100063	10/9/99	คุณพร	วโรตนะวิชญ	378	จันทราสุข วังทองหลาง บางกะปิ	กทม	10240
100083	11/12/99	คุณจันทร์	ศีรีกั้น	592	มหาดไทย วังทองหลาง บางกะปิ	กทม	10310
100085	12/9/00	คุณพรพรรณ	สีสุข	134/1	พระราม 4 คลองเตย คลองเตย	กทม	10110
100088	12/10/00	คุณสาววิศนี	วัชรวงศ์ชัย	111/1	พระราม 9 บางกะปิ ห้วยขวาง	กทม	10320
100100	12/1/00	คุณคนัย	คงกะนันท์	111	เทียมร่วมมิตร ห้วยขวาง ห้วยขวาง	กทม	10310
100101	1/4/00	คุณวีชัย	วิธีจงเจริญ	819	เกษมสุวรรณ พระโขนง คลองเตย	กทม	10310
100155	12/8/99	คุณสุธิชัย	สวนนุช	819	เกษมสุวรรณ พระโขนง คลองเตย	กทม	10250

จำนวนลูกค้าทั้งหมด:	16
จำนวนลูกค้าใหม่:	5
%จำนวนลูกค้าใหม่:	31%

Figure G.6. Repair of Customer.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

รายงานรถเข้า

ระหว่างวันที่:	1/6/00	พิมพ์วันที่:	5/1/01
ถึงวันที่:	30/6/00		

No.	เลขที่ใบสั่งซ่อม	ประเภทลูกค้า	ทะเบียนรถ	ยี่ห้อ	รุ่น	แผนก	รถเข้าวันที่	วันนัดรับรถ	วันรถออก
1	100124	รถลูกค้า	ออ-5846	Honda	Accord	เครื่องยนต์	1/6/00	10/6/00	10/6/00
2	100125	รถลูกค้า	เว-4574	Toyota	Corona	เครื่องยนต์	1/6/00	5/6/00	6/6/00
3	100126	วิริยะฯ	5ฐ-7412	Honda	Civic	แผนกสีและเครื่อง	2/6/00	5/6/00	5/6/00
4	100127	ทิพยประกันภัย	อย-4871	Isuzu	Big M	แผนกสี	2/6/00	13/9/00	13/6/00
5	100128	ไทยประกันภัย	8ฮ-9888	Toyota	Soluna	แผนกสีและเครื่อง	3/6/00	7/6/00	7/6/00
6	100129	ทิพยประกันภัย	9ฐ-7841	Mitsubishi	Strada	เครื่องยนต์	6/6/00	7/6/00	7/6/00
7	100130	รถลูกค้า	4ว-8895	Nissan	Sunny	เครื่องยนต์	6/6/00	8/6/00	9/6/00
8	100131	วิริยะฯ	7ค-7581	Nissan	Sunny	แผนกสีและเครื่อง	7/6/00	11/6/00	11/6/00
9	100132	วิริยะฯ	5ง-4733	Toyota	Corola	แผนกสี	8/6/00	15/6/00	18/6/00
10	100133	วิริยะฯ	1ธ-1125	Honda	City	แผนกสี	8/6/00	14/6/00	15/6/00
11	100134	อาคเนย์	2ฮ-3321	Honda	CRV	แผนกสี	9/6/00	19/6/00	19/6/00
12	100135	รถลูกค้า	9ฮ-4138	Toyota	Mighty X	เครื่องยนต์	10/6/00	11/6/00	11/6/00
13	100136	ทิพยประกันภัย	เว-9656	Isuzu	Big M	แผนกสี	10/6/00	12/6/00	13/6/00
14	100137	รถลูกค้า	8ษ-4754	Honda	Civic	เครื่องยนต์	12/6/00	15/6/00	15/6/00
15	100138	อาคเนย์	9ศ-1651	Mitsubishi	Strada	แผนกสีและเครื่อง	12/6/00	22/6/00	15/6/00
16	100139	รถลูกค้า	1ธ-9585	Nissan	Sunny	เครื่องยนต์	13/6/00	14/6/00	14/6/00
17	100140	วิริยะฯ	6ศ-4743	Toyota	Soluna	แผนกสี	15/6/00	25/6/00	25/6/00
18	100141	อาคเนย์	5ค-4478	Honda	City	เครื่องยนต์	15/6/00	17/6/00	17/6/00
19	100142	รถลูกค้า	6ษ-7789	Honda	CRV	แผนกสี	16/6/00	30/6/00	30/6/00

รวมจำนวนรถเข้า:	19

รถลูกค้า	7 คัน				
วิริยะประกันภัย	5 คัน	รวมจำนวนรถเครื่อง	8 คัน	คิดเป็น	42%
ทิพยประกันภัย	3 คัน	รวมจำนวนรถสี	7 คัน	คิดเป็น	37%
ไทยประกันภัย	1 คัน	รวมจำนวนรถสีและเครื่อง	4 คัน	คิดเป็น	21%
อาคเนย์	3 คัน				

Figure G.7. Repair of Car in for Repair.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

รายงานรถในอู่

ณ วันที่: 12/6/00 พิพม์วันที่: 20/6/00

No.	เลขที่ใบสั่งซ่อม	ประเภทลูกค้า	ทะเบียนรถ	ยี่ห้อ	รุ่น	แผนก	รถเข้าวันที่	วันนัดรับรถ
1	100126	รถลูกค้า	5ฐ-7412	Honda	Civic	แผนกสีและเครื่อง	2/6/00	5/6/00
2	100127	รถลูกค้า	อย-4871	Isuzu	Big M	แผนกสี	2/6/00	13/9/00
3	100128	วิริยะฯ	8ฮ-9888	Toyota	Soluna	แผนกสีและเครื่อง	3/6/00	12/6/00
4	100129	ทิพยประกันภัย	9ฐ-7841	Mitsubishi	Strada	เครื่องยนต์	6/6/00	15/6/00
5	100130	ไทยประกันภัย	4ว-8895	Nissan	Sunny	เครื่องยนต์	6/6/00	20/6/00
6	100131	ทิพยประกันภัย	7ค-7581	Nissan	Sunny	แผนกสีและเครื่อง	7/6/00	18/6/00
7	100132	รถลูกค้า	5ง-4733	Toyota	Corola	แผนกสี	8/6/00	3/6/00
8	100133	วิริยะฯ	1ช-1125	Honda	City	แผนกสี	8/6/00	12/6/00
9	100134	วิริยะฯ	2ฮ-3321	Honda	CRV	แผนกสี	9/6/00	13/6/00
10	100135	วิริยะฯ	9ฮ-4138	Toyota	Mighty X	เครื่องยนต์	10/6/00	14/6/00
11	100136	อาคเนย์	1ว-9656	Isuzu	Big M	แผนกสี	10/6/00	12/6/00
12	100137	รถลูกค้า	8ษ-4754	Honda	Civic	เครื่องยนต์	12/6/00	15/6/00
13	100138	ทิพยประกันภัย	9ศ-1651	Mitsubishi	Strada	แผนกสีและเครื่อง	12/6/00	22/6/00
14	100139	รถลูกค้า	1ช-9585	Nissan	Sunny	เครื่องยนต์	13/6/00	14/6/00
15	100140	อาคเนย์	6ศ-4743	Toyota	Soluna	แผนกสี	15/6/00	25/6/00
16	100141	รถลูกค้า	5ค-4478	Honda	City	เครื่องยนต์	15/6/00	17/6/00
17	100142	วิริยะฯ	6ษ-7789	Honda	CRV	แผนกสี	16/6/00	30/6/00

รวมจำนวนรถเข้า: 17

รถลูกค้า	5 คัน				
วิริยะประกันภัย	5 คัน	รวมจำนวนรถเครื่อง	7 คัน	คิดเป็น	41%
ทิพยประกันภัย	3 คัน	รวมจำนวนรถสี	7 คัน	คิดเป็น	41%
ไทยประกันภัย	1 คัน	รวมจำนวนรถสีและเครื่อง	3 คัน	คิดเป็น	18%
อาคเนย์	2 คัน				

page 1 of 1

Figure G.8. Report of Car under Repair.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

รายงานรถออก

ระหว่างวันที่:	1/6/00	พิพม์วันที่:	5/1/01
ถึงวันที่:	30/6/00		

No.	เลขที่ใบสั่งซ่อม	ประเภทลูกค้า	ทะเบียนรถ	ยี่ห้อ	รุ่น	แผนก	รถเข้าวันที่	วันนัดรับรถ	วันรถออก
1	100124	รถลูกค้า	2อ-5846	Honda	Accord	เครื่องยนต์	1/6/00	10/6/00	10/6/00
2	100125	รถลูกค้า	1ว-4574	Toyota	Corona	เครื่องยนต์	1/6/00	5/6/00	6/6/00
3	100126	วิริยะฯ	5ฐ-7412	Honda	Civic	แผนกสีและเครื่อง	2/6/00	5/6/00	5/6/00
4	100127	ทิพยประกันภัย	อย-4871	Isuzu	Big M	แผนกสี	2/6/00	13/9/00	13/6/00
5	100128	ไทยประกันภัย	8ฮ-9888	Toyota	Soluna	แผนกสีและเครื่อง	3/6/00	7/6/00	7/6/00
6	100129	ทิพยประกันภัย	9ฐ-7841	Mitsubishi	Strada	เครื่องยนต์	6/6/00	7/6/00	7/6/00
7	100130	รถลูกค้า	4ว-8895	Nissan	Sunny	เครื่องยนต์	6/6/00	8/6/00	9/6/00
8	100131	วิริยะฯ	7ค-7581	Nissan	Sunny	แผนกสีและเครื่อง	7/6/00	11/6/00	11/6/00
9	100132	วิริยะฯ	5ง-4733	Toyota	Corola	แผนกสี	8/6/00	15/6/00	18/6/00
10	100133	วิริยะฯ	1ธ-1125	Honda	City	แผนกสี	8/6/00	14/6/00	15/6/00
11	100134	อาคเนย์	2ฮ-3321	Honda	CRV	แผนกสี	9/6/00	19/6/00	19/6/00
12	100135	รถลูกค้า	9ฮ-4138	Toyota	Mighty X	เครื่องยนต์	10/6/00	11/6/00	11/6/00
13	100136	ทิพยประกันภัย	1ว-9656	Isuzu	Big M	แผนกสี	10/6/00	12/6/00	13/6/00
14	100137	รถลูกค้า	8ย-4754	Honda	Civic	เครื่องยนต์	12/6/00	15/6/00	15/6/00
15	100138	อาคเนย์	9ศ-1651	Mitsubishi	Strada	แผนกสีและเครื่อง	12/6/00	22/6/00	15/6/00
16	100139	รถลูกค้า	1ธ-9585	Nissan	Sunny	เครื่องยนต์	13/6/00	14/6/00	14/6/00
17	100140	วิริยะฯ	6ศ-4743	Toyota	Soluna	แผนกสี	15/6/00	25/6/00	25/6/00
18	100141	อาคเนย์	5ค-4478	Honda	City	เครื่องยนต์	15/6/00	17/6/00	17/6/00
19	100142	รถลูกค้า	6ย-7789	Honda	CRV	แผนกสี	16/6/00	30/6/00	30/6/00

รวมจำนวนรถเข้า:	19

รถลูกค้า	7 คัน				
วิริยะประกันภัย	5 คัน	รวมจำนวนรถเครื่อง	8 คัน	คิดเป็น	42%
ทิพยประกันภัย	3 คัน	รวมจำนวนรถสี	7 คัน	คิดเป็น	37%
ไทยประกันภัย	1 คัน	รวมจำนวนรถสีและเครื่อง	4 คัน	คิดเป็น	21%
อาคเนย์	3 คัน				

page 1 of 1

Figure G.9. Report of Repair Job Delivery.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

รายงานประมาณระยะเวลาซ่อมในการซ่อม

ระหว่างวันที่:	1/6/00	ประเภทงานซ่อม:	5/1/01
ถึงวันที่:	30/6/00	พิมพ์วันที่:	งานเคาะหนัก

No.	เลขที่ใบสั่งซ่อม	ทะเบียนรถ	ยี่ห้อ	รุ่น	รถเข้าวันที่	วันนัดรับรถ	วันรถออก	จำนวนวัน
1	100124	2อ-5846	Honda	Accord	1/6/00	10/6/00	10/6/00	9
2	100125	1ว-4574	Toyota	Corona	1/6/00	5/6/00	6/6/00	5
3	100126	5ฐ-7412	Honda	Civic	2/6/00	5/6/00	5/6/00	3
4	100127	อย-4871	Isuzu	Big M	2/6/00	13/9/00	13/6/00	11
5	100128	8ฮ-9888	Toyota	Soluna	3/6/00	7/6/00	13/6/00	10
6	100129	9ฐ-7841	Mitsubishi	Strada	6/6/00	7/6/00	16/6/00	10
7	100130	4ว-8895	Nissan	Sunny	6/6/00	8/6/00	11/6/00	5
8	100131	7ค-7581	Nissan	Sunny	7/6/00	11/6/00	11/6/00	4
9	100132	5ง-4733	Toyota	Corola	8/6/00	15/6/00	18/6/00	10
10	100133	1ธ-1125	Honda	City	8/6/00	14/6/00	15/6/00	7
11	100134	2ฮ-3321	Honda	CRV	9/6/00	19/6/00	19/6/00	10
12	100135	9ฮ-4138	Toyota	Mighty X	10/6/00	11/6/00	17/6/00	7
13	100136	1ว-9656	Isuzu	Big M	10/6/00	12/6/00	18/6/00	8
14	100137	8ษ-4754	Honda	Civic	12/6/00	15/6/00	20/6/00	8
15	100138	9ศ-1651	Mitsubishi	Strada	12/6/00	22/6/00	21/6/00	9
16	100139	1ธ-9585	Nissan	Sunny	13/6/00	14/6/00	20/6/00	7
17	100140	6ศ-4743	Toyota	Soluna	15/6/00	25/6/00	25/6/00	10
18	100141	5ค-4478	Honda	City	15/6/00	17/6/00	24/6/00	9
19	100142	6ษ-7789	Honda	CRV	15/6/00	30/6/00	26/6/00	11

ประมาณระยะเวลาในการซ่อม 8

Figure G.10. Report of Average Repair Time.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

รายงานส่งรถเลยวันนัด

ระหว่างวันที่:	1/6/00	พิพม์วันที่:	5/1/01
ถึงวันที่:	30/6/00	แผนก:	เคาะพ่นสี

No.	เลขที่ใบสั่งซ่อม	ทะเบียนรถ	ยี่ห้อ	รุ่น	รถเข้าวันที่	วันนัดรับรถ	วันรถออก	จำนวนวันเลย
1	100124	2อ-5846	Honda	Accord	1/6/00	10/6/00	15/6/00	5
2	100125	1ว-4574	Toyota	Corona	1/6/00	5/6/00	6/6/00	1
3	100126	5ฐ-7412	Honda	Civic	2/6/00	5/6/00	5/6/00	0
4	100127	อย-4871	Isuzu	Big M	2/6/00	13/9/00	13/6/00	0
5	100128	8ย-9888	Toyota	Soluna	3/6/00	7/6/00	10/6/00	3
6	100129	9ฐ-7841	Mitsubishi	Strada	6/6/00	7/6/00	7/6/00	0
7	100130	4ว-8895	Nissan	Sunny	6/6/00	8/6/00	9/6/00	1
8	100131	7ค-7581	Nissan	Sunny	7/6/00	11/6/00	13/6/00	2
9	100132	5ง-4733	Toyota	Corola	8/6/00	15/6/00	18/6/00	3
10	100133	1ธ-1125	Honda	City	8/6/00	14/6/00	15/6/00	1
11	100134	2ย-3321	Honda	CRV	9/6/00	19/6/00	24/6/00	5
12	100135	9ย-4138	Toyota	Mighty X	10/6/00	11/6/00	11/6/00	0
13	100136	1ว-9656	Isuzu	Big M	10/6/00	12/6/00	13/6/00	1
14	100137	8ษ-4754	Honda	Civic	12/6/00	15/6/00	15/6/00	0
15	100138	9ศ-1651	Mitsubishi	Strada	12/6/00	15/6/00	15/6/00	0
16	100139	1ธ-9585	Nissan	Sunny	13/6/00	14/6/00	17/6/00	3
17	100140	6ศ-4743	Toyota	Soluna	15/6/00	25/6/00	25/6/00	0
18	100141	5ค-4478	Honda	City	15/6/00	17/6/00	17/6/00	0
19	100142	6ษ-7789	Honda	CRV	16/6/00	30/6/00	30/6/00	0

		รวมจำนวนรถออก:	19
รวมจำนวนรถเลยวันนัด:	10.00 คัน	คิดเป็น	53%
เฉลี่ยจำนวนวันที่เลย:	3 วัน		

Figure G.11. Report of Late Job Delivery.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

รายงานรายได้

ระหว่างวันที่: 1/6/00 พิพม์วันที่: 5/1/01

ถึงวันที่: 30/6/00

No.	เลขที่ใบสั่งซ่อม	ทะเบียนรถ	ยี่ห้อ	รุ่น	แผนก	ประเภทลูกค้า	ยอดรวม	วันรับเงิน
1	100124	2อ-5846	Honda	Accord	เครื่องยนต์	รถลูกค้า	50,000.00	2/6/00
2	100125	1ว-4574	Toyota	Corona	เครื่องยนต์	รถลูกค้า	23,500.00	4/6/00
3	100126	5ฐ-7412	Honda	Civic	แผนกสีและเครื่อง	วิริยะฯ	10,500.00	5/6/00
4	100127	อย-4871	Isuzu	Big M	แผนกสี	ทิพยประกันภัย	8,500.00	7/6/00
5	100128	8ฮ-9888	Toyota	Soluna	แผนกสีและเครื่อง	ไทยประกันภัย	62,400.00	7/6/00
6	100129	9ฐ-7841	Mitsubishi	Strada	เครื่องยนต์	ทิพยประกันภัย	12,000.00	8/6/00
7	100130	4ว-8895	Nissan	Sunny	เครื่องยนต์	รถลูกค้า	22,000.00	10/6/00
8	100131	7ค-7581	Nissan	Sunny	แผนกสีและเครื่อง	วิริยะฯ	20,000.00	11/6/00
9	100132	5ง-4733	Toyota	Corola	แผนกสี	วิริยะฯ	12,580.00	11/6/00
10	100133	1ช-1125	Honda	City	แผนกสี	วิริยะฯ	51,000.00	15/6/00
11	100134	2ฮ-3321	Honda	CRV	แผนกสี	อาคเนย์	34,000.00	16/6/00
12	100135	9ฮ-4138	Toyota	Mighty X	เครื่องยนต์	รถลูกค้า	15,000.00	17/6/00
13	100136	1ว-9656	Isuzu	Big M	แผนกสี	ทิพยประกันภัย	36,690.00	17/6/00
14	100137	8ษ-4754	Honda	Civic	เครื่องยนต์	รถลูกค้า	25,000.00	18/6/00
15	100138	9ศ-1651	Mitsubishi	Strada	แผนกสีและเครื่อง	อาคเนย์	23,000.00	20/6/00
16	100139	1ช-9585	Nissan	Sunny	เครื่องยนต์	รถลูกค้า	65,200.00	21/6/00
17	100140	6ศ-4743	Toyota	Soluna	แผนกสี	วิริยะฯ	9,000.00	22/6/00
18	100141	5ค-4478	Honda	City	แผนกสี	วิริยะฯ	75,000.00	22/6/00
19	100142	6ษ-7789	Honda	CRV	แผนกสี	วิริยะฯ	5,000.00	23/6/00

รายการสั่งซ่อม:	19 รายการ	รวมรายรับ:	560,370.00 บาท		
รายการแผนกเครื่อง:	7 รายการ	รายรับแผนกเครื่อง	212,700.00 บาท	คิดเป็น:	38%
รายการแผนกเคาะพ่นสี:	8 รายการ	รายรับแผนกเคาะพ่นสี:	231,770.00 บาท	คิดเป็น:	41%
รายการแผนกสีและเครื่อง:	4 รายการ	รายรับแผนกสีและเครื่อง:	115,900 บาท	คิดเป็น:	21%
รายการรถลูกค้า:	6 รายการ	รายรับ:	200,700.00 บาท	คิดเป็น:	35.82%
รายการวิริยะประกันภัย:	7 รายการ	รายรับ:	183,080.00 บาท	คิดเป็น:	32.67%
รายการรถทิพยประกันภัย:	3 รายการ	รายรับ:	57,190.00 บาท	คิดเป็น:	10.21%
รายการรถไทยประกันภัย:	1 รายการ	รายรับ:	62,400.00 บาท	คิดเป็น:	11.14%
รายการรถอาคเนย์:	2 รายการ	รายรับ:	57,000.00 บาท	คิดเป็น:	10.17%

page 1 of 1

Figure G.12. Report of Income.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

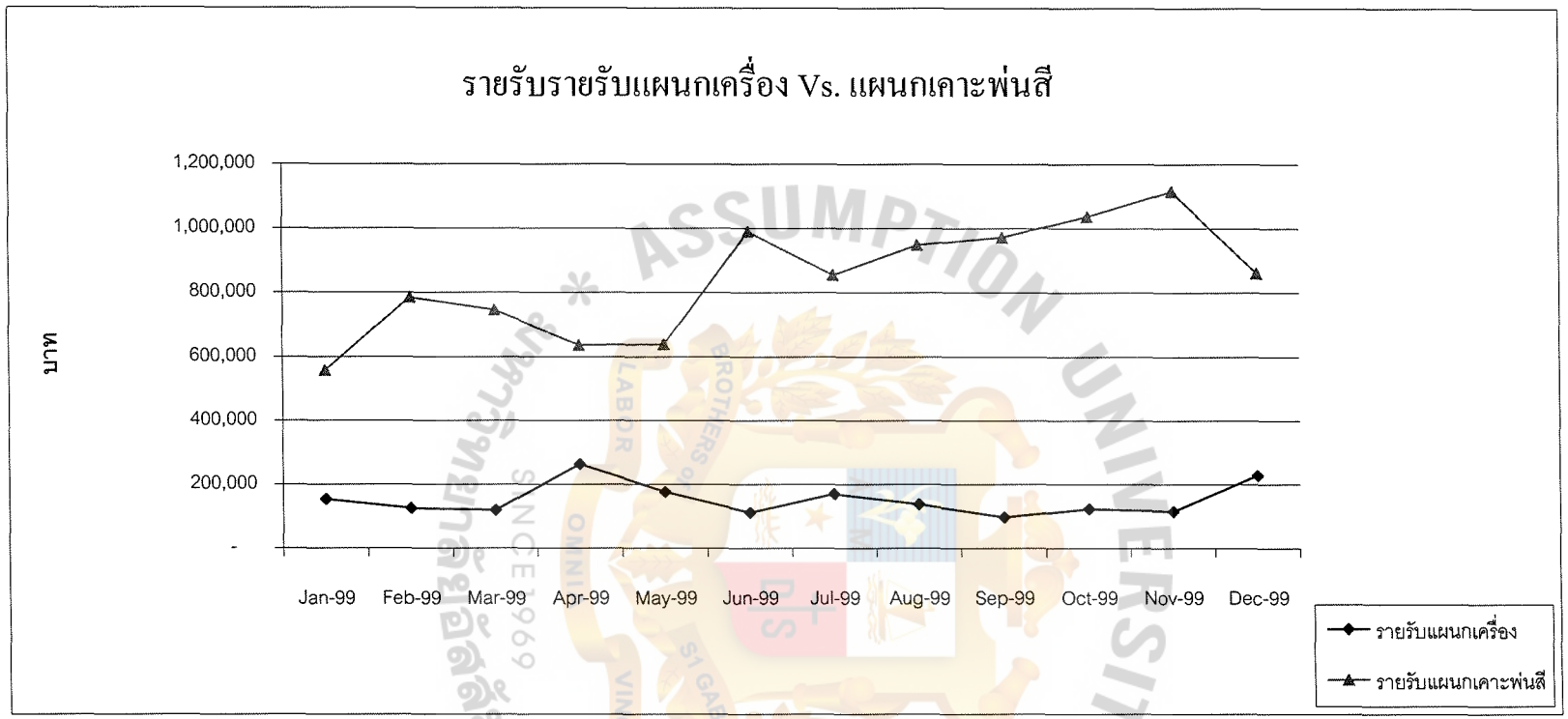
รายงาน VAT

ระหว่างวันที่:	1/6/00	พิพม์วันที่:	20/7/00
ถึงวันที่:	30/6/00		

No.	เลขที่ใบสั่งซ่อม	ทะเบียนรถ	ประเภทลูกค้า	แผนก	ยอดก่อน VAT	VAT	ยอดรวม
1	100124	2อ-5846	รถลูกค้า	เครื่องยนต์	50,000.00	3,500.00	53,500.00
2	100125	1ว-4574	รถลูกค้า	เครื่องยนต์	23,500.00	1,645.00	25,145.00
3	100126	5ฐ-7412	วิริยะฯ	แผนกสีและเครื่อง	10,500.00	735.00	11,235.00
4	100127	อย-4871	ทิพยประกันภัย	แผนกสี	8,500.00	595.00	9,095.00
5	100128	8ฮ-9888	ไทยประกันภัย	แผนกสีและเครื่อง	32,000.00	2,240.00	34,240.00
6	100129	9ฐ-7841	ทิพยประกันภัย	เครื่องยนต์	12,000.00	840.00	12,840.00
7	100130	4ว-8895	ทิพยประกันภัย	เครื่องยนต์	22,000.00	1,540.00	23,540.00
8	100131	7ค-7581	ทิพยประกันภัย	แผนกสีและเครื่อง	20,000.00	1,400.00	21,400.00
9	100132	5ง-4733	วิริยะฯ	แผนกสี	12,580.00	880.60	13,460.60
10	100133	1ธ-1125	วิริยะฯ	แผนกสี	12,000.00	840.00	12,840.00
11	100134	2ฮ-3321	อาคเนย์	แผนกสี	22,000.00	1,540.00	23,540.00
12	100135	9ฮ-4138	วิริยะฯ	เครื่องยนต์	25,000.00	1,750.00	26,750.00
13	100136	1ว-9656	ทิพยประกันภัย	แผนกสี	36,690.00	2,568.30	39,258.30
14	100137	8ษ-4754	วิริยะฯ	เครื่องยนต์	25,000.00	1,750.00	26,750.00
15	100138	9ศ-1651	อาคเนย์	แผนกสีและเครื่อง	23,000.00	1,610.00	24,610.00
16	100139	1ธ-9585	วิริยะฯ	เครื่องยนต์	41,000.00	2,870.00	43,870.00
17	100140	6ศ-4743	วิริยะฯ	แผนกสี	9,000.00	630.00	9,630.00
18	100141	5ค-4478	วิริยะฯ	แผนกสี	45,000.00	3,150.00	48,150.00
19	100142	6ษ-7789	วิริยะฯ	แผนกสี	5,000.00	350.00	5,350.00
20	100200	2ษ-9107	วิริยะฯ	แผนกสี	25,000.00	1,750.00	26,750.00
21	100245	1ษ-5474	วิริยะฯ	แผนกสี	18,000.00	1,260.00	19,260.00

รวมยอดก่อน VAT:	477,770.00	บาท
รวมVAT:	33,443.90	บาท
รวมยอดรวม:	511,213.90	บาท

Figure G.13. Report of VAT.



	Jan-99	Feb-99	Mar-99	Apr-99	May-99	Jun-99	Jul-99	Aug-99	Sep-99	Oct-99	Nov-99	Dec-99
รายรับแผนกเครื่อง	153,100	125,551	119,497	263,091	176,994	111,749	169,609	137,669	97,537	123,780	115,292	228,102
รายรับแผนกเคาะพ่นสี	556,433	783,819	745,535	635,041	638,332	989,630	853,666	948,139	971,205	1,036,436	1,115,270	861,269

Figure G.14. Graph of Engine versus Body Department Revenue.

Japanese Car Repair

คณะบุคคล แจแปนนีส คาร์รีแพร์

42/133 ถ. สุขาภิบาล 1 คลองกุ่ม กรุงเทพฯ โทร. 510-7655, 509-4193 โทรสาร. 509-4193

รายงานการเบิกเงินจากประกัน

รถเข้าระหว่างวันที่:	1/6/00	พิมพ์วันที่:	20/8/00
ถึงวันที่:	30/6/00	บริษัทประกันภัย:	วิริยะประกันภัย

No.	สาขา	เลขที่ใบสั่งซ่อม	ยอดก่อน VAT	VAT	ยอดรวม	วันรถออก	วันรับเงิน	ระยะเวลา
1	ดอนเมือง	100126	10,500.00	735.00	11,235.00	18/6/00	20/7/00	22
2	ดอนเมือง	100131	20,000.00	1,400.00	21,400.00	19/6/00	12/7/00	23
3	บางนา	100124	50,000.00	3,500.00	53,500.00	15/6/00	10/7/00	25
4	บางนา	100134	22,000.00	1,540.00	23,540.00	25/6/00	15/7/00	20
5	บางนา	100141	45,000.00	3,150.00	48,150.00	12/7/00	-	-
6	ปู่เจ้าฯ	100128	32,000.00	2,240.00	34,240.00	14/6/00	-	-
7	ปู่เจ้าฯ	100137	25,000.00	1,750.00	26,750.00	28/6/00	25/7/00	27
8	พัฒนาการ	100136	36,690.00	2,568.30	39,258.30	2/7/00	-	-
9	พัฒนาการ	100139	41,000.00	2,870.00	43,870.00	5/7/00	-	-
10	รัชดาฯ	100130	22,000.00	1,540.00	23,540.00	21/6/00	10/7/00	19
11	รัชดาฯ	100138	23,000.00	1,610.00	24,610.00	1/7/00	-	-
12	รัชดาฯ	100142	5,000.00	350.00	5,350.00	18/6/00	10/7/00	22
13	สะพานขาว	100129	12,000.00	840.00	12,840.00	20/6/00	-	-
14	สะพานขาว	100135	25,000.00	1,750.00	26,750.00	30/6/00	-	-
15	สุขาภิบาล3	100127	8,500.00	595.00	9,095.00	10/6/00	12/7/00	32
16	สุขาภิบาล3	100132	12,580.00	880.60	13,460.60	7/6/00	10/7/00	33
17	สุขาภิบาล3	100133	12,000.00	840.00	12,840.00	11/6/00	2/7/00	21
18	สุขาภิบาล3	100140	9,000.00	630.00	9,630.00	16/6/00	12/7/00	26

รวมยอดก่อน VAT:	411,270.00 บาท
รวมVAT:	28,788.90 บาท
รวมยอดรวม:	440,058.90 บาท

ยอดคงค้างสาขา:

ดอนเมือง:	0 บาท	พัฒนาการ:	83128 บาท	สุขาภิบาล 3:	0 บาท
บางนา:	48,150 บาท	รัชดาฯ:	24610 บาท		
ปู่เจ้าฯ:	34240 บาท	สะพานขาว:	39590 บาท		

เฉลี่ยระยะเวลาจ่ายเงิน:

ดอนเมือง:	22 วัน	พัฒนาการ:	0 วัน	สุขาภิบาล 3:	28 วัน
บางนา:	22 วัน	รัชดาฯ:	20 วัน		
ปู่เจ้าฯ:	27 วัน	สะพานขาว:	0 วัน		

Figure G.15. Report of Insurance Payment.

APPENDIX H

DATA STRUCTURE

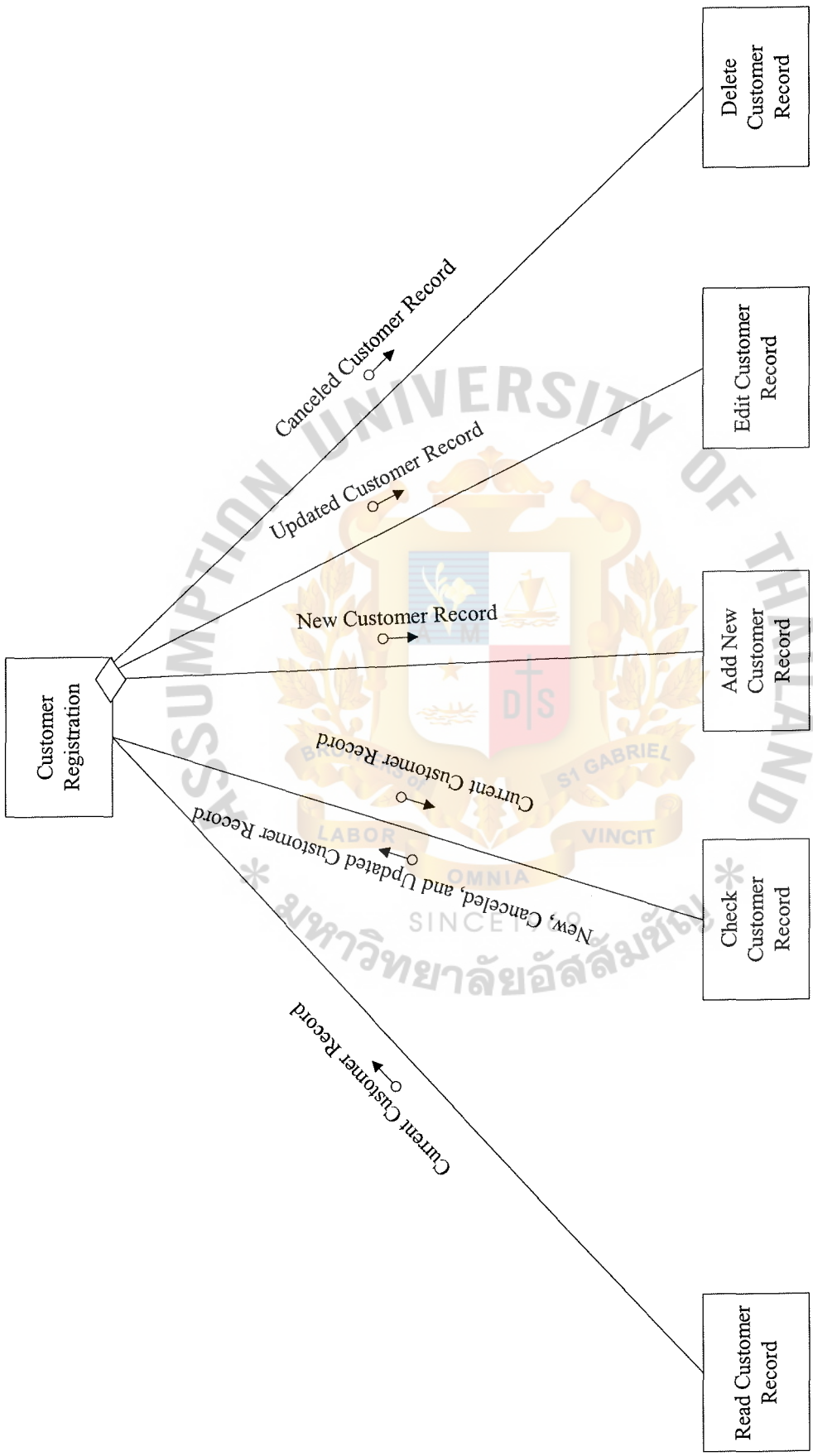


Figure H.1. Structure Chart from Customer Registration of Auto Repair Order Information System.

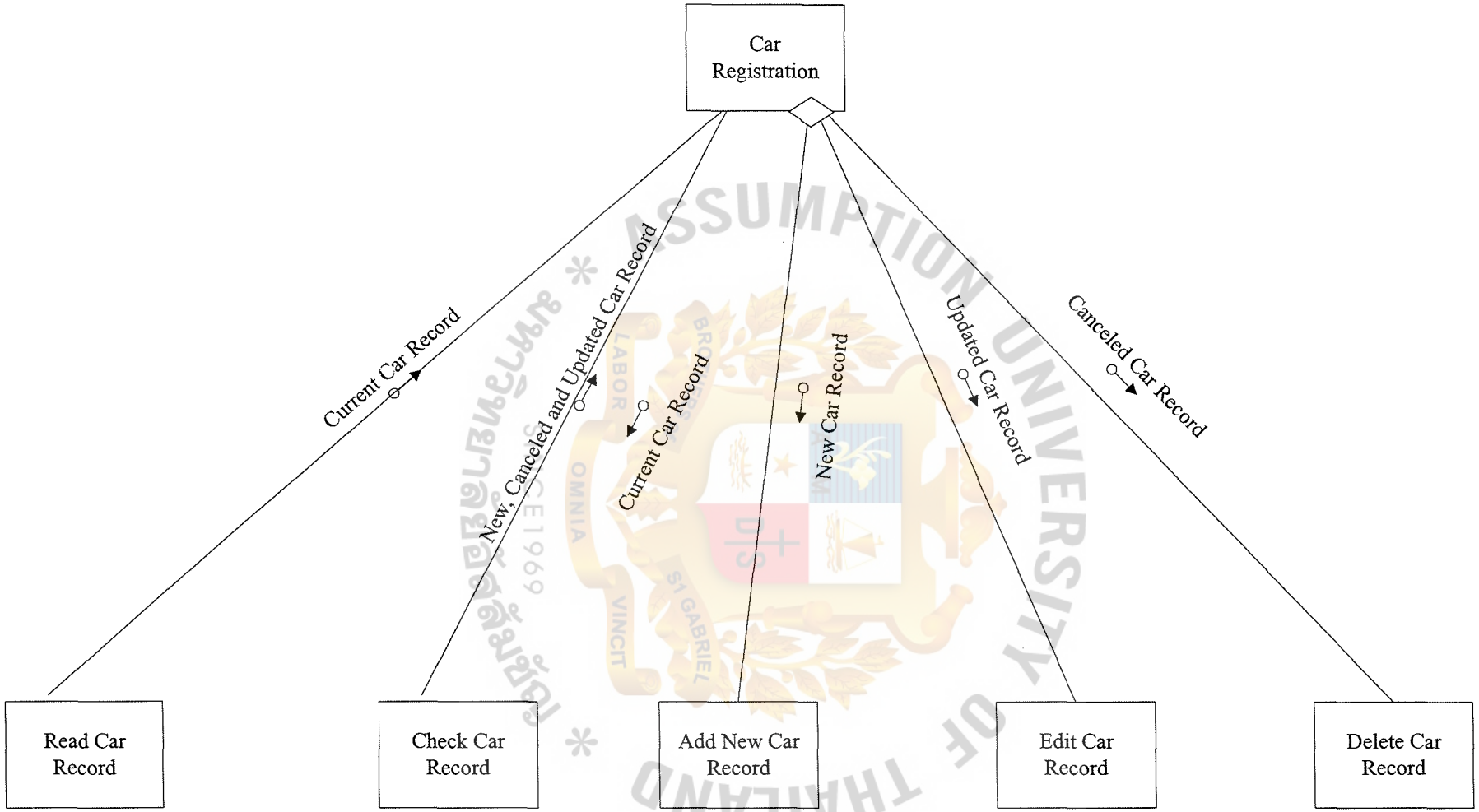


Figure H.2. Structure Chart from Car Registration of Auto Repair Order Information System.

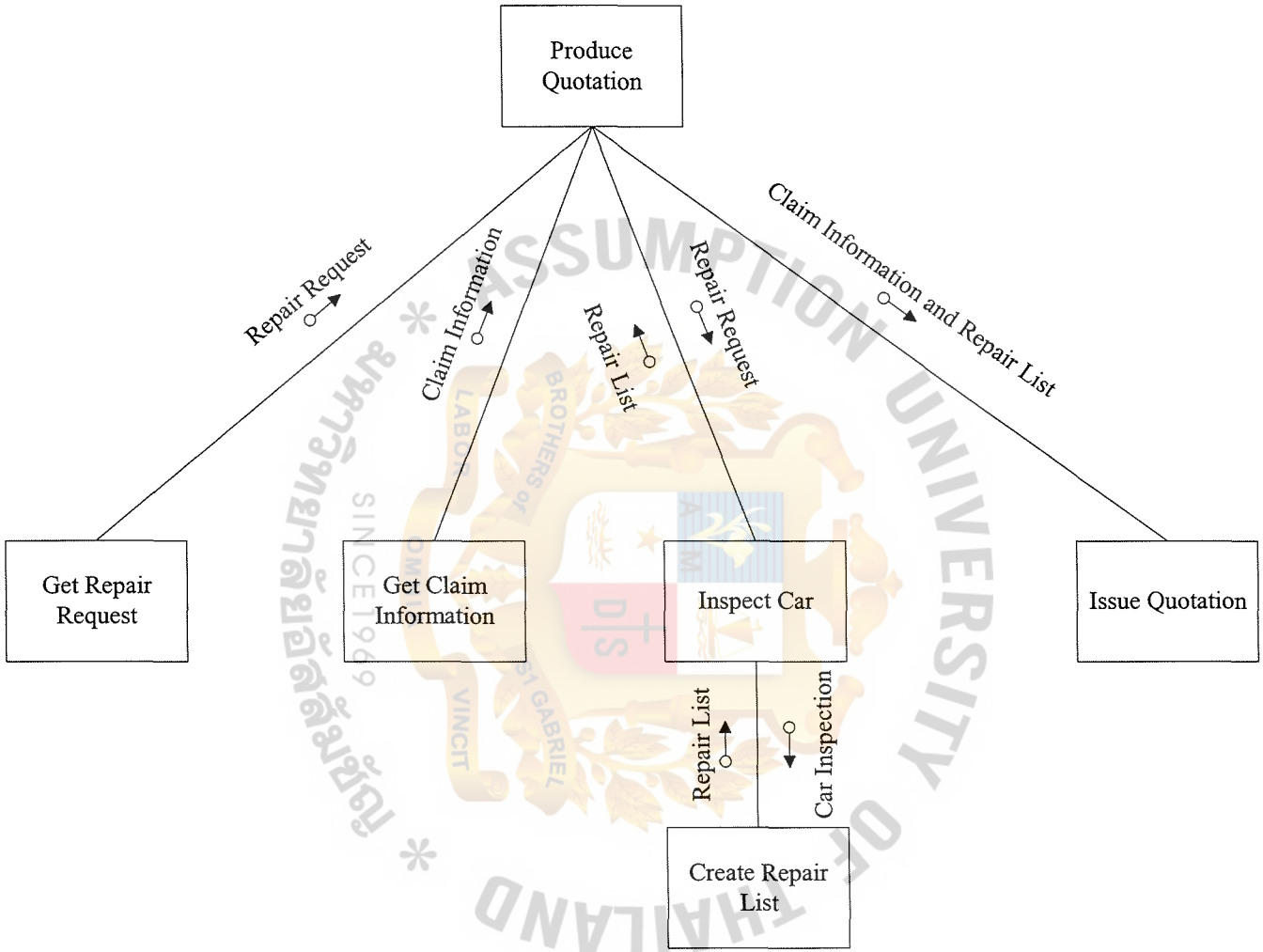


Figure H.3. Structure Chart from Produce Quotation of Repair Order Information System.

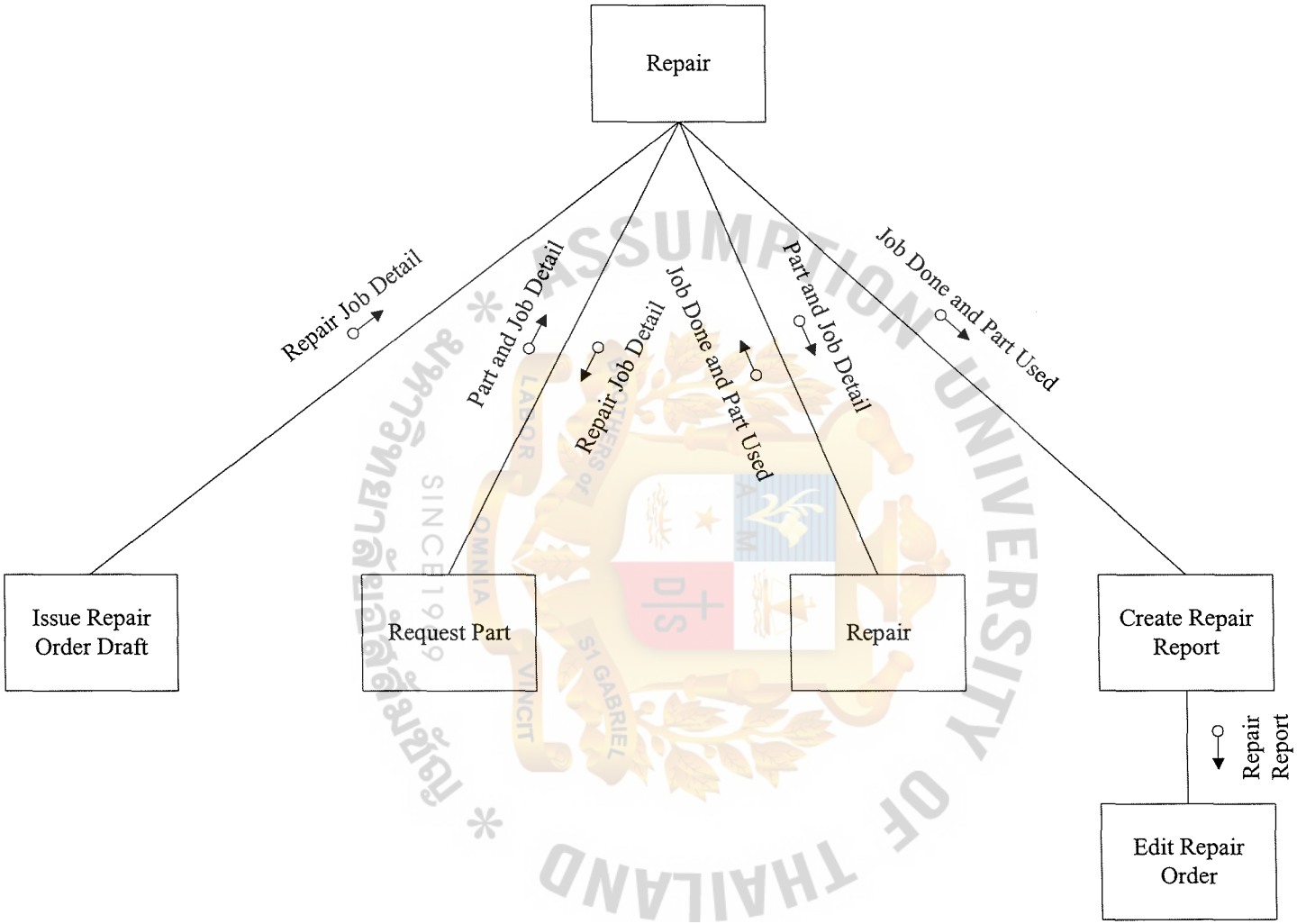


Figure H.4. Structure Chart from Repair of Repair Order Information System.

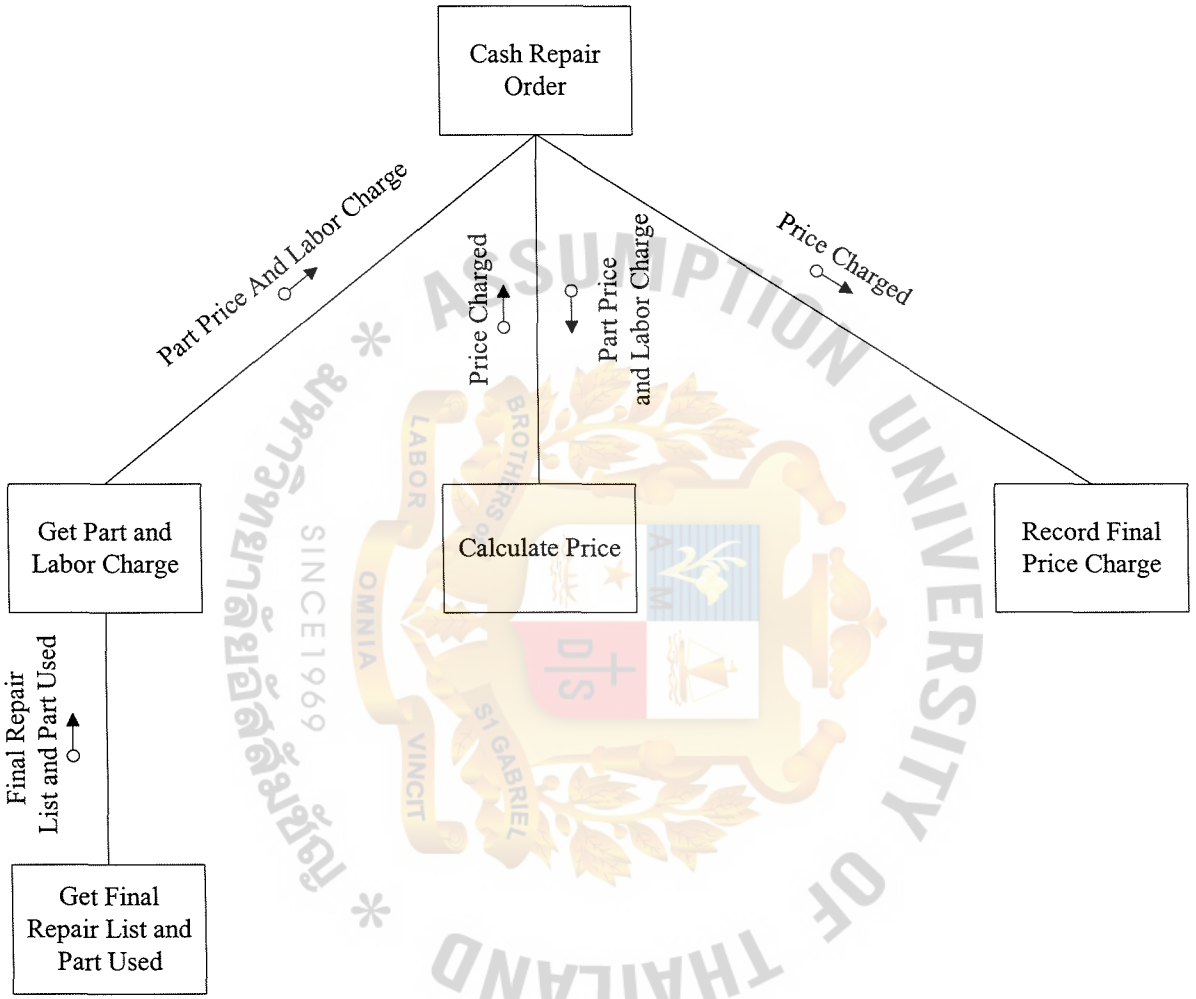


Figure H.5. Structure Chart from Cash Repair Order of Auto Repair Order Information System.

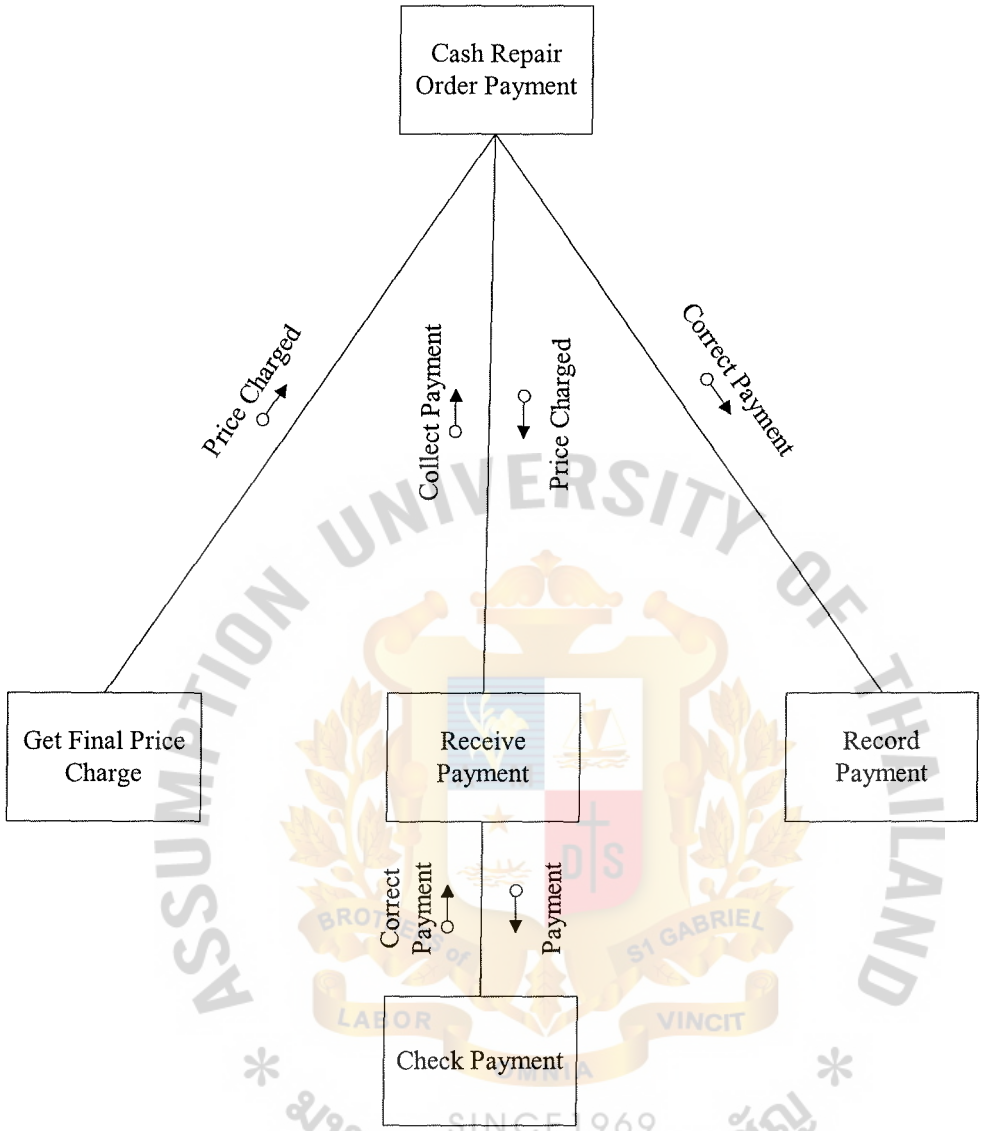


Figure H.6. Structure Chart from Cash Repair Order Payment of Auto Repair Order Information System.

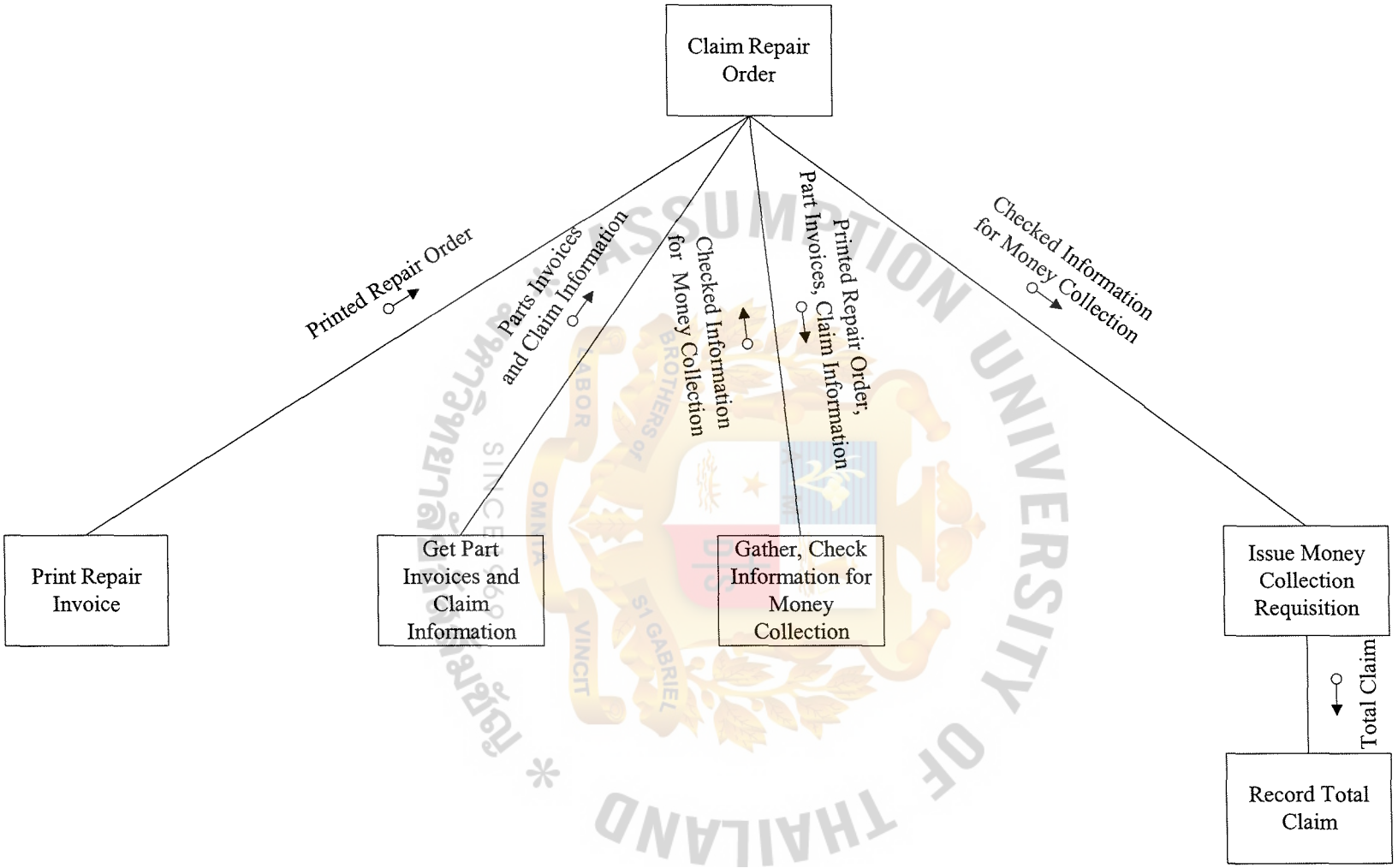


Figure H.7. Structure Chart from Claim Repair Order of Auto Repair Order Information System.

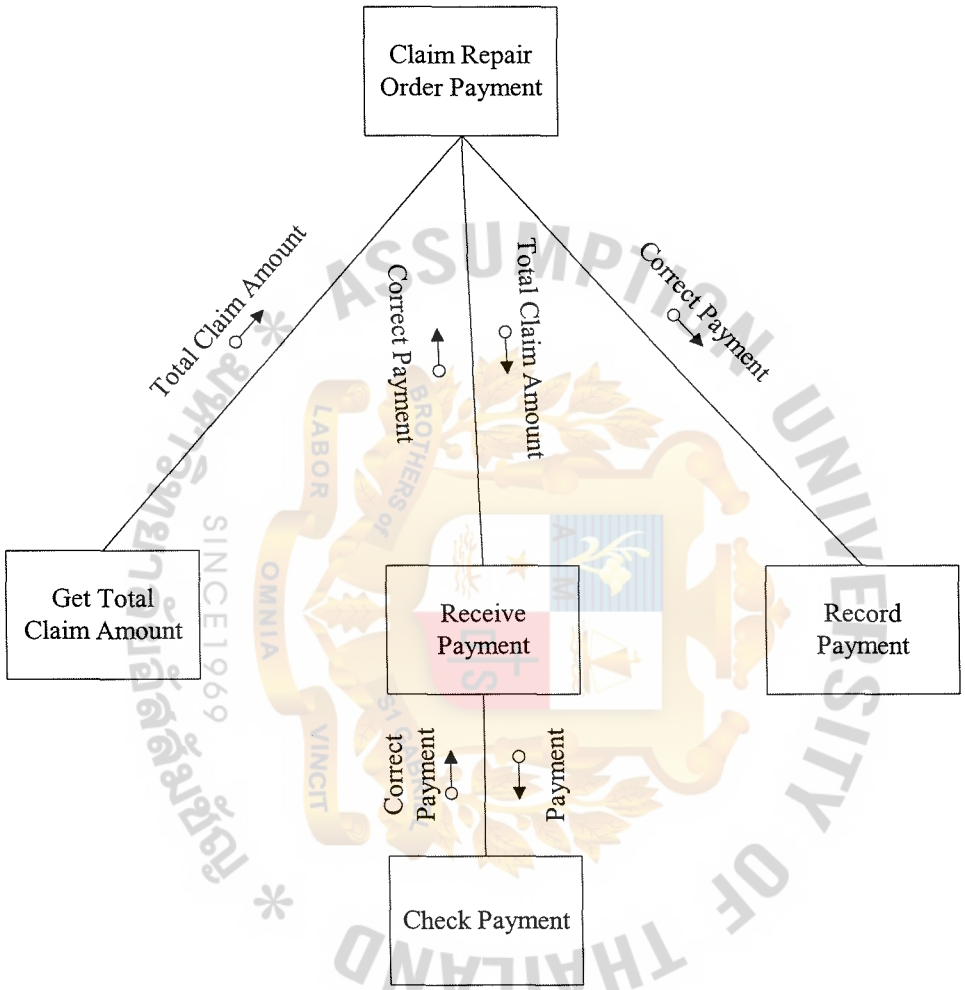


Figure H.8. Structure Chart from Claim Repair Order Payment of Auto Repair Order Information System.

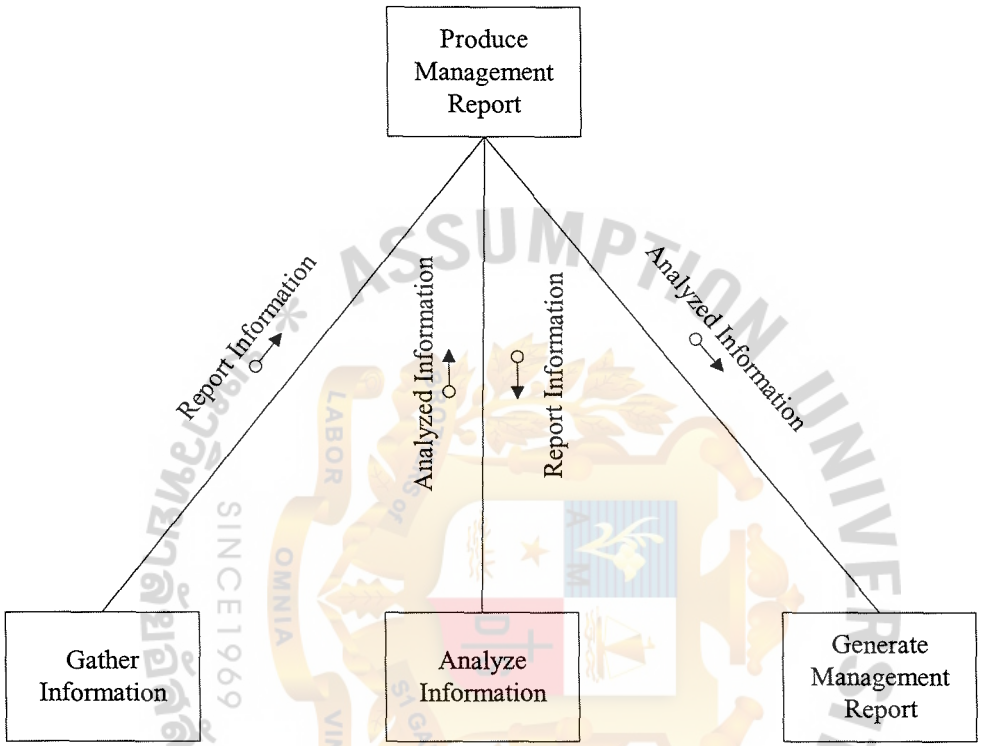


Figure H.9. Structure Chart from Produce Management Report of Auto Repair Order Information System.

BIBLIOGRAPHY

English References

1. Chittayasothorn, Suphamit. "Relational Database Design." Proceedings of the Seminar of Institute of Thai Information Technology, Bangkok Palace, June 11 and 18, 1994.

2. Date, C. J. An Introduction Database Systems, 6th Edition. New York: Addison-Wesley Publishing Company, 1995.

3. Flok, Michael J., Bill Zoellick, and Greg Riccadi. File Structures an Object-Oriented Approach with C++. USA: Addison-Wesley, 1998.

4. Forouzan, Behrouz A. Introduction to Data Communication and Networking, International Edition. Singapore: WCB/McGraw-Hill, 1998.

5. Laudon, Kenneth C. Management Information Systems, 5th Edition. New Jersey: Prentice Hall International, Inc., 1998.

6. Whitten, L. Jeffery and Lonnie D. Bentley. System Design Analysis and Design Methods, 4th Edition. USA: Irwin/McGraw-Hill, 1998.

Thai References

1. กิตติ ภัทดีวัฒนะกุล และ จำลอง ครูอุสาหะ. Visual Basic 6 ฉบับฐานข้อมูล. กรุงเทพมหานคร: บริษัท ไทยเจริญการพิมพ์ จำกัด, 2543.

2. ธนพล ฉันจรัสวิชัย. การเขียนโปรแกรมและแมโครบน Access 97 (Macro & Programing). กรุงเทพมหานคร: ซีเอ็ดยูเคชั่น, 2542.

3. ศุภชัย สมพานิช. Database Programming ด้วย Visual Basic 6.0. กรุงเทพมหานคร: บริษัท อินโฟเพรส จำกัด, 2543.

4. สิทธิชัย ประสานวงศ์. การใช้ Microsoft Access 2000. กรุงเทพมหานคร: ซอฟท์เพรส, 2543.