Customer Service & Repair for Digital Mobile Shop Co., Ltd.

by

Ms. Jintana Virodvanit

A Final Report of the Six-Credit Course
CS 6998 - CS 6999 System Development Project

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Computer Information Systems
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Project Title	Customer Service & Repair for Digital Mobile Shop Co., Ltd.
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Academic Year	November 2003

The Graduate School of Assumption University has approved this final report of the six-credit course, CS 6998 – CS 6999 System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information Systems.

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ABSTRACT

Customer Service & Repair System is created for a retail mobile phone business, Digital Mobile Shop Co., Ltd. The business provides quality products and services to customers. The nature of business requires a tremendous amount of data to be collected on the order of customers. A lot of paper documents are kept for reference and analysis.

Currently, some processes are done manually, some are done by using MS-Excel and are time consuming. The human error is quite a big problem because of service repair which can't estimate schedule finish date to customers and also cannot follow up the status of each job order that is solved by engineers. Information seeking always takes a lot of time. These cause staffs to do over time, which increase operating expenses for the company. Due to intense competition in business, the company needs to improve business processes for more customer satisfaction.

With the proposed system, it will use a computerized system with web based architecture by all shops connected to center. All sales data will be kept in database using Oracle 9I Database. The application is developed by using Oracle Developer 2000 with a user-friendly interface. Information can easily be retrieved in a short time. Document and report preparation can also be prepared in less time. It solves the problem of the existing system and provides better information support for management.

ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

1.1 Background of the Project

In the globalization of the world's industrial economies and the current economic situation, the effectiveness and efficiency of using information is the most important tool for the company to gain advantages over other competitors in the competitive business world. The power of today's computer hardware, software and network has grown rapidly, so many companies use the new computer technologies to apply to their current business environment in order to make the company more competitive. The information technology can improve the use of meaningful information to be more powerful. Moreover, it can support decision-making management, planning, customer relationship management, and reduce the time required to control and manage the information. In addition, the information technology can eliminate unnecessary work in the organization.

Digital Mobile Shop Co., Ltd. is a company that sells mobile phones, accessories, and service and repairs mobile phones. Since the company has increased the number of stores and the total amount of sales to customers, it makes the company also have more transactions of sale. The effectiveness of a computerized system would contribute to increase the performance of selling products at stores. It can improve the customer satisfaction, save working procedure and time, reduce human errors. Also, it can support the marketing planning, decision-making of management or executive level of the company.

The new computerized customer service and repair system is believed to provide a better support to the users in day-to-day operation, improve the operation time in doing business, follow up job order , reduces human error and also can support statistical data using decision-making and marketing planning of the company.

1.2 Objectives of the Project

The main objective of the project is to develop a computerized system for the point of sale system of Digital Mobile Shop Co., Ltd. The reason is to improve the customer satisfaction and keeping the sale transaction data for other departments.

To develop the computerized system, the company has to define the problem as well as user requirements. This project will be completed only when most of the problems have been solved and the system meets the user requirements. The following are the project's objectives:

(1) To improve the efficiency and effectiveness of the operation of Point of Customer Service and Repair system.

(2) To serve the service function like service support claim mobile, claim accessories, service mobile in period of warrantee.

(3) To improve an inconsistency of data between each branch and an inconsistency of sale report.

(4) To help the management people in analyzing performance service report and in planning for marketing strategy.

(5) To reduce cost of operation.

(6) To improve the customer satisfaction.

1.3 Scope of the Project

This project focuses on point of sale system that is currently done manually. A computerized system is expected to replace the existing system in order to provide a high quality point of sale system. The computerized solution for this project will cover the major aspects of a Customer service and repair system as follows:

The project will only cover major parts of the Point of Customer Service and Repair system that can be classified as follows:

(1) The staffs or customer service can record service and repair information such as customer information, Job order Entry, Repair information Entry Service Charge Entry, and etc.

(2) The system can keep, calculate the customer service and repair information

(3) The system can provide various reports such as Job Order Detail report, Cause of Job Order Analyst report, Performance of Engineer Report, History of Item Analyst report, Service Charge Detail, Repair Information report, Steps of Job Order Report, Job Order Summary report and etc.

(4) The system can serve the interface service charge transaction to P.O.S system.

1.4 Deliverables of the Project

(1) Minutes of Meeting

After the meeting with the user, we will summarize the details that we have talked and send to the user for reviewing.

(2) Statement of work report

This report will present all the requirements and our suggestion during the gathering of the requirement phase. To ensure that what we are going to develop is the same as the customer need.

(3) System Specification

(a) Design Specification

(b) Context Diagram

(c) Data Flow Diagram

(d) Entity Relationships Diagram

(4) Programs

(a) Reference Table

(1) Customer Service Information

(2) Engineer Information

(3) Symptom Information

(4) Repair Method Information

(5) Cause Information

(6) Steps of work Information

(7) Sub Inventory Information

(b) Daily Transaction Entry

(1) Registration Entry

(2) Job Order Entry

(3) Repair Information

(4) Service Charge Entry

(c) Queries

(1) Inquiry Customer Information

(2) Inquiry Job Order Information

(3) Inquiry Status of Service

(4) Inquiry Repair Information

(5) Inquiry Service Charge Information

(d) Reports

(1) Job Order Detail Report

(2) Cause of Job Order Analyst Report

(3) Performance of Engineer Report

(4) History of Item Analyst Report

(5) Repair Information Report

(6) Steps of Job Order Report

(7) Job Order Summary Report

(8) Job Order Analyst Report

(9) Job Order Form

(5) Project Plan

(6) Work Progress Report

(7) Test Plan and Results Report

(8) Training Material

(9) User Manual

1.5 Project Plan

The procedures of the customer service and repair system project are based on the concept of System Development Life Cycle (SDLC). The processes are divided into 3 main phases as follows:

(1) Analysis of the existing system.

(2) Analysis and design of the proposed system.

(3) Implementation of the proposed system.

This project plan of customer service and repair system is given in Figure 1.1.

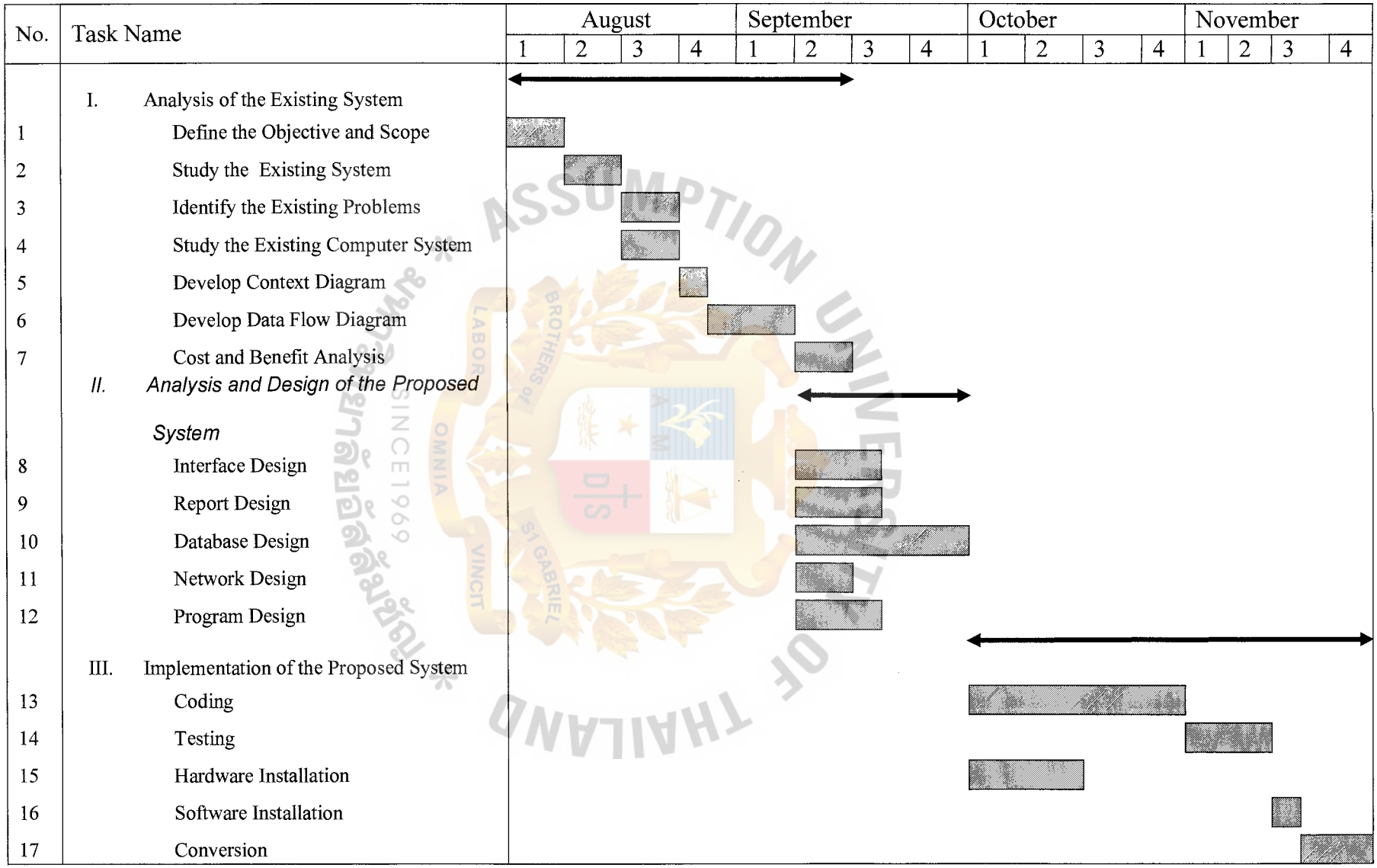

Figure 1.1. Project Plan of Customer Service and Repair System of Digital Mobile Shop Co., Ltd.

II. THE EXISTING SYSTEM

2.1 Background of the Organization

Digital Mobile Shop Co., Ltd. was established in 1999. At the opening, the company opened one shop for selling mobile and accessories in Thailand. In the technology and information age, the company has maintained its constant rapid growth over 3 years. Until now, Digital Mobile shop has been one of the leading companies in Thailand. There are 20 shops in Bangkok and 40 shops in other provinces. Nowadays, the Digital Mobile Shop operates not only in the retail business, but also in the wholesale business.

The company range of products and services cover:

(1) Mobile Phones

(2) Mobile phone's accessories

2.2 The major department

There are six major departments are as follows:

(1) Accounting and Finance Department

The department deals with all jobs such as making general accounting standard.

(2) Marketing Department

This department is responsible for both retail and wholesale business. Also, it is involved in marketing planning, promotion campaign, exhibition, and consignment.

(3) Human Resource Department

The department is responsible for human resources of the company.

(4) Information Technology Department

The department deals with all jobs in information technology, for example, network, application program, and etc.

(5) Technical Department

The department is responsibilities are to repair mobile phone and to support customers in terms of technical problems.

(6) Purchasing Department

The main responsibility is to purchase the main products for selling and distributing products to Digital Mobile shops throughout Thailand.

The organization chart will be shown in Figure 2.1.

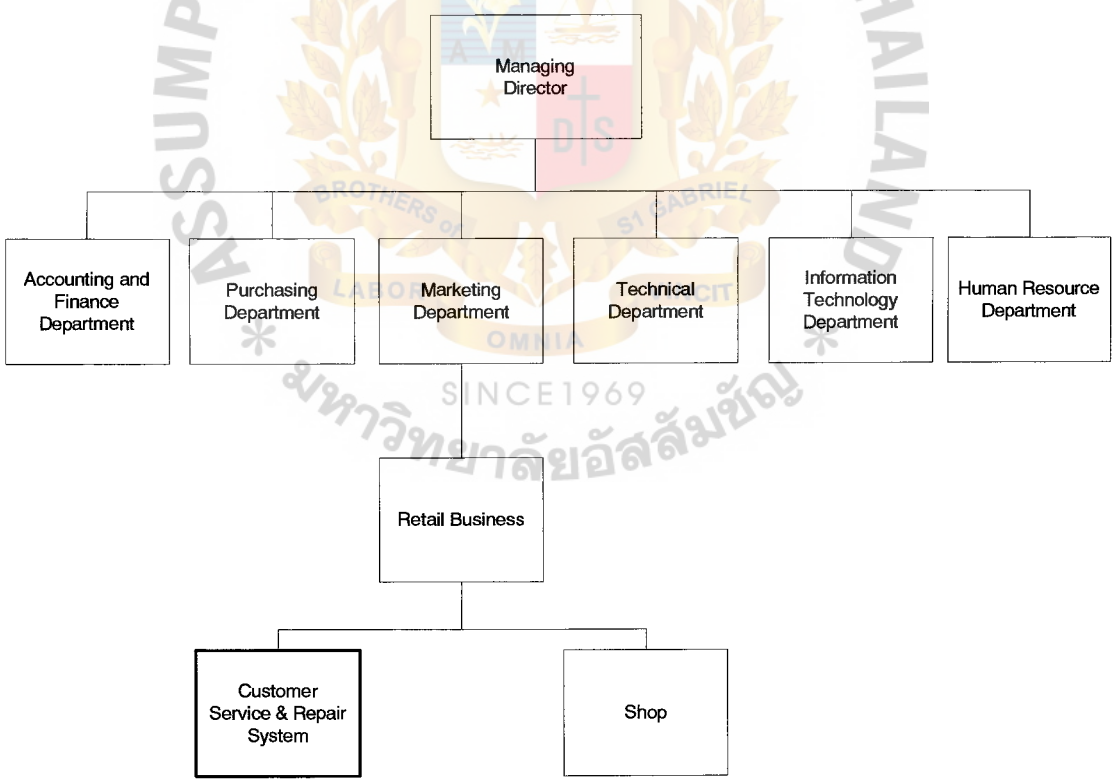

Figure 2.1. Organization Chart of Digital Mobile Shop Co., Ltd.

2.3 Existing Business Function

Every morning, the product department prepares service charge price list by using Excel and sends files to store by using the modem.

At the store, when customers walk in to repair products, staff check service charge price list, check schedules of engineers, check steps of work in the Excel file, and issued job order no. by using the excel file for customers and the staff also record job order details, symptom details in the excel file, send job order and products to engineers for analysis and repair. When engineers complete the repair product will record cause analysis, and repair method details, update status and steps of work on job order in the excel file and then return the product to staff. When the staff receive the product they will call the customers to receive product and then issue charge service transactions into the excel file. Then, the staff will update status of job order in the excel file to close the job order.

At the end of everyday, the staff will summary service charge list from the excel file and send to the Accounting department. Next, the Accounting staffs prepare a sales tax report, daily report, and other reports, which are requested by the management team.

2.4 Currents Problems and Areas for Improvement

Several problems were identified during the analysis of the existing system. The problems could be summarized as follows:

(1) Mistaken problem.

The staff can easily make a mistake because the staff issue job order no. by running the no. of job order numbers and also running service charge no., check service price list in the excel file and record item code all of which are controlled manually so, staff often record the wrong item code which does not match with the item description.

(2) Difficult to control at shops.

According to the work in the excel file, it is difficult to control the shop staff. For example, when a customer sends product for repair, the shop staff issue the incorrect job order no. to the customer.

(3) Operation takes more time.

At point of service, the staff find it difficult to track or follow up the status of job order and cannot estimate the schedule finish date and time for customers. So, it makes customers wait for this process and they are not satisfied.

(4) Cannot serve the customers in term of privilege.

The current system is difficult to serve the customer in terms of checking the status of repair product.

(5) Staff working redundancy

Because all systems are not integrated to each other, staffs in each department work redundantly. For example, customer information and membership department needs to summarize customers to prepare account receivable, and etc.

(6) Management team finds it difficult to analyze, plan and make marketing strategies because of the delay of service report and inconsistency of data.

(7) Data damaged and lost.

They often found that data files are damaged and cannot be recovered at all or sometimes the files are lost from the computer.

(8) Security problem.

The current system lacks security control and backup recovery system. So, everyone finds it easy to access and change the data.

III. THE PROPOSED SYSTEM

3.1 User Requirement

User requirements concern about the proposed system in which the information system specification that the users would like to get from the new Digital Mobile Shop of Customer Service and Repair System.

The user requirements of the proposed system are as follows:

(1) Concerning incorrect information, many times staffs make mistakes in data input. Users require having a system that can cross check and inform whenever errors occur. It would produce less or no wrong information.

(2) Concerning mistaken problem when staff service repair product, the new system needs a barcode scan, the service charge price and step of work to estimate schedule plan finish date needed to control by the new system.

(3) Concerning operation time, the new system should take less time in the process of issued job order / service charge. So, this makes customer satisfaction.

(4) Concerning serving customers in term of privilege, the new system should automatically calculate schedule finish date and estimate cost of repair.

(5) Concerning large amount of data for analyzing, marketing planning and making decision, good database management system is required in order that information is retrieved with quicker speed.

(6) Concerning report, the manual system takes too much time and human efforts to produce, and is incorrect. The new system needs to produce daily report, job order analyst report, performance engineer report, monthly reports and other management reports in a timely manner.

(7) Concerning working redundancy, the new system needs to generate service charge transaction to account receivable system. So, the accounting department does not need to key in data again.

(8) Concerning information sharing, the new system should provide networking capability. So, each shop can share the information together like customer information.

(9) Concerning update information to support decision making, the users require getting most current, accurate and reliable information to support decision making.

(10) Concerning input screen, users require to use easy methods and allow direct manipulation of screen representation which can be accomplished with keyboard input, mouse, or barcode scanner. For output display, it should be expressed in the way that the management team can use directly. Even new users can use it quickly.

(11) Concerning value of data, the new system should be secured by having login and passwords so only authorized people can view the information.

(12) Concerning economy, information cost of gathering manipulating and reporting should cost less with the new system, while value of tangible and intangible benefits exceed the cost of investment in new system.

3.2 System Design

The objective of the new system design is to convert user requirements into computer solution. Existing problems, Context Diagram and Data Flow Diagram(DFD) and user requirements are used as a basis for the development of the models of the proposed system. The details of analysis and design are as follows:

3.2.1 Data Flow Diagrams (DFDs)

The logical Data Flow Diagrams (DFDs) are the structures analysis and design tools that analysts can use to understand the process of the system and the movement of the data through the system.

The logical data flow diagram will indicate the flow of the requirement and the data type used in developing the program to support the new system. With DFDs, the analyst can design the file to cover the requirements of the users and support the report design of the system. The details of data flow diagram of Digital Mobile Shop of Customer Service and repair system are shown in Appendix A, which includes:

(1) Context Data Flow Diagram

In the context data flow diagram (shown in Appendix A, Figure A.1.), the area being studied is shown as round rectangle in the diagram. It interacts with other external entities, shown by rectangles on the context diagram. The external entities provide information to it and receive information from it. Lines show the data flow with arrowhead indicating the direction of the flow. Data is input into the system. Information is produced as output from the system.

(2) Functional Decomposition Diagram

The decomposition diagram of Digital Mobile Shop of Customer Service and repair system shows a top down view of the system functional structure starting from the system itself and decomposing it into the subsystem and finally to each subsystem processes. The decomposition diagram is illustrated in Appendix A, Figure A.3. There are altogether four subsystems. Each subsystem has its own data flow and processes are illustrated in Appendix A, Figure A.3.

The four subsystems are as follows:

(a) Table Reference Maintain Subsystem

This subsystem is responsible for maintaining all table reference. The subsystem consists of the following processes:

(1) Customer Service Maintain Program

(2) Engineer Maintain Program

(3) Symptom Maintain Program

(4) Repair Method Maintain Program

(5) Cause Maintain Program

(6) Step of work Maintain Program

(7) Working Time of Sub Inventory Maintain Program

(b) Job Order Subsystem

This subsystem is responsible for getting Job order from customers and service and repair product to customers and also update status of Job order. The subsystem consists of the following processes:

(1) Job Order Entry

(2) Repair Information Entry

(3) Update Status of Document

(4) Close Document

(c) Service Charge Subsystem

This subsystem is responsible for issuing Service Charge transaction and generated to P.O.S system. The subsystem consists of the following processes:

(1) Service Charge Process

(2) Generated Service Charge Transaction to P.O.S system.

(d) End of Day Activity Subsystem

This subsystem is responsible for daily generated report. The subsystem consists of the following processes:

(1) Generated other Job Order Analyst Report

(2) Generated other Performance of Engineer Analyst Report

(3) Level 0 of Data Flow Diagram (Shown in Appendix A, Figure A.2.)

(4) Level 1 of Data Flow Diagram (Shown in Appendix A, Figure A.4 – A.9.)

(5) Structure Chart (Shown in Appendix B)

To understand the details of each process in data flow diagram, the process specification is shown in Appendix C.

3.2.2 Entity Relationship Diagram (ERD)

ERD data modeling is the technique used in organizing and documenting a system data. ERD also illustrates how that data will be captured, stored, used, and maintained. Data modeling, which is called database modeling, is usually a database implementation.

The ERD of the new system is shown in Appendix D as follows:

(1) A Context Data Model

(2) A Key-Base Data Model

(3) Fully Attributed Data Model

The data structure, the table that describes the details of each entity and attribute in ERD, is shown in Appendix E. Moreover, the data dictionary, the table which describes the meaning of each attribute in ERD, is shown in Appendix F.

3.2.3 Input Design

The input design screens of the system are in many forms for the various purposes that are shown in Appendix G. In addition, before entering into the system, system

security must be concerned. Users need to enter ID and password (Figure G.1.). After the main menu (Figure G.2.) and submenu (Figure G.3.) will appear in order for users to communicate with the system.

3.2.4 Output Design

There are 2 types of system output forms that are in the form of hardcopy and in the form of display screen. Some reports need preprint form and need a copy for customers, for example Job Order. Some reports are generated periodically by the shop staffs and head office staffs, such as daily report, weekly report, monthly report or quarterly report and other reports are generated by managers when requested. The outputs in the displayed screen are for monitoring daily operation purposes.

All the reports and outputs generated by the system are shown in Appendix H.

3.3 Candidate Solutions

There are some candidates we should select that are listed as follows:

(1) In-houses

(2) Outsourcing development

(3) Express Program, Customer Service software (CSS)

Table 3.1. Candidate Systems Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized	Application program will be developed by our own developers	Outsourcing will be hired for developing application program	Express Program, CSS package will be purchased and customized to meet business requirement
Benefits	This solution can completely fulfill our requirements, less risk, easier and better maintenance	This solution can completely fulfill our requirements, but more difficult to maintain	This solution can be easily implemented, but may not fully support our operation
Server & Workstations	Server: Pentium4, SCO Unix Client:Windows XP	Server: Pentium4, SCO Unix Client:Windows XP	Server: Pentium4, Windows NT Client:Windows XP
Software Tools Needed	Oracle Developer 2000	Visual Basic.Net	Visual Basic 6
Application Software	Custom Solution	Custom Solution	Package Solution
Method of Data Processing	Web base architecture	Web base architecture	Client/Server
Input Device and Implication	Keyboard, Mouse, Barcode Scanner	Keyboard, Mouse, Barcode Scanner	Keyboard, Mouse, Barcode Scanner
Output Device and Implication	Shop : Dot Matrix Printer Center : Laser printer	Shop : Dot Matrix Printer Center : Laser printer	Shop : Dot Matrix Printer Center : Laser printer
Storage Devices and Implications	Oracle 9i DBMS with 80 GB array capacity	Oracle 9i DBMS with 80 GB array capacity	MS SQL Server with 80 GB Harddisk

Table 3.2. Estimated Cost for the First Candidate, Baht.

Cost Item		Amount
Development Cost		
Personnel		
1	System Analyst (1 @ 300 hours/each 250 Baht/hr)	75,000
2	Programmer (1 @ 300 hours/each 200 Baht/hr)	120,000
1	System Architecture (1 @ 100 hours/each 400Baht/hr)	40,000
1	Database Specialist (1 @ 50 hours/each 500Baht/hr)	25,000
Expenses		
8	Training Cost (15,000/Course)	120,000
Hardware & Software		
3	Server(DBMS Server, Application Server, Web Server)	300,000
9	Workstation (30,000/unit)	270,000
3	Server Software (OS)	240,000
9	Workstation Software (OS)	90,000
1	DBMS Software for server(Oracle 9i)	90,000
9	DBMS Client	90,000
1	Laser Printer	40,000
7	Dot-matrix printer	42,000
3	UPS	40,000
1	HUB	5,000
1	Unshielded Twisted Pair (UTP)	3,000
6	Barcode Sacnner	60,000
6	Leased Line Installation	400,000
Total Development Cost		2,050,000
Project Annual Operating Cost		
Personnel		
1	Manager (30,000/Person/Month)	360,000
2	Officer at center (15,000/Person/Month)	360,000
6	Staff at shop (8,500/Person/Month)	612,000
1	IT Specialist (20,000/Person/Month)	240,000
Expenses		
1	General Maintenance Cost (11,000/Month)	132,000
1	Maintenance Agreement for 3 Servers	75,000
1	Utility Cost (20,000/Month)	240,000
6	Leased Line (6,000 Baht / Month)	432,000
	Preprinted forms (30000/year @ 0.25Baht/form)	30,000
Total Project Annual Operating Costs		2,481,000

Table 3.3. Payback Analysis for the First Candidate, Baht.

Cash Flow Description	Years					
	0	1	2	3	4	5
Development Cost	-2,050,000					
Maintenance Cost	-	-2,481,000	-2,729,100	-3,002,010	-3,302,211	-3,632,432
Discount factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost (adjusted to present value)	-2,050,000	-2,215,533	-2,175,093	-2,137,431	-2,100,206	-2,059,589
Cumulative time-adjusted costs over lifetime	-2,050,000	-4,265,533	-6,440,626	-8,578,057	-10,678,263	-12,737,852
Benefits derived from operation of new system	0	3,600,000	3,960,000	4,356,000	4,791,600	5,270,760
Discount factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (current of present value)	0	3,214,800	3,156,120	3,101,472	3,047,458	2,988,521
Cumulative time-adjusted benefits over lifetime	0	3,214,800	6,370,920	9,472,392	12,519,850	15,508,371
	0	1	2	3	4	5
Cumulative lifetime Time-adjusted costs + Benefits	-2,050,000	-1,050,733	-69,706	894,335	1,841,587	2,770,519

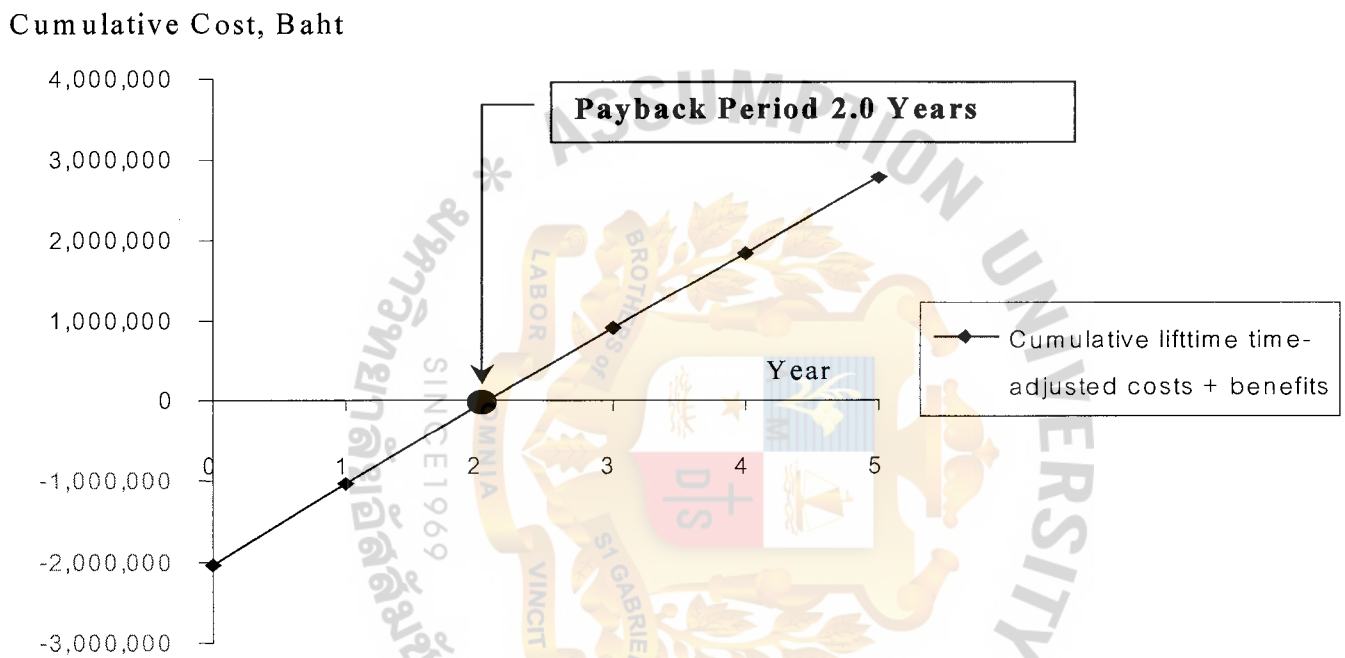

Figure 3.1. Payback Period of the First Candidate

Table 3.4. Estimated Cost for the Second Candidate, Baht.

Cost Item		Amount
Development Cost		
Personnel (Outsourcing)		
1	System Analyst (1 @ 300 hours/each 500 Baht/hr)	150,000
2	Programmer (1 @ 300 hours/each 500Baht/hr)	300,000
1	System Architecture (1 @ 100 hours/each 500Baht/hr)	50,000
1	Database Specialist (1 @ 50 hours/each 700Baht/hr)	35,000
Expenses		
9	Training Cost (10,000/Course)	90,000
Hardware & Software		
1	Server(DBMS Server, Application Server, Web Server)	300,000
9	Workstation (30,000/unit)	270,000
3	Server Software (OS)	240,000
9	Workstation Software (OS)	90,000
1	DBMS Software for server(Oracle 9i)	90,000
9	DBMS Client	90,000
1	Laser Printer	40,000
7	Dot-matrix printer	42,000
1	UPS	40,000
1	HUB	5,000
1	Unshielded Twisted Pair (UTP)	3,000
6	Barcode Scanner	60,000
6	Leased Line Installation	400,000
Total Development Cost		2,295,000
Project Annual Operating Cost		
Personnel		
2	Manager (30,000/Person/Month)	360,000
3	Officer at center (15,000/Person/Month)	360,000
6	Staff at shop (8,500/Person/Month)	612,000
1	IT Specialist (20,000/Person/Month)	240,000
Expenses		
1	General Maintenance Cost (10,000/Month)	120,000
1	Maintenance Agreement for 3 Servers	30,000
1	Maintenance Agreement for Application Software (Outsourcing)	200,000
1	Utility Cost (20,000/Month)	240,000
6	Leased Line (6,000 Baht / Month)	432,000
	Preprinted forms (30000/year @ 0.25Baht/form)	30,000
Total Project Annual Operating Costs		2,624,000

Table 3.5. Payback Analysis for the Second Candidate, Baht.

Cash Flow Description	Years					
	0	1	2	3	4	5
Development Cost	-2,295,000					
Maintenance Cost	-	-2,624,000	-2,886,400	-3,175,040	-3,492,544	-3,841,798
Discount factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost (adjusted to present value)	-2,295,000	-2,343,232	-2,300,461	-2,260,628	-2,221,258	-2,178,300
Cumulative time-adjusted costs over lifetime	-2,295,000	-4,638,232	-6,938,693	-9,199,321	-11,420,579	-13,598,879
Benefits derived from operation of new system	0	3,600,000	3,960,000	4,356,000	4,791,600	5,270,760
Discount factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (current of present value)	0	3,214,800	3,156,120	3,101,472	3,047,458	2,988,521
Cumulative time-adjusted benefits over lifetime	0	3,214,800	6,370,920	9,472,392	12,519,850	15,508,371
	0	1	2	3	4	5
Cumulative lifetime Time-adjusted costs + Benefits	-2,295,000	-1,423,432	-567,773	273,071	1,099,270	1,909,492

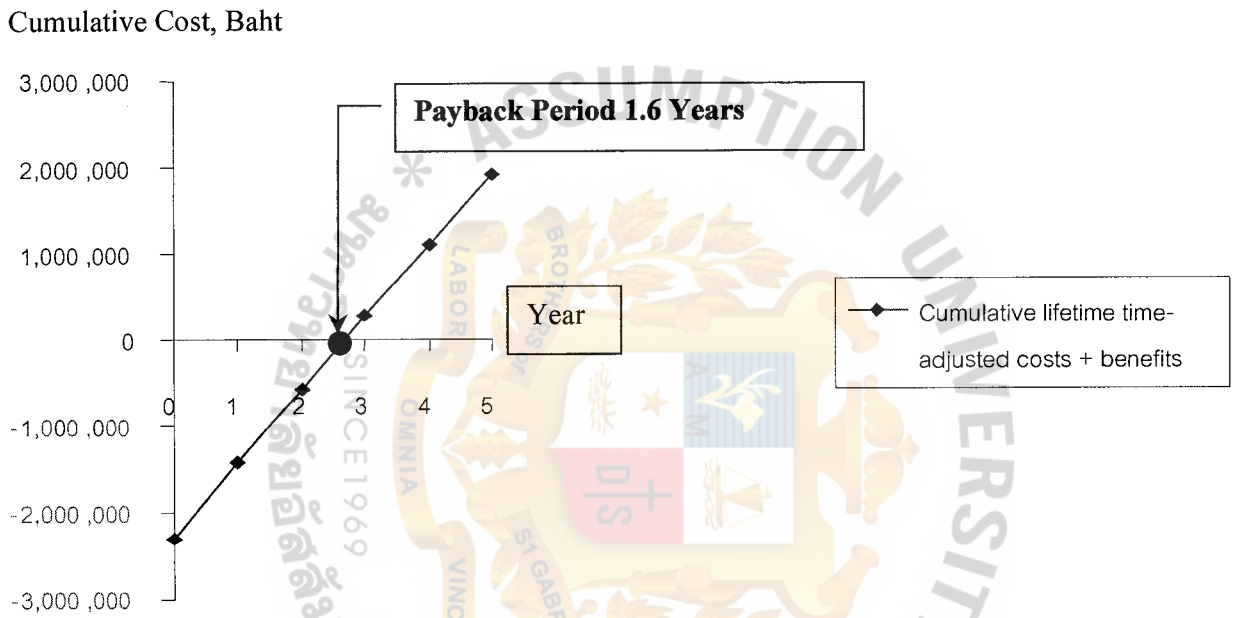

Figure 3.2. Payback Period of the Second Candidate.

Table 3.6. Estimated Cost for the Third Candidate, Baht.

Cost Item		Amount
Development Cost		
Personnel		
1	System Analyst (1 @ 250 hours/each 400 Baht/hr)	100,000
1	Programmer (1 @ 200 hours/each 400Baht/hr)	80,000
3	System Architecture (1 @ 200 hours/each 400Baht/hr)	80,000
1	Database Specialist (1 @ 50 hours/each 500Baht/hr)	25,000
Expenses		
9	Training Cost (10,000/Course)	90,000
Hardware & Software		
1	Server	100,000
9	Workstation (30,000/unit)	270,000
1	Server Software (OS)	65,000
9	Workstation Software (OS)	90,000
1	DBMS Software for server	90,000
9	DBMS Client	90,000
1	Laser Printer	40,000
7	Dot-matrix printer	42,000
1	UPS	15,000
1	HUB	5,000
Unshielded Twisted Pair (UTP)		2,000
9	Express Software License	1,200,000
6	Barcode Scanner	60,000
6	Leased Line Installation	400,000
Total Development Cost		2,844,000
Project Annual Operating Cost		
Personnel		
1	Manager (30,000/Person/Month)	360,000
2	Officer at center (15,000/Person/Month)	360,000
6	Staff at shop (8,500/Person/Month)	612,000
1	IT Specialist (20,000/Person/Month)	240,000
Expenses		
1	General Maintenance Cost (10,000/Month)	120,000
2	Maintenance Agreement for 3 Servers	60,000
1	Maintenance Agreement for Application Software (Outsourcing)	300,000
1	Utility Cost (20,000/Month)	240,000
6	Leased Line (6,000 Baht / Month)	432,000
Preprinted forms (30000/year @ 0.25Baht/form)		30,000
Total Project Annual Operating Costs		2,754,000

Table 3.7. Payback Analysis for the Third Candidate, Baht.

Cash Flow Description	Years					
	0	1	2	3	4	5
Development Cost	-2,844,000					
Maintenance Cost	-	-2,754,000	-3,029,400	-3,332,340	-3,665,574	-4,032,131
Discount factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost (adjusted to present value)	-2,844,000	-2,459,322	-2,414,432	-2,372,626	-2,331,305	-2,286,219
Cumulative time-adjusted costs over lifetime	-2,844,000	-5,303,322	-7,717,754	-10,090,380	-12,421,685	-14,707,903
Benefits derived from operation of new system	0	3,600,000	4,212,000	4,928,040	5,765,807	6,745,994
Discount factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (current of present value)	0	3,214,800	3,356,964	3,508,764	3,667,053	3,824,979
Cumulative time-adjusted benefits over lifetime	0	3,214,800	6,571,764	10,080,528	13,747,582	17,572,560
	0	1	2	3	4	5
Cumulative lifetime Time-adjusted costs + Benefits	-2,844,000	-2,088,522	-1,145,990	-9,851	1,325,897	2,864,657

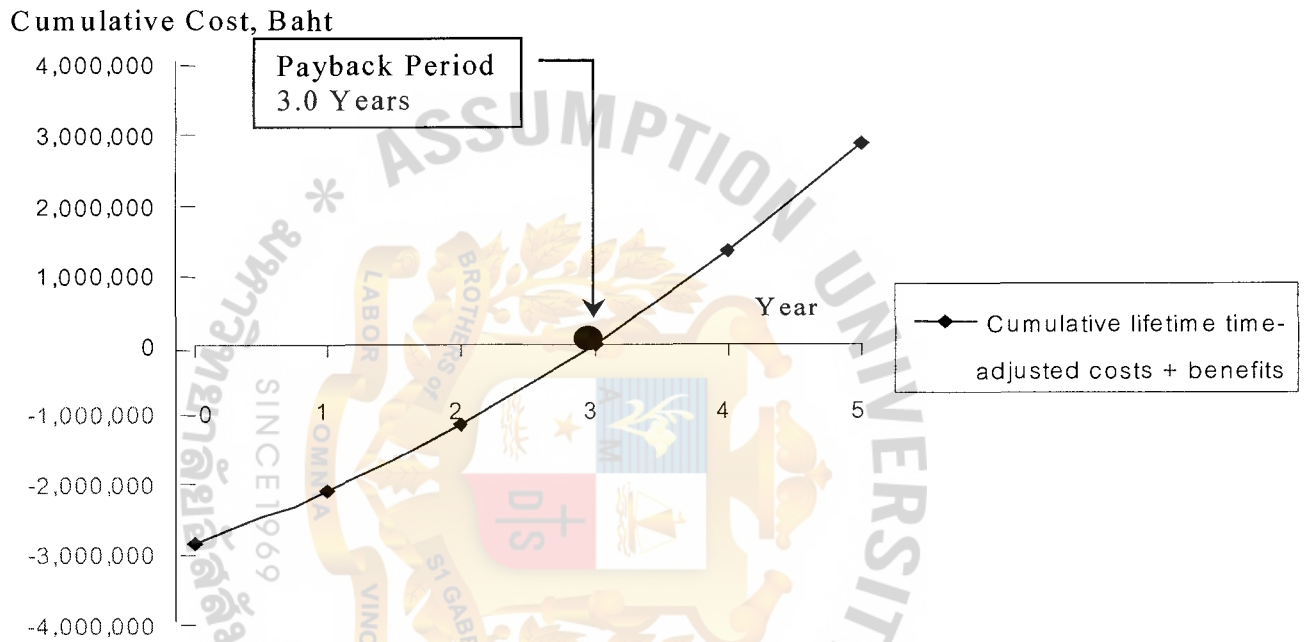

Figure 3.3. Payback Period of the Third Candidate.

3.3 Feasibility Analysis

For the project, cost and benefit will be analyzed for the proposed system. The proposed system should decrease cost while increasing benefit.

Processing analysis should be based on feasibility analysis and cost-benefit analysis techniques.

Feasibility analysis is a measure of how beneficial the development of an information system would be to an organization. Feasibility analysis is the process by which we measure feasibility. It is an ongoing evaluation of feasibility at various checkpoints in the life cycle. It measures four feasibility tests such as operational feasibility, technical feasibility, schedule feasibility, and economic feasibility.

Cost-benefit analysis determines if the project or solution is cost-effective and if lifetime benefits will exceed lifetime costs. There are two ways to measure cost effectiveness : payback analysis and net present value analysis.

Table 3.8. Feasibility Analysis Matrix.

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility Functionality. A description of to what degree the candidate would benefit the organization and how well the system would work. Political. A description of how well received this solution would be from both user management, user, and organization perspective.	30%	Fully supports user required functionality and also makes user satisfied because of the efficiency and accurately of the new system. Score: 100	Same as candidate 2 Score: 100	Only support some part of the requirement. The software can not support the item that is controled by serial. Moreover, current business processes would have to be modified to take advantage of software functionality. Score: 40

Table 3.8. Feasibility Analysis Matrix (Continued).

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Technical Feasibility Technology. An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate. Expertise. An assessment of the technical expertise needed to develop, operate, and maintain the candidate system.	30%	Although some technical staff have less of Developer 2000 experience, the SA recommend to use Developer 2000 because this program has a useful tool, support web based programming. Developer 2000 has a good trend in the IT market and of course the programmers of Developer 2000 are easy to find and at a much cheaper cost. Developer 2000 is a mature technology based on version number. Score: 95	Visual Basic.Net is software that is support web based programming. Also, it has a good trend in the IT market. Score: 90	The software is not good enough to serve multiple users to access at the same time. Also, difficult to modify because it is not flexible. Score: 45

Table 3.8. Feasibility Analysis Matrix (Continued).

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Economic Feasibility Cost to develop: Payback period (discounted): Net present value:	30%	 Approximately 2,050,000 Baht Approximately 2.0 years Approximately 2,770,519 Baht Score: 95	 Approximately 2,295,000 Baht Approximately 2.6 years Approximately 1,909,492 Baht Score: 80	. Approximately 1,986,500 Baht Approximately 3.0 years Approximately 2,864,657 Baht Score: 80
Schedule Feasibility An assessment of how long the solution will take to design and implement.	10%	4 Months. Score: 80	4 Months. Score: 80	.Less than 3 months. Score: 95
Ranking	100 %	92.5	87.5	65

After considering the candidate solutions and feasibility analysis, we should select the candidate 1 (In-houses) because it can satisfy the business requirement with lower cost.

3.5 Cost Analysis

3.5.1 Cost analysis of existing system.

There are three factors that effect the cost analysis for the system, which are development cost, and annual operating cost. The followings are the cost of the existing system.

Cost of existing system can be divided into 2 parts that are fixed cost and operation cost.

The fixed costs are as follows:		Baht
(1)	Computer (13@30,000)	390,000
(2)	Modem (6@2,500)	15,000

The operation cost of Existing System in the first year		Baht
(1)	Employee Salary	
	Manager (1@30,000)	360,000
	Officer at Center (6@15,000)	1,080,000
	Staff at Shop (6@8,500)	612,000
	Total Employee Salary Cost	2,052,000
(2)	Operating and Utility Cost (1@85,000)	1,020,000
	Total operation cost of Existing System	3,072,000

3.5.1 Benefit Analysis

The benefit of the proposed system over the existing system can be classified into two categories as follows:

Tangible Benefit

(1) Employee Salary

(2) Operating Cost

(3) Utility Cost

Intangible Benefit

(1) Improve efficiency and effectiveness of utilizing resources

(2) Improve efficiency and effectiveness of the operation of point of the sale system

(3) Improve data accuracy, consistency, and integrity

(4) Decrease working process and time consumption

(5) Decrease human error

(6) Increase customer satisfaction

(7) Increase productivity of point of sale system

(8) Provide reports for the management team in making decision and marking planning

(9) Provide management and control of point of sale system

3.5.2 Costs and Benefit Comparison

The principal objective of the comparison is to evaluate the break-even point of the cost and benefit of the current system and the proposed system. The break-even point represents the time when the benefit is equal to the investment cost.

The hardware and software cost will be amortized into 5 years. Therefore, the cost will be equal through year 1-5. The implement cost, in the first year, is numerous amounts due to installation of the both hardware and software. All costs except office equipment will be increased 10% every year.

Table 3.9. Cost Analysis of the Existing System, Baht.

Cost Items	Years				
	1	2	3	4	5
Fixed cost:					
Computer (13@30,000)	78,000	78,000	78,000	78,000	78,000
Modem (6@2,500)	3,000	3,000	3,000	3,000	3,000
Total Fixed Cost	81,000	81,000	81,000	81,000	81,000
Operating cost:					
Personnel Cost:					
Manager (1@30,000)	360,000	396,000	435,600	479,160	527,076
Officer at center (6@15,000)	1,080,000	1,188,000	1,306,800	1,437,480	1,581,228
Staff at shop (6@8,500)	612,000	673,200	740,520	814,572	896,029
Expense:					
Operating and Utility cost (1@85,000)	720,000	792,000	871,200	958,320	1,054,152
Total Operating Cost	2,772,000	3,049,200	3,354,120	3,689,532	4,058,485
Total Cost	2,853,000	3,130,200	3,435,120	3,770,532	4,139,485
Accumulated Cost	2,853,000	5,983,200	9,418,320	13,188,852	17,328,337

Table 3.10. Five Years Accumulated Existing System Cost, Baht.

Year	Total Existing System Cost	Accumulated Cost
1	2,853,000	2,853,000
2	3,130,200	5,983,200
3	3,435,120	9,418,320
4	3,770,532	13,188,852
5	4,139,485	17,328,337
Total	17,328,337	-

Table 3.11. Cost Analysis of the Proposed System, Baht.

Cost Items	Years				
	1	2	3	4	5
Fixed cost:					
Server(DBMS Server, Application Server, Web Server) (3@100,000)	60,000	60,000	60,000	60,000	60,000
Workstation (9@30,000)	54,000	54,000	54,000	54,000	54,000
Server Software (OS) (3@80,000)	48,000	48,000	48,000	48,000	42,000
Workstation Software (OS) (9@10,000)	18,000	18,000	18,000	18,000	18,000
DBMS Software for server(Oracle 9i) (1@90,000)	18,000	18,000	18,000	18,000	18,000
DBMS Client License (9@10,000)	18,000	18,000	18,000	18,000	18,000
Laser Printer (1@40,000)	8,000	8,000	8,000	8,000	8,000
Dot-matrix printer (7@6,000)	8,400	8,400	8,400	8,400	8,400
UPS (3 units, total 40,000)	8,000	8,000	8,000	8,000	8,000
HUB (5,000)	900	900	900	900	900
(UTP) (3,000)	600	600	600	600	600
6 Barcode Scanner (total 10,000)	12,000	12,000	12,000	12,000	12,000
Leased Line Installation (400,000)	80,000	80,000	80,000	80,000	80,000
Implementation Cost:					
System Analyst	75,000				
Programmer	120,000				
System Architecture	40,000				
Database Specialist	25,000				
Training	120,000				
Total Fixed Cost:	713,900	333,900	333,900	333,900	327,900
Operating cost:					
Personnel Cost:					
Manager (1@30,000/Month)	360,000	396,000	435,600	479,160	527,076
Officer (2@15,000/Month)	360,000	396,000	435,600	479,160	527,076
Staff at shop (6@8,500/Month)	612,000	673,200	740,520	814,572	896,029
IT Specialist (1@20,000/Month)	240,000	264,000	290,400	319,440	351,384
Expenses:					
General Maintenance Cost (11,000/Month)	132,000	145,200	159,720	175,692	193,261
Maintenance Agreement for Server (25,000/year)	25,000	27,500	30,250	33,275	36,603
Utility Cost (20,000/Month)	240,000	264,000	290,400	319,440	351,384
Leased Line (6,000 Baht / Month)	432,000	475,200	522,720	574,992	632,491
Preprinted forms (30,000/year @ 0.25Baht/form)	30,000	33,000	36,300	39,930	43,923
Total Operating cost	2,431,000	2,674,100	2,941,510	3,235,661	3,559,227
Total Computerized Cost	3,144,900	3,008,000	3,275,410	3,569,561	3,887,127
Accumulated Cost	3,144,900	6,152,900	9,428,310	12,997,871	16,884,998

Table 3.12. Five Years Accumulated Proposed System Cost, Baht.

Year	Total Proposed System Cost	Accumulated Cost
1	3,144,900	3,144,900
2	3,008,000	6,152,900
3	3,275,410	9,428,310
4	3,569,561	12,997,871
5	3,887,127	16,884,998
Total	16,884,998	-

The comparison of the system costs between Proposed System and Existing System, Baht.

Table 3.13. Five Years Accumulated Existing System Cost vs. Proposed System Cost, Baht.

Year	Accumulated Existing System Cost	Accumulated Proposed System Cost
1	2,853,000	3,005,900
2	5,983,200	6,013,900
3	9,418,320	9,289,310
4	13,188,852	12,858,871
5	17,328,337	16,745,998

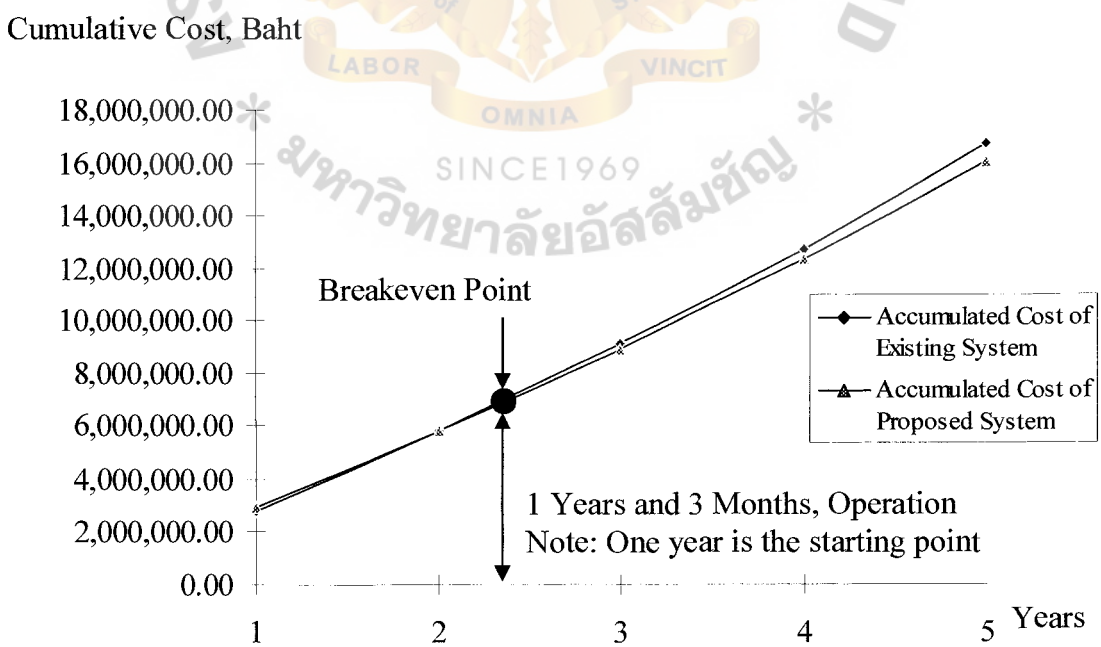

Figure 3.4. Cost Comparison between the Existing System and the Proposed System.

3.6 Hardware and Software Requirement

3.6.1 Network Requirement

The proposed system will use centralized database, a form of web base architecture. There are 3 servers at center, Database server, application server, and web server. At center, 3 workstations connect to server by LAN using Hub. At the shop, workstations connect to server at the center by using the leased line.

Figure 3.5 illustrates the network configuration of the proposed system.

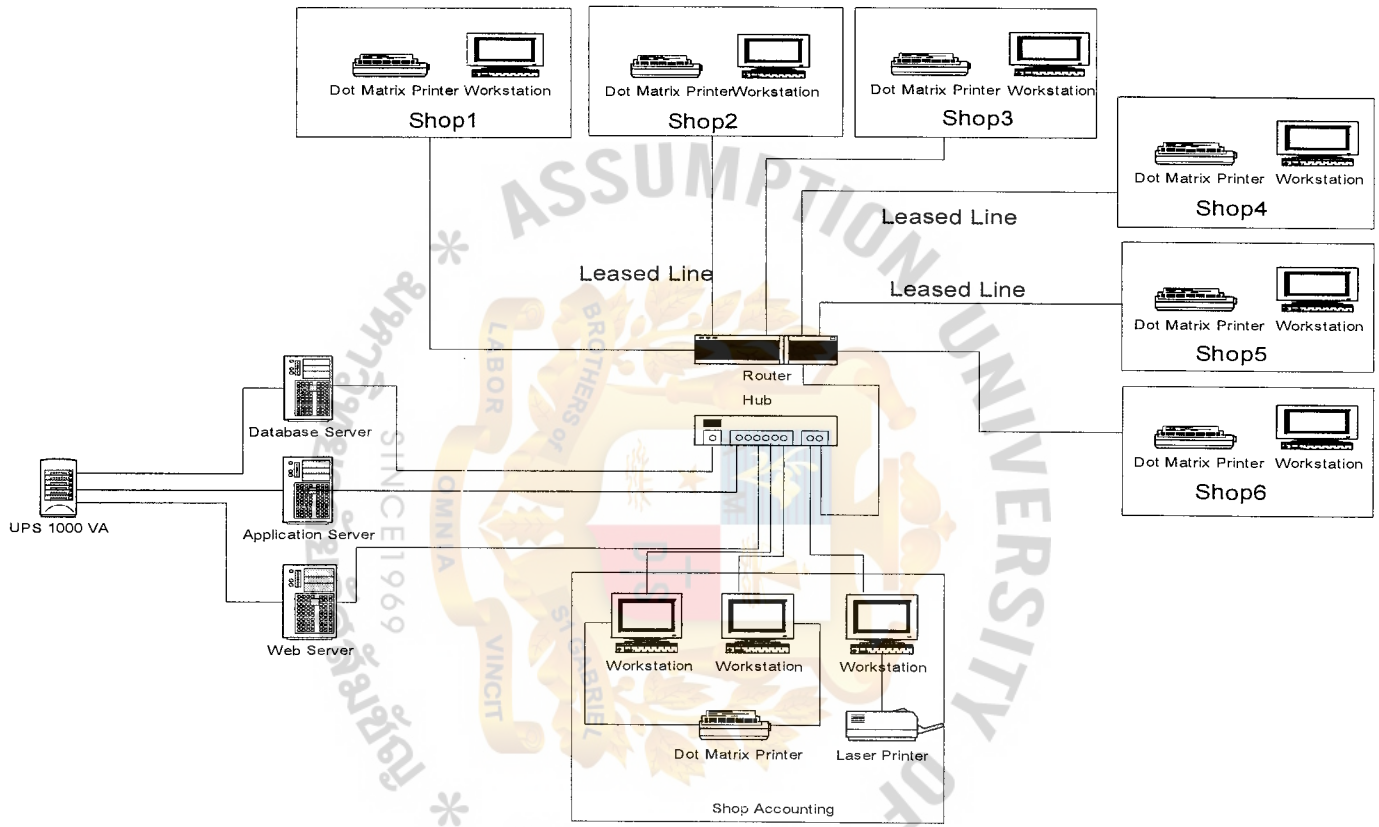

Figure 3.5. The Network Configuration of the Proposed System.

3.6.2 Hardware Requirement

All hardware needed to implement for the proposed system have to be purchased. The hardware requirements for the proposed system are as follows:

Table 3.14. The Hardware Specification for the Server.

Characteristics	Specification
CPU	Intel Pentium 4 Processor 1.6 GHz
Memory	256 MB
Hard disk	200 GB
CD-ROM Drive	52x CD-ROM Drive
Floppy Drive	1.44 MB diskette drive
Network Adapter	10/100 Ethernet NIC
Display	USB Internet Keyboard (104 key)
Mouse	Internet Scroll Mouse
Keyboard	15" SVGA Monitor

Table 3.15. The Software Specification for the Server.

Server	Software
Database Server	SCO Unix, Oracle 9I Database Software
Application Server	Windows 2000
Web Server	Windows 2000, Internet Explorer

Table 3.16. The Hardware Specification for Each Client.

Characteristics	Specification
CPU	Intel Pentium 3 Processor 1 GHz
Memory	256 MB
Hard disk	20 GB
CD-ROM Drive	52x CD-ROM Drive
Floppy Drive	1.44 MB diskette drive
Network Adapter	10/100 Ethernet NIC
Display	USB Internet Keyboard (104 key)
Mouse	Internet Scroll Mouse
Keyboard	15" SVGA Monitor

The client software are windows XP, Internet Explorer, and Janitiator Control Panel 1.1.8.7.

Table 3.17. Peripheral Specification for Center and Shop.

Hardware	Specification
Dot Matrix Printer	Epson LX-300+
Hub	10 Mbps Port or higher
Laser Printer	HP LaserJet 4
Barcode Scanner	Barcode Scanner

3.7 Security and Control

The Customer service & repair information is a valuable asset of the company. In addition, it is the highest confidential information of the company which cannot allow unauthorized people to access the information. Therefore, various methods are created to protect the system from all possible risks that can happen to the system.

The security and control of proposed system possesses the properties as follows:

3.7.1 User Identification

This method is used to ensure that only authorized users can enter the system and access the information. Each user at the shop and the center have a specific user name and password to log in into the system. Therefore, unauthorized people who do not have a username and password are not allowed to access the information area. Furthermore, both user name and password can also be used to limit the user access level to the information.

3.7.2 Data Entry Control (Input Control)

The input control is implemented through various checks incorporated in the programs. The program can be set to check every record entered. This method can ensure the correctness and completeness of data entry, so the company can ensure it has a good quality of data to analyze and generate reports.

3.7.3 Physical Security and System Security

The company should set the rules for using the computer to protect the physical components as well as the computer system:

(1) Do not use the computer without air-conditioning.

(2) Do not smoke near the computer.

(3) Do not eat or drink any food near the computer.

(4) Shut down the computer when not using it.

(5) Do not allow users to fix any physical part of the computer by themselves.

(6) Do not allow users to download any program into the computer by themselves.

(7) Users have to check virus before they open any file from diskette.

(8) All computers must have routine virus checks at a specified time every week.

3.7.4 Data Backup

Even though many rules are set to prevent any risk that can happen to the information, the routine system backup of all database files onto tape backup, CD-ROM and keeping it in the safe place are required at a specified time everyday in order to ensure that the data can be recovered when the system crashes or the database files in the server are destroyed.

IV. PROJECT IMPLEMENTATION

System Implementation is the conversion processes from an existing to a proposed information system. The final design should be evaluated first by the users and management teams to make sure that the new proposed system can meet the requirements and objectives, and then the other remaining processes will be performed. It is expected that the system implementation would take approximately 2 months. The duration may vary depending on the readiness of the staffs to use the new system. The process of the implementation are as follows:

(1) Software Development

(2) Hardware and network installation

(3) Testing

(4) Training

(5) Conversion

(6) Documentation

4.1 Software Development

Using Oracle Developer 2000 and Oracle9I as a database develops the Point of sale system. The proposed system is developed based on being user friendly and the capability in making reports. The system allows the user to add, edit and delete the data and also can search for desired data. In order to generate reports, the system will join tables in database and make the calculation in the required field based on user and management requirements.

4.2 Hardware and Network Installation

In order to establish the proposed system, the company requires new Database Server and Application Server and Web Server as shown in the Figure 3.5.

4.3 Testing

After the program has been designed and installed, module testing, unit or program testing, and integrated testing is required to ensure that the new system has less errors and can work well with the other systems in the company.

Before testing, the system analyst should prepare test case, then they will test by following the test case. Module testing would help to check errors in the program module. It can detect errors in coding and errors in logic. After finishing all module testing, unit or program testing is used to check the program to verify the way of the system working and to check whether each module can work together or not. Integrated testing is checked to see whether the proposed system can share data or work with the other existing systems properly. When all testing is finished, the testing document plans and testing results should be made, so that when the company has to do testing again in the future, programmers can use these plans and results to do the testing again.

4.4 Training

The user training course is an important process in system implementation. The objective of training courses is to make users understand, become familiar and be able to use the program correctly. The training courses should include computer concepts, functions of hardware and software, functions of the proposed system and how to use the system properly and efficiently. Users should be given the system manual, class lecture about the procedure and hands on experience on using the new equipment. Furthermore, users also should be supervised by the programmer or the system analyst when initially using the system. After training, users can be trusted in using the computer and can use it to provide a good job.

4.5 Conversion

Conversion is the process of changing from an existing manual system to a new proposed system. Before making a conversion, they should convert the old data in the excel file to the new Oracle database in a specific table with the new data format.

For Digital Mobile Shop of customer service and repair system, the location conversion approach will be used. With this approach, at the first state, one shop will be chosen to use the new system that runs parallel with the manual system. As soon as the shop has approved the system, it can be farmed out to the other shops. Other shops can be cut over abruptly because major errors have been fixed. Furthermore, other shops benefit from the learning experiences of the first test site.

4.6 Documentation

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

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This report is mostly concerned with the design of customer service and repair system. The existing system raises many issues and problems such as time consumed for the operation process, difficult to generate report, working redundancy, and etc. A new computerized system for the customer service and repair is designed to replace the manual system. It is expected to provide issuing tax invoice to customers quickly, and control the job order in each shop. It also provides more up to date information for decision making. Moreover, it provides convenience and fast services for recording, finding or reporting the sale information.

In order to analyze the major factors that have affected the process, cost-benefit analysis and uncertain events should be examined.

The study has proposed a new system for efficient customer service and repair system. The context diagram of the proposed system demonstrates the system. The database management system also enables better point of sale operation than the old process does. It provides an effective system, which increases efficiency in point of sale.

After the system survey, the information has been collected in order to support the system design process. Valuable information was received from investigating, analyzing and classifying the function and activities of the operation.

The proposed system will directly benefit staffs who can reduce workload. The managers will get better reports in a more timely manner that can better facilitate their decision making and provide them with more thorough looks at the operation and control. In addition, customers will get better and faster services from the staffs that make customer satisfaction.

Table 5.1 shows achievements of the proposed system over the existing system.

(1) Table Reference maintenance process

Staffs do not need much time to maintain the Table Reference.

(2) Job Order process

Staffs need less time to record job order information, repair information , update status of job order, closed job order and easy to follow up job order by the system.

(3) Service Charge process

Staffs do not need much time to check the service charge information when finished to repair and customers received the product.

(4) End of Day Activities Process

Staffs at the shop and officers at the center 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. Moreover, service charge transaction will be transfered to P.O.S system in the right data format.

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

Process	Existing System	Proposed System
Table Reference maintenance process	5 Minutes	1 Minute
Job Order process	10 Minutes	5 Minutes
Service Charge Process	10 Minutes	5 Minute
End of Day Activities Process	3 Hours	3 Minutes

5.2 Recommendations

The proposed system does not only help the user to get rid of tedious tasks, but also provides efficient and effective performance in the point of service and repair at the shop. The users can use PC client to perform their tasks accurately and quickly. Also, it can make the customer satisfied.

In the future, this system can be expanded and connected with other computerized systems such as purchasing, financial or general ledger, if the business operation expands to that level. Both internal and external factors such as political, infrastructure, financial position must be concerned in order to introduce new systems to the company. Electronic commerce should not be ignored by the organization so that it can enhance more customer satisfaction by letting customers order their required products in front of their computers. This provides a lot of convenience.

Customer Relationship Management (CRM) and Data Warehouse should be considered to link to the system in the future for analyzing, finding the need of customers, and for planning.

Finally, the system security must be adapted to suit the new systems. System monitoring must be done periodically in order to suitably support increasing business operation.

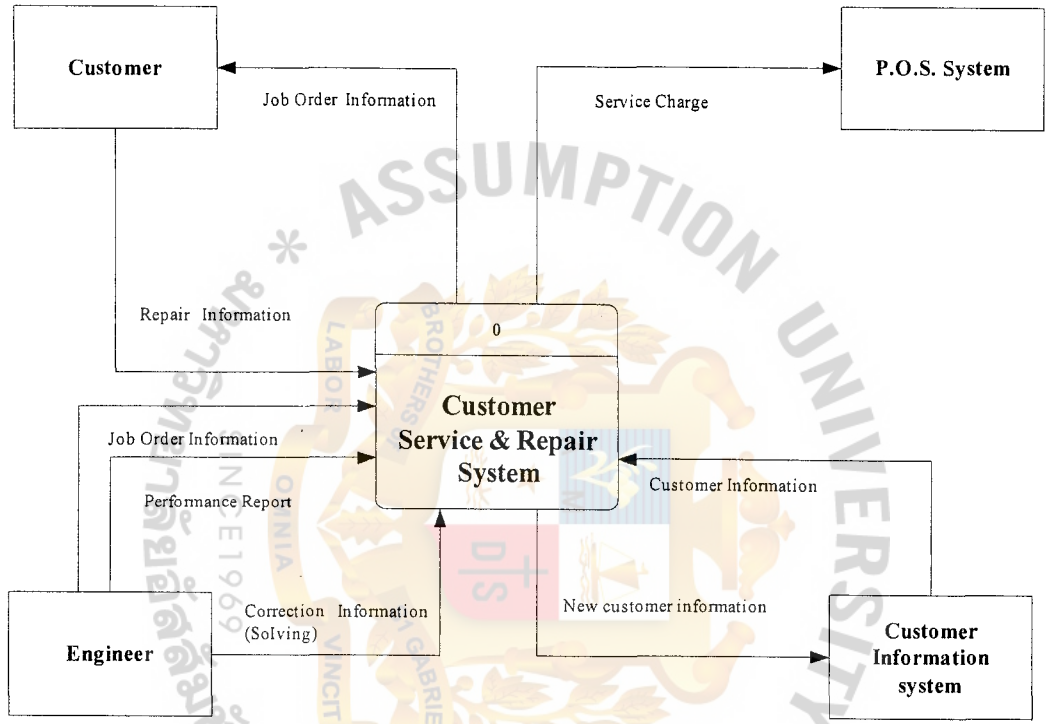

Figure A.1. Context Diagram of Digital Mobile Shop of Customer Service & Repair System.

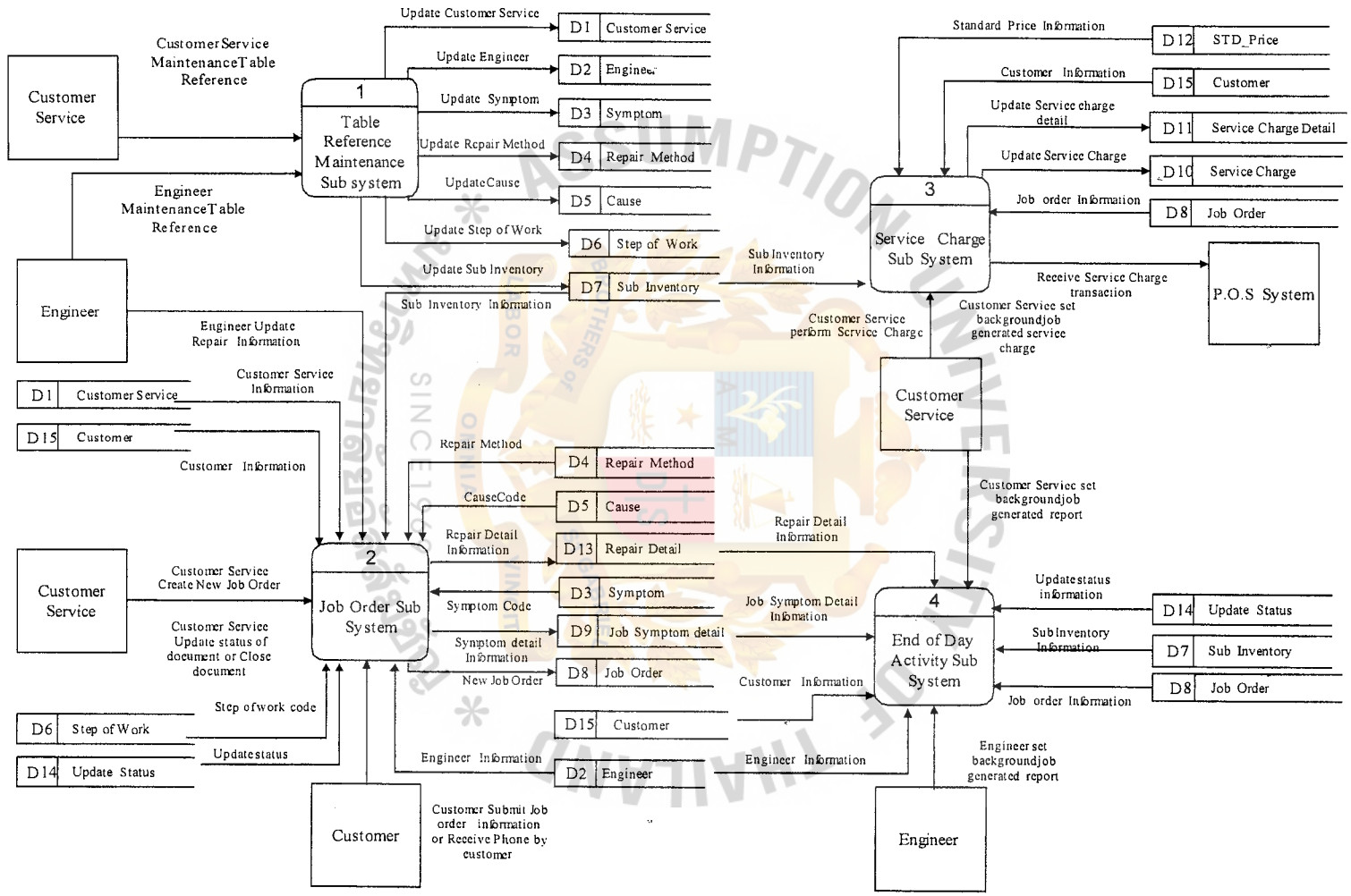

Figure A.2. Data Flow Diagram Level 0 of Digital Mobile Shop of Customer Service & Repair System.

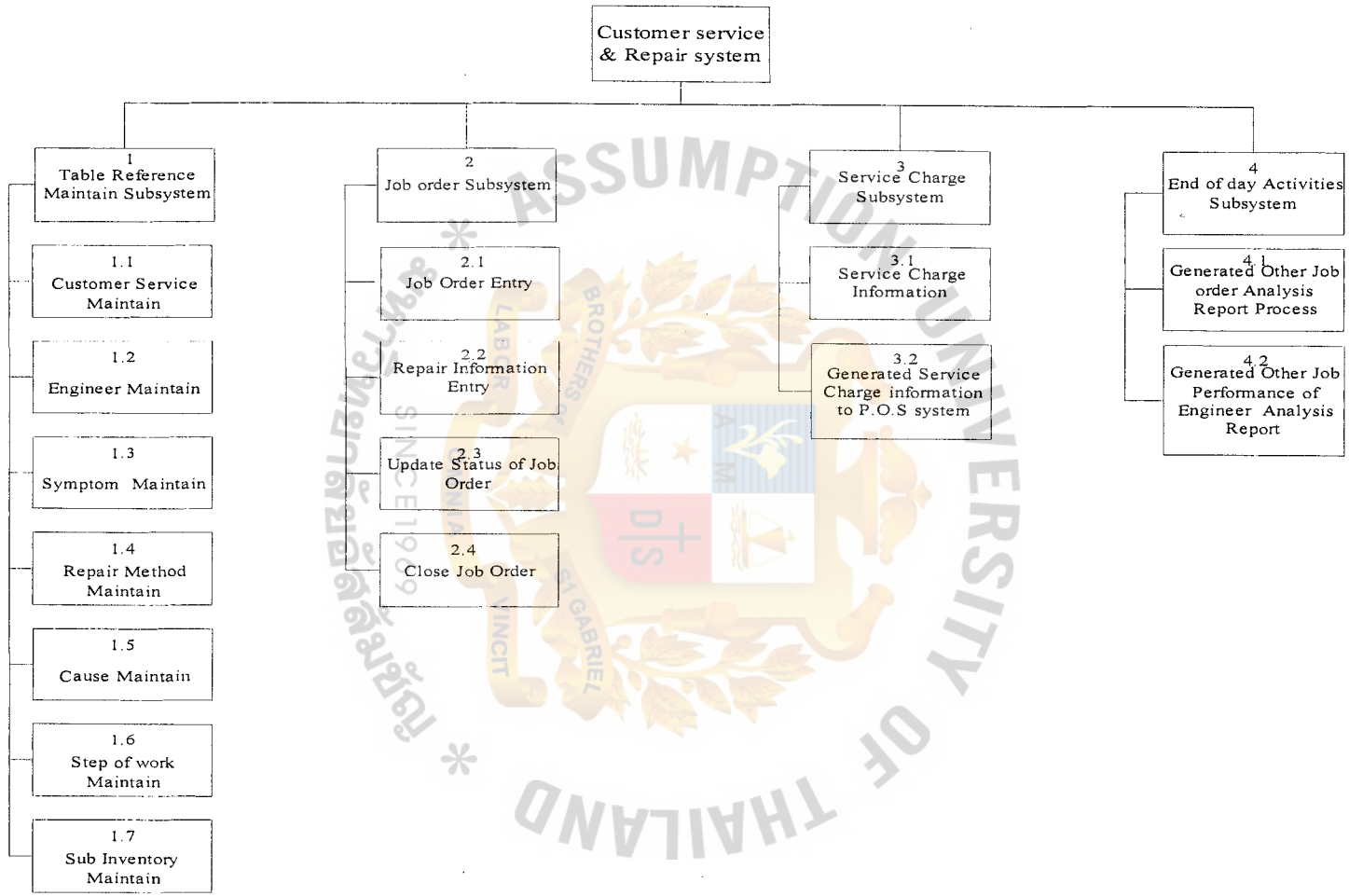

Figure A.3. Functional Decomposition Diagram of Digital Mobile Shop of Customer Service and Repair System.

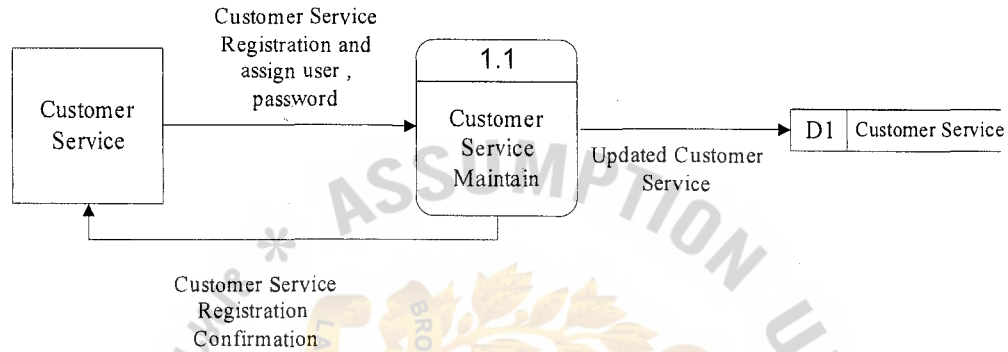

Figure A.4. Customer Service Maintain of Digital Mobile Shop of Customer Service and Repair System.

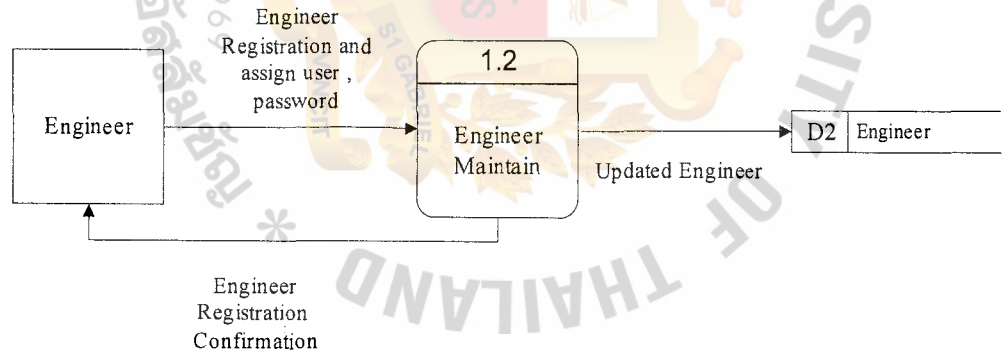

Figure A.5. Engineer Maintain of Digital Mobile Shop of Customer Service and Repair System.

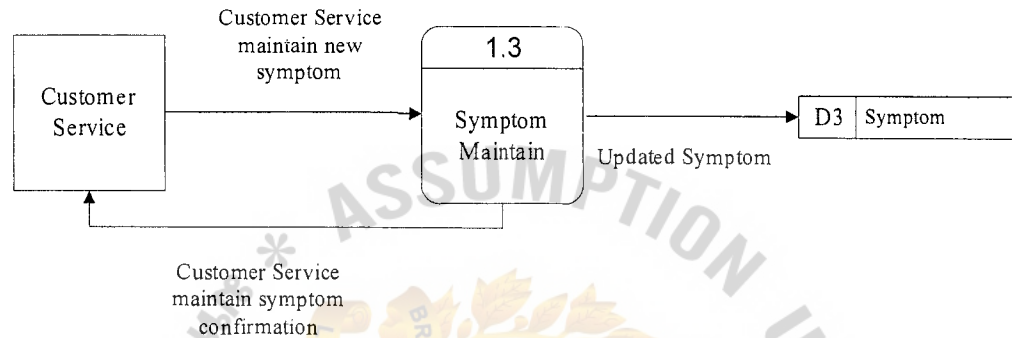

Figure A.6. Symptom Maintain of Digital Mobile Shop of Customer Service and Repair System.

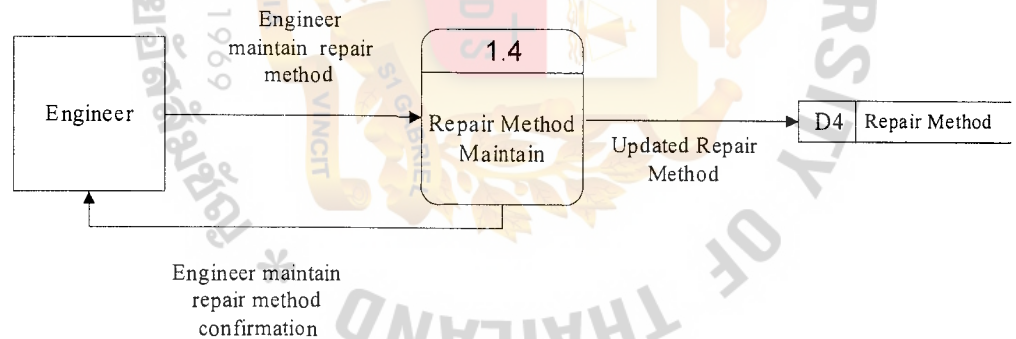

Figure A.7. Repair Method Maintain of Digital Mobile Shop of Customer Service and Repair System.

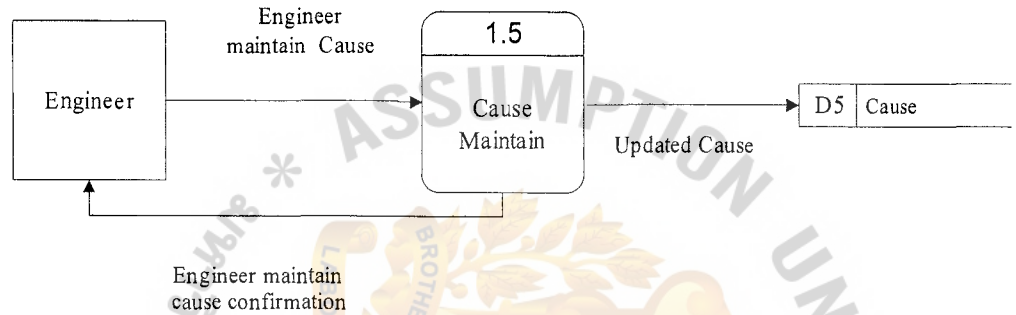

Figure A.8. Cause Maintain of Digital Mobile Shop of Customer Service and Repair System.

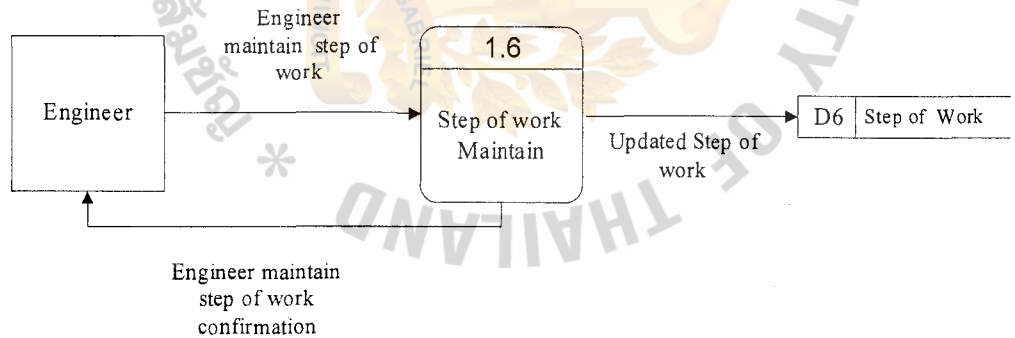

Figure A.9. Step of Work Maintain of Digital Mobile Shop of Customer Service and Repair System.

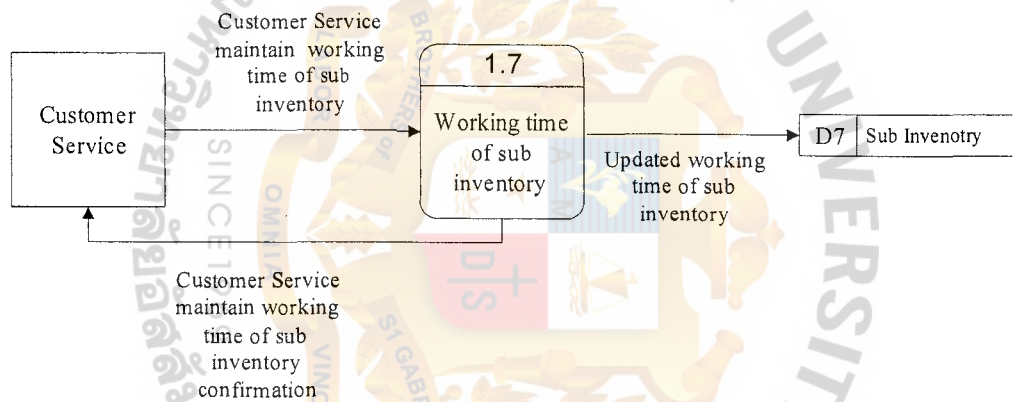

Figure A.10. Working Time of Sub Inventory Maintain of Digital Mobile Shop of Customer Service and Repair System.

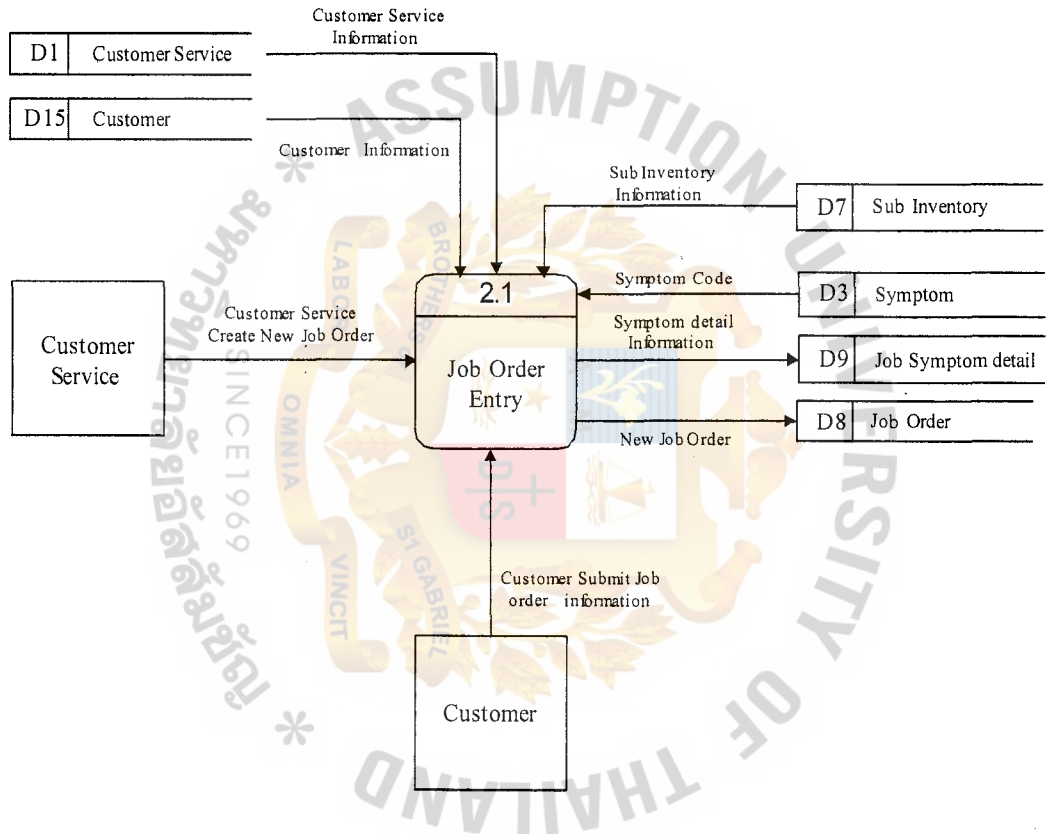

Figure A.11. Job Order Entry of Digital Mobile Shop of Customer Service and Repair System.

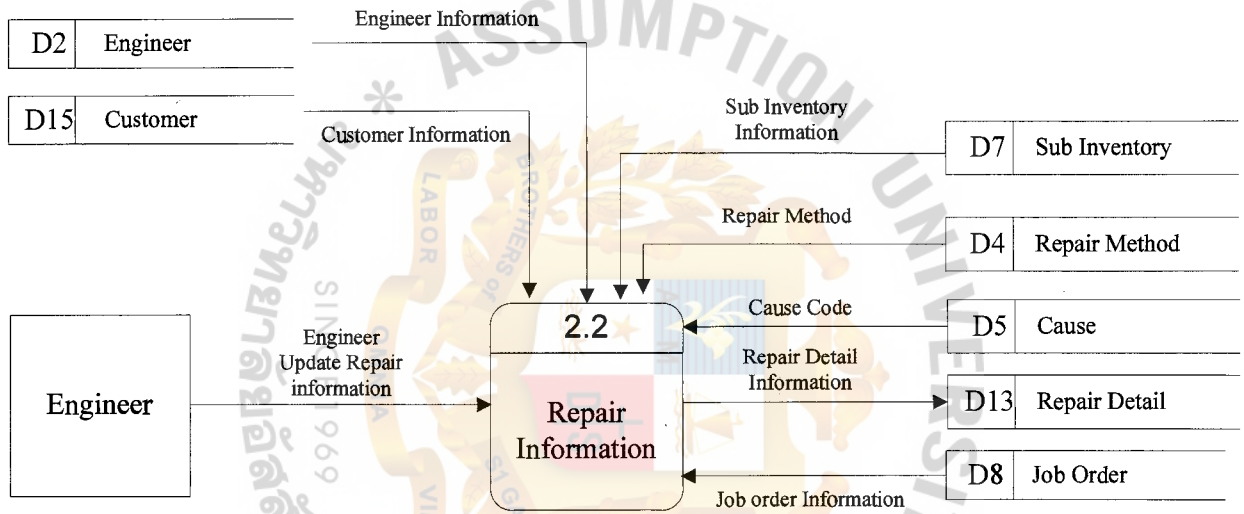

Figure A.12. Update Repair Information of Digital Mobile Shop of Customer Service and Repair System.

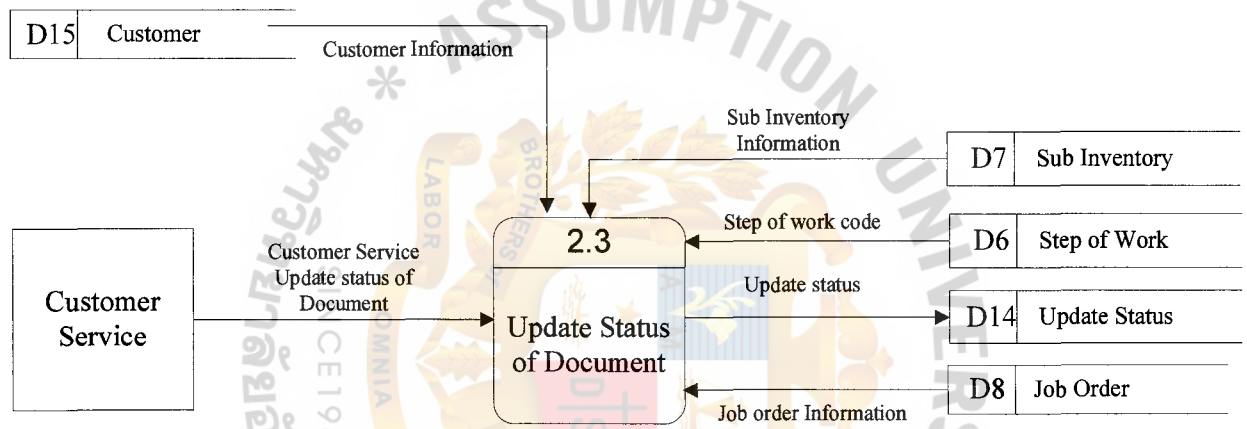

Figure A.13. Update Status of Job Order of Digital Mobile Shop of Customer Service and Repair System.

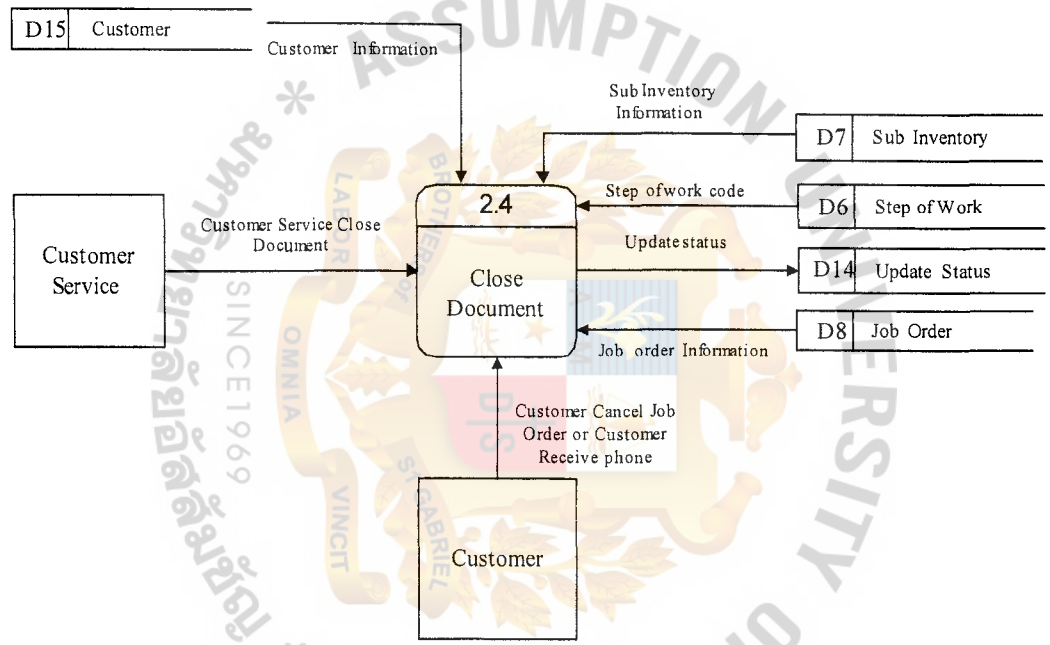

Figure A.14. Close Document of Digital Mobile Shop of Customer Service and Repair System.

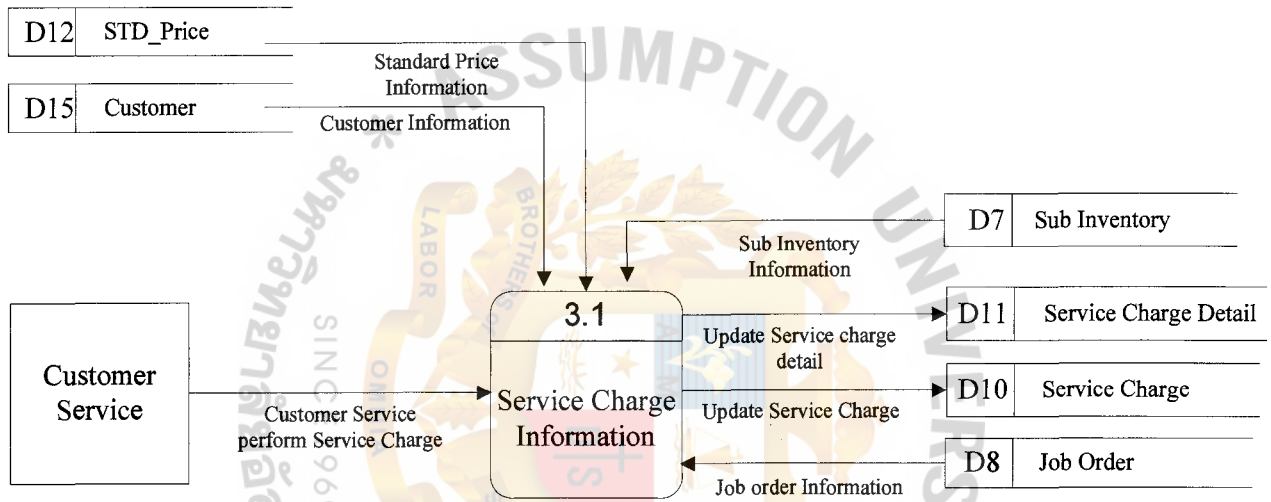

Figure A.15. Service Charge Information of Digital Mobile Shop of Customer Service and Repair System.

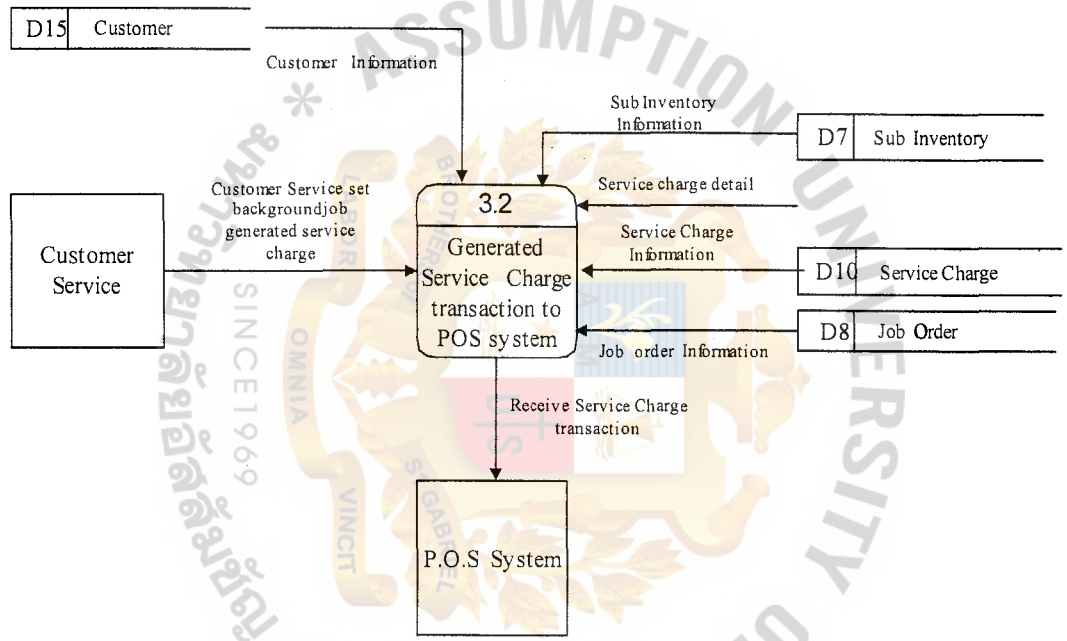

Figure A.16. Generated Service Charge Transaction to P.O.S system of Digital Mobile Shop of Customer Service and Repair System.

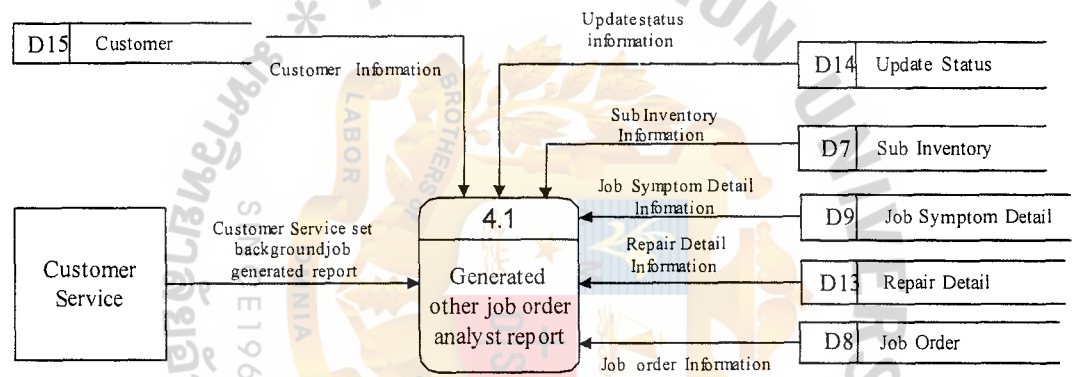

Figure A.17. Generated other Job Order Analyst Report of Digital Mobile Shop of Customer Service and Repair System.

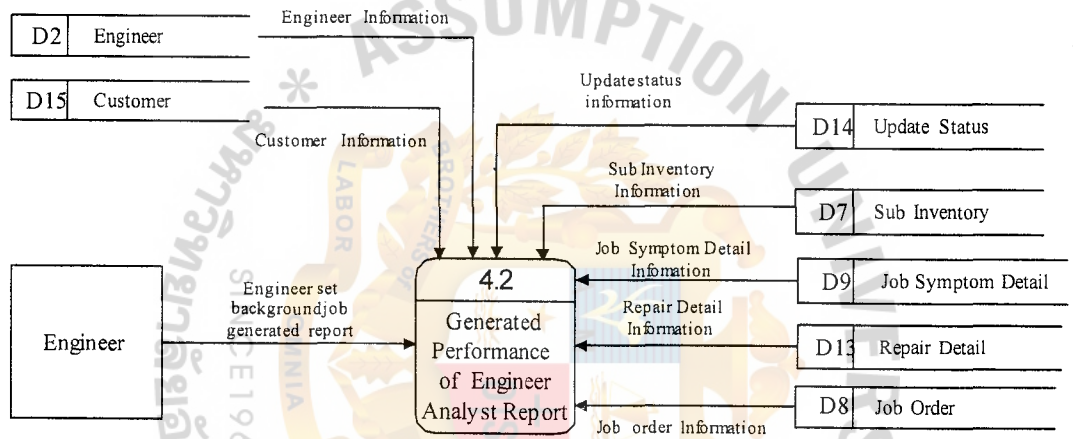

Figure A.18. Generated Performance of Engineer Analyst Report of Digital Mobile Shop of Customer Service and Repair System.

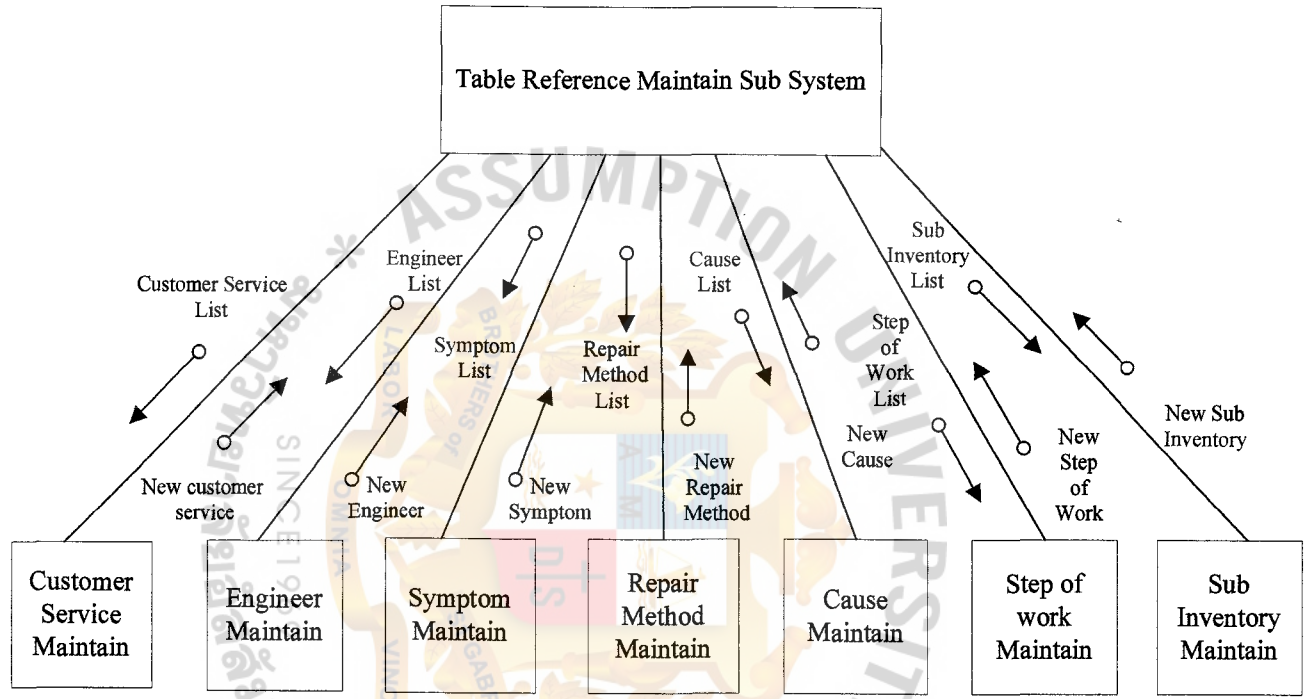

Figure B.1. Table Reference Maintain Process Structure Chart.

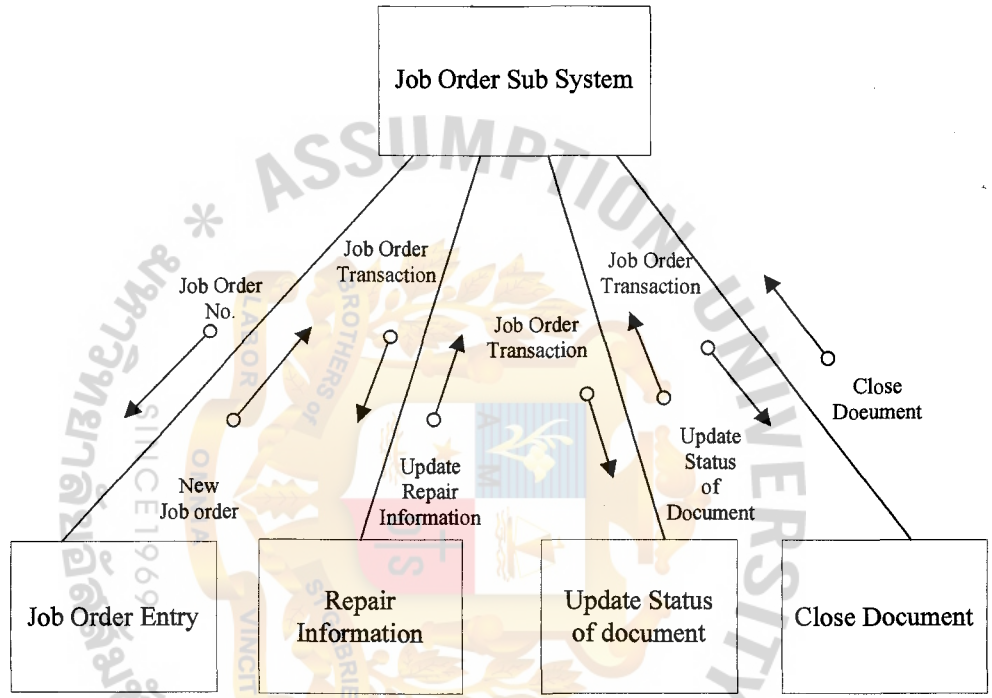

Figure B.2. Job Order Process Structure Chart.

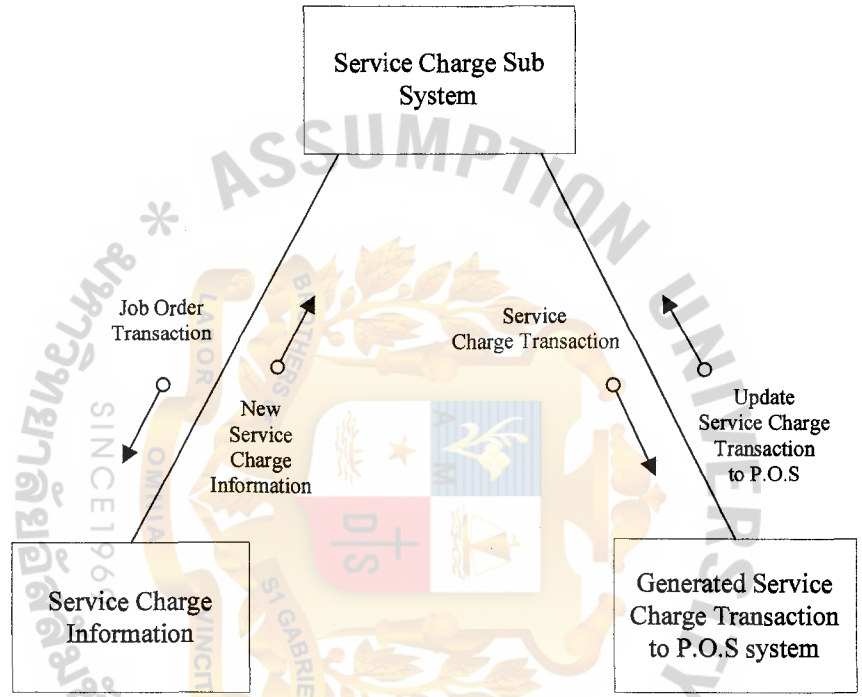

Figure B.3. Service Charge Process Structure Chart.

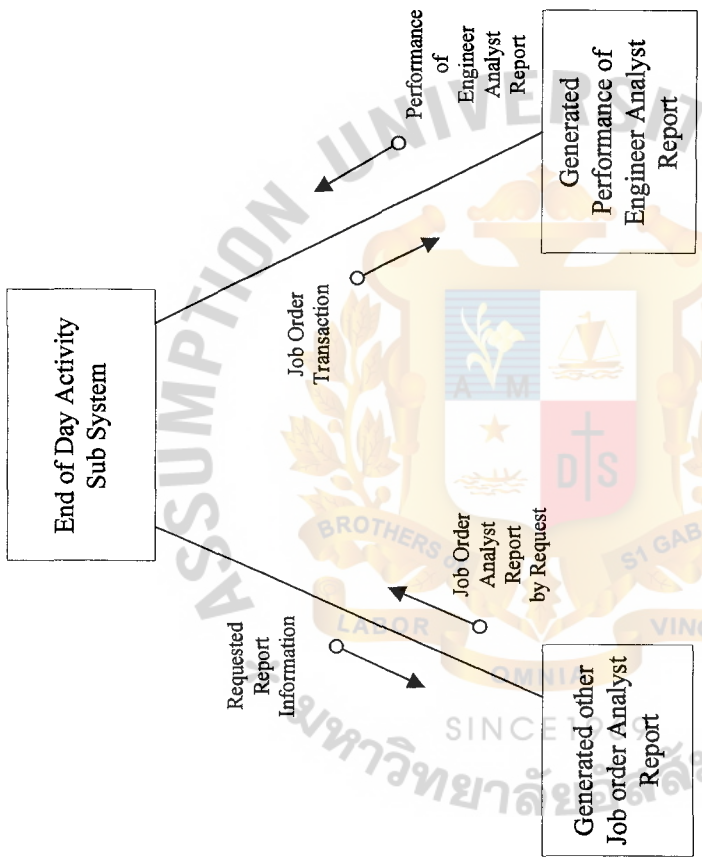

Figure B.4. End of Day Activity Process Structure Chart.

PROCESS SPECIFICATION

Table C.1. Process Specification of Process 1.1.

Data Item	Description
Process Name:	Customer Service Maintain
Data In:	Customer Service Code, Name, Password Require, Inactive
Data Out:	Inactive date and time
Process:	Checking exist Customer Service and update or add customer service
Attachment	Customer Service File

Table C.2. Process Specification of Process 1.2.

Data Item	Description
Process Name:	Engineer Maintain
Data In:	Engineer Code, Name, Password Require, Inactive
Data Out:	Inactive date and time
Process:	Checking exist Engineer and update or add Engineer
Attachment	Engineer File

Table C.3. Process Specification of Process 1.3.

Data Item	Description
Process Name:	Symptom Maintain
Data In:	Symptom Code, Description, Days, Hours, Minute, Inactive
Data Out:	Inactive date and time
Process:	Checking exist Symptom Code and update or add Symptom
Attachment	Symptom File

Table C.4. Process Specification of Process 1.4.

Data Item	Description
Process Name:	Repair Method Maintain
Data In:	Repair Method Code, Description, Inactive
Data Out:	Inactive date and time
Process:	Checking exist Repair Method Code and update or add Repair Method
Attachment	Repair Method File

Table C.5. Process Specification of Process 1.5.

Data Item	Description
Process Name:	Cause Maintain
Data In:	Cause Code, Description, Days, Hours, Minute, Inactive
Data Out:	Inactive date and time
Process:	Checking exist Cause Code and update or add Cause
Attachment	Cause File

Table C.6. Process Specification of Process 1.6.

Data Item	Description
Process Name:	Step of work Maintain
Data In:	Step of work Code, Description, Inactive
Data Out:	Inactive date and time
Process:	Checking exist Step of work Code and update or add Step of work
Attachment	Step of work File

Table C.7. Process Specification of Process 1.7.

Data Item	Description
Process Name:	Sub Inventory Maintain
Data In:	Sub Inventory Code, Start date, End date, working time (hours)
Data Out:	-
Process:	Checking exist Sub Inventory Code and update or add Sub Inventory
Attachment	Sub Inventory File

Table C.8. Process Specification of Process 2.1.

Data Item	Description
Process Name:	Job Order Entry
Data In:	Sub Inventory, Job order date, Job Order No., Customer Code, Customer service code, IMEI, Item code, phone no., SIM code Remark, Symptom code
Data Out:	Job order no, customer name, customer address, item description, Symptom description
Process:	1. Check existed job order no. if found will select information shown on screen 2. If job order no. not found, will generated new job order no. 3. Used Customer code to find the customer name and address from Customer file shown on screen. 4. Used Customer Service code to find the customer service name from customer service file shown on screen. 5. Used item code find item description from Item file (POS system) shown on screen 6. Used Symptom code find symptom description, days, hours, minutes from Symptom file shown on screen 7. When user presses save button, will record all field into job order file and job symptom detail.
Attachment	Job order File, Customer File, Customer Service File, Symptom File, Job symptom detail

Table C.9. Process Specification of Process 2.2.

Data Item	Description
Process Name:	Repair Information
Data In:	Sub Inventory, Job order date, Job Order No., Engineer code, Finished date, Finished time, Cause code, Repair Method code.
Data Out:	Customer code, Customer name, Customer address, IMEI, item code, item description, Engineer name, cause description, Repair method description
Process:	1. Check existed job order no. if found will select job order information shown on screen 2. Used Engineer code to find the Engineer name from Engineer file shown on screen. 3. Used Cause code to find the Cause description from Cause file shown on screen. 4. Used Repair Method code find Repair Method description from Repair Method file shown on screen 5. When user presses save button, will record all field into job order file and Job Repair detail.
Attachment	Job order File, Repair Method File, Cause File, Repair Detail

Table C.10. Process Specification of Process 2.3.

Data Item	Description
Process Name:	Update status of document
Data In:	Job Order No., Step of work code, Document reference, Remark
Data Out:	Customer code, Customer name, Job order date, Job order time
Process:	1. Check existed job order no. if found will select job order information shown on screen 2. Used Step or work code to find the Step of work description from Step of work file shown on screen. 3. Used Sub Inventory and job order to find last step of work to shown on screen 4. When user presses save button, will record all field into Update status File
Attachment	Job order File, Step of work File, Sub Inventory, Update status

Table C.11. Process Specification of Process 2.4.

Data Item	Description
Process Name:	Close of document
Data In:	Job Order No., Select process, Completed, Cancel
Data Out:	Customer code, Customer name, Job order date, Job order time
Process:	1. Check existed job order no. if found will select job order information shown on screen 2. When user presses save button, will record all field into Update status file.
Attachment	Job order File, Update status File, Sub Inventory, Step of work File.

Table C.12. Process Specification of Process 3.1.

Data Item	Description
Process Name:	Service Charge Information
Data In:	Sub Inventory, Service Charge date, Service Charge No., Job order no., Item code, Qty, Discount, Refer invoice, vat code, discount percent
Data Out:	Job order date, Job order time, Customer code, Customer name, Customer address, status of job order, item description, Price per unit, Amount, Total, Vat amount, Net Total
Process:	1. Check existed Service Charge no. and job order no. if found will select job order information shown on screen 2. Used item code find item description from Item file (POS system) and find unit price from STD_price shown on screen 3. Calculate amount by qty * unit price – discount 4. Calculate Total by sum each item of amount. 5. Calculate Vat amount by Total * vat percent. 6. Calculate Net total by Total – Vat amount. 7. When user presses save button, will record all field into Service Charge and Service Charge detail.
Attachment	Job order File, Service charge, Service charge detail, STD_PRICE File

Table C.13. Process Specification of Process 3.2

Data Item	Description
Process Name:	Generated Service Charge Information transaction to P.O.S system
Data In:	Sub Inventory, Service Charge date, Service Charge No., Job order no., Customer code
Data Out:	Sub Inventory, Service Charge date, Service Charge No., Job order no., Customer code, Net total
Process:	1. Check existed Service Charge date and Service Charge no. that generated by today and then select and update into P.O.S database
Attachment	Job order File, Service charge, Service charge detail, P.O.S database

Table C.14. Process Specification of Process 4.1.

Data Item	Description
Process Name:	Generated other job order analyst report
Data In:	Sub Inventory, Job order no., Job order date
Data Out:	Sub Inventory, Job order information, Repair information
Process:	Generated History item analyst report, Repair information report, Step of job order report, Job order detail report, Cause of job order report, Job order summary report, Job order analyst report.
Attachment	Job order File, Repair detail File, Job symptom detail File, Engineer File, Update status.

Table C.15. Process Specification of Process 4.2.

Data Item	Description
Process Name:	Generated other job performance of engineer analyst report
Data In:	Sub Inventory, Job order no., Job order date
Data Out:	Sub Inventory, Job order information, Performance of Engineer information
Process:	Generated performance of engineer analyst report.
Attachment	Job order File, Repair detail File, Job symptom detail File, Engineer File, Update status.

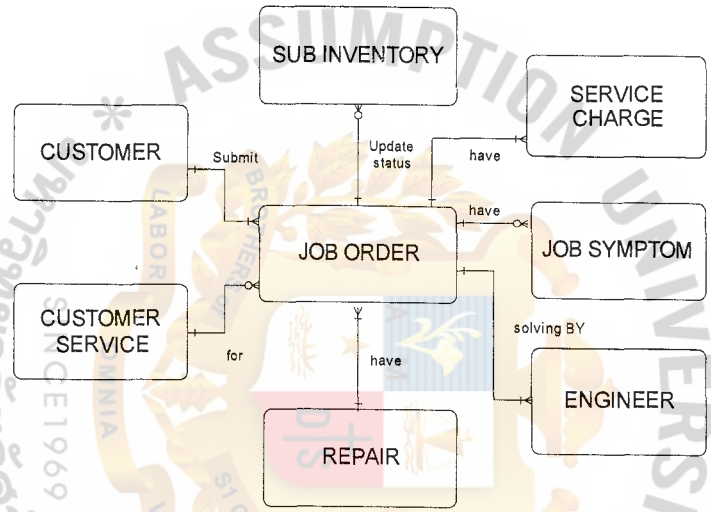

Figure D.1. Context Data Model of Digital Mobile Shop of Customer Service & Repair System.

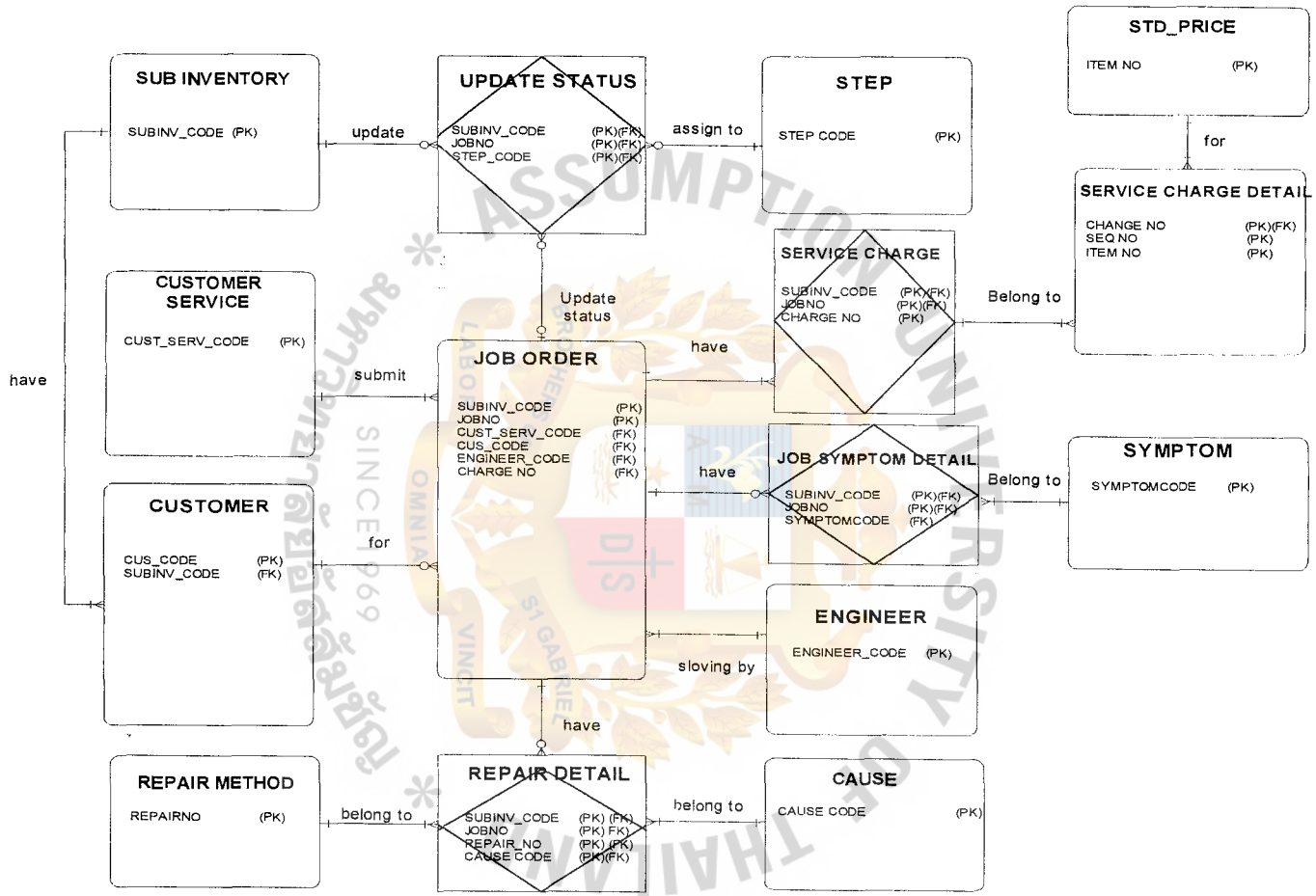

Figure D.2. Key-Base Data Model of Digital Mobile Shop of Customer Service & Repair System.

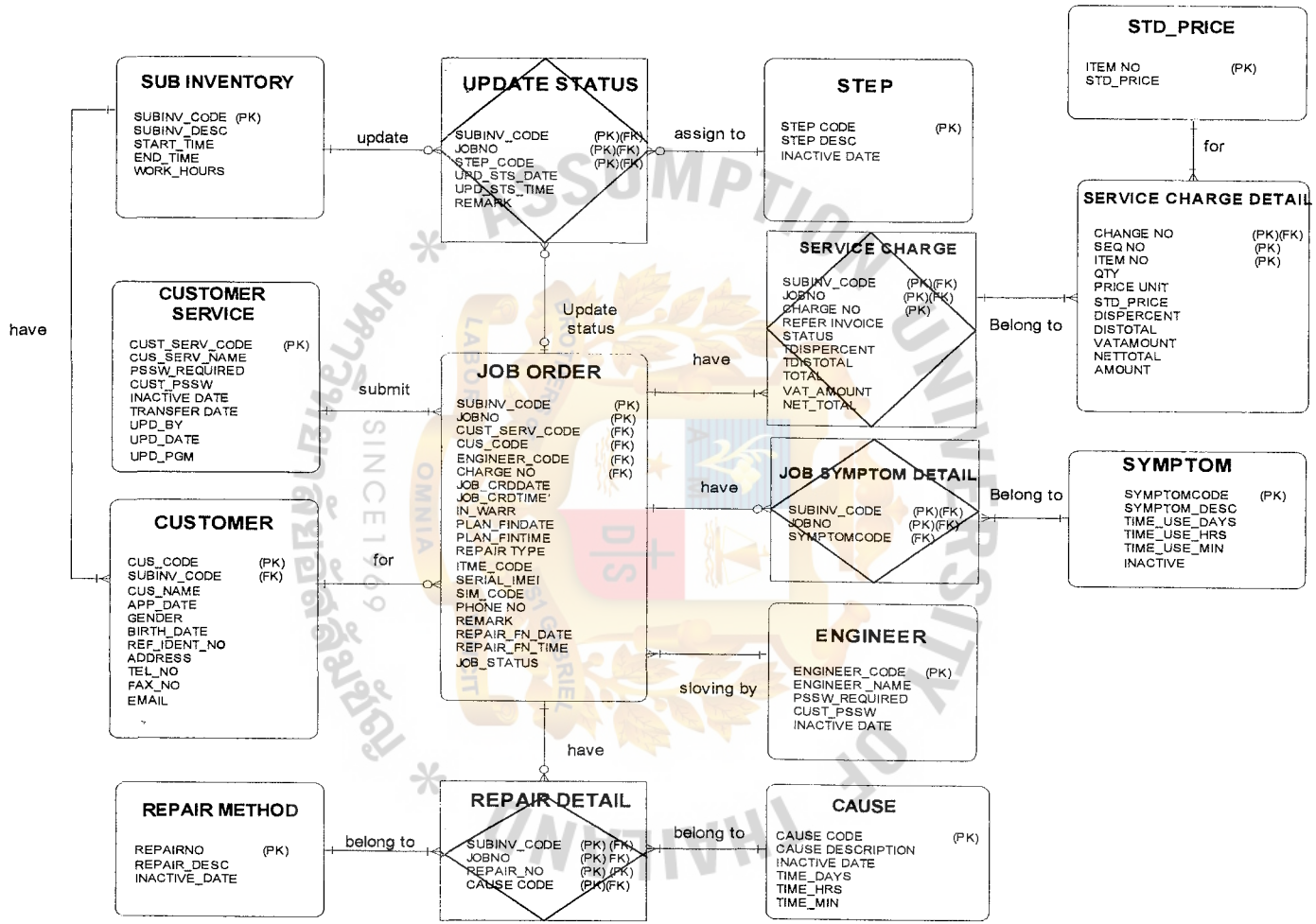

Figure D.3. Fully Attributed Data Model of Digital Mobile Shop of Customer Service & Repair System.

DATA STRUCTURE

Table E.1. Data Structure of Customer Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Subinv_code	Varchar2(4)	Y	Y		Job order, service charge, job symptom detail, repair detail, assign job, assign job detail	Primary Key
2	Cus_code	Varchar2(14)	Y	Y		Job order	Primary Key
3	Cust_name	Varchar2(120)	Y	Y			Attribute
4	App_date	Date					Attribute
5	Gender	Varchar2(1)	Y				Attribute
6	Birth_date	Date					Attribute
7	Address	Varchar2(500)					Attribute
8	Tel_no	Varchar2(50)			Y		Attribute
9	Fax_no	Varchar2(50)			Y		Attribute
10	Email	Varchar2(50)			Y		Attribute

Table E.2. Data Structure of Customer Service Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Cust_Serv_Code	Varchar2(15)	Y	Y		Job order	Primary Key
2	Cust_Serv_Name	Varchar2(120)	Y				Foreign Key
3	Pssw_Required	Varchar2(14)					Attribute
4	Cust_Pssw	Varchar2(20)					Attribute
5	Inactive date	Date			Y		Attribute

Table E.3. Data Structure of Engineer Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Engineer_code	Varchar2(14)	Y	Y		Job order	Primary Key
2	Engineer_Name	Varchar2(120)					Attribute
3	Pssw_Required	Varchar2(1)					Attribute
4	Engineer_Pssw	Varchar2(20)					Attribute
5	Inactive date	Date			Y		Attribute

Table E.4. Data Structure of Symptom Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Symptom code	Varchar2(5)	Y	Y		Job symptom detail	Primary Key
2	Sympotm Desc	Varchar2(100)					Attribute
3	Time_use_days	Number(5,2)			Y		Attribute
4	Time_use_hrs	Number(5,2)			Y		Attribute
5	Time_use_min	Number(5,2)			Y		Attribute

Table E.5. Data Structure of Repair Method Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Repair no	Varchar2(5)	Y	Y		Repair detail	Primary Key
2	Repair_Desc	Varchar2(100)					Attribute
3	Inactive date	date			Y		Attribute

Table E.6. Data Structure of Cause Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Cause code	Varchar2(5)	Y	Y		Repair Detail	Primary Key
2	Cause_Desc	Varchar2(100)					Attribute
3	Inactive date	date					Attribute
4	Time_use_days	Number(5,2)			Y		Attribute
5	Time_use_hrs	Number(5,2)			Y		Attribute
6	Time_use_min	Number(5,2)			Y		Attribute

Table E.7. Data Structure of Sub Inventory Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Subinv_code	Varchar2(4)	Y	Y		Job order, service charge, job symptom detail, repair detail, assign job, assign job detail	Primary Key
2	Subinv_desc	Varchar2(100)					Attribute
3	Start_time	Number(6)					Attribute
4	End_time	Number(6)					Attribute
5	Work_Hours	Number(5,2)					Attribute

Table E.8. Data Structure of Step of Work Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Step code	Varchar2(3)	Y	Y		Update status	Primary Key
2	Step Desc	Varchar2(100)					Attribute
3	Inactive date	date			Y		Attribute

Table E.9. Data Structure of Job Order Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Subinv_code	Varchar2(4)	Y	Y		Job order, service charge, job symptom detail, repair detail, assign job, assign job detail	Primary Key
2	Jobno	Varchar2(15)	Y	Y		Service charge, Job symptom detail , Update status, Repair detail	Primary Key
3	Cust_Serv_Code	Varchar2(15)	Y	Y		Job order	Foreign Key
4	Cus_code	Varchar2(14)	Y	Y		Job order	Foreign Key
5	Engineer_code	Varchar2(14)	Y	Y		Job order	Foreign Key
6	Job_Crddate	Date					Attribute
7	Job_Crdtime	Number(6)					Attribute
8	In_warr	Varchar2(4)					Attribute
9	Plan_findate	Date					Attribute
10	Plan_fintime	Number(6)					Attribute
11	Item_code	Varchar2(20)	Y				Attribute
12	Serial_imei	Varchar2(20)	Y	Y			Attribute

Table E.9. Data Structure of Job Order Table (Continued).

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
13	Sim_code	Varchar2(20)	Y	Y			Attribute
14	Phone_no	Varchar2(20)	Y	Y			Attribute
15	Remark	Varchar2(100)					Attribute
16	Repair_fn_date	Date					Attribute
17	Repair_fn_time	Number(6)					Attribute
18	Job_status	Varchar2(20)					Attribute

Table E.10. Data Structure of Job Symptom Detail Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Subinv_code	Varchar2(4)	Y	Y		Job order, service charge, job symptom detail, repair detail, assign job, assign job detail	Primary Key/ Foreign Key
2	Jobno	Varchar2(15)	Y	Y		Service charge, Job symptom detail , Update status, Repair detail	Primary Key / Foreign Key
3	Symptom code	Varchar2(5)	Y	Y			Foreign Key

Table E.11. Data Structure of Repair Detail Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Subinv_code	Varchar2(4)	Y	Y		Job order, service charge, job symptom detail, repair detail, assign job, assign job detail	Primary Key / Foreign Key
2	Jobno	Varchar2(15)	Y	Y		Service charge, Job symptom detail , Update status, Repair detail	Primary Key / Foreign Key
3	Repairno	Varchar2(5)	Y	Y		Repair detail	Primary Key / Foreign Key
4	Cause code	Varchar2(5)	Y	Y		Repair Detail	Primary Key / Foreign Key

Table E.12. Data Structure of Update Status Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Subinv_code	Varchar2(4)	Y	Y		Job order, service charge, job symptom detail, repair detail, assign job, assign job detail	Primary Key / Foreign Key
2	Jobno	Varchar2(15)	Y	Y		Service charge, Job symptom detail , Update status, Repair detail	Primary Key / Foreign Key
3	Step code	Varchar2(3)	Y	Y		Update status	Primary Key
4	Upd_sts_date	Date					Attribute
5	Upd_sts_time	Number(6)			Y		Attribute
6	Remark	Varchar2(100)					

Table E.13. Data Structure of Service Charge Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Subinv_code	Varchar2(4)	Y	Y		Job order, service charge, job symptom detail, repair detail, assign job, assign job detail	Primary Key / Foreign Key
2	Jobno	Varchar2(15)	Y	Y		Service charge, Job symptom detail , Update status, Repair detail	Primary Key / Foreign Key
3	Charge no	Varchar2(15)	Y	Y		Service charge detail	Primary Key
4	ReferInvoice	Varchar2(15)	Y	Y			Attribute
5	Status	Varchar2(1)					Attribute
6	Tdispercent	Number(5,2)					Attribute
7	Tdistotal	Number(12,2)					Attribute
8	Total	Number(12,2)					Attribute
9	Vat_amount	Number(12,2)					Attribute
10	Net_total	Number(12,2)					Attribute

Table E.14. Data Structure of Service Charge Detail Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Charge no	Varchar2(15)	Y	Y			Primary Key / Foreign Key
2	Seq no	Number(5)	Y	Y			Primary Key
3	Item_code	Varchar2(20)	Y				Primary Key
4	Qty	Number(12,2)					Attribute
5	Price_unit	Number(12,2)					Attribute
6	Std_price	Number(12,2)					Attribute
7	Dispercent	Number(5,2)					Attribute
8	Distotal	Number(12,2)					Attribute
9	Vat_amount	Number(12,2)					Attribute
10	Net_total	Number(12,2)					Attribute
11	Amount	Number(12,2)					Attribute

Table E.15. Data Structure of Standard Price Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key toTable	Key Type
1	Item code	Varchar2(20)	Y	Y			Primary Key
2	Std_price	Number(12,2)					Attribute

DATA DICTIONARY

Table F.1. Data Dictionary of Customer Table.

Field Name	Meaning
Subinv_code	Subinventory Code
Customer_id	Customer Code Format is cSSSSYYMMRRRRR C = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Cust_name	Customer Name
App_date	Application Date
Gender	Gender M = Male , F = Female
Birth_date	Date of Birth
Address	Address (Address + Tambon + Amphur + Tambon + Province + Postcode)
Tel_no	Telephone number
Fax_no	Fax number
Email	E-Mail Address

Table F.2. Data Dictionary of Customer Service Table.

Field Name	Meaning
Cust_Serv_Code	Customer Service Code Format is CSSSSSYYMMRRRRR CS = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Cust_Serv_Name	Customer Service Name
Pssw_Required	Y = Yes , N = No
Cust_Pssw	Customer password
Inactive date	Date of customer service active

Table F.3. Data Dictionary of Engineer Table.

Field Name	Meaning
Engineer_code	Engineer Code Format is ESSSSYYMMRRRRR E = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Engineer_Name	Engineer Name
Pssw_Required	Y = Yes , N = No
Engineer_Pssw	Engineer password
Inactive date	Date of Engineer active

Table F.4. Data Dictionary of Symptom Table.

Field Name	Meaning
Symptom code	Symptom code format is RRRRR RRRRR = Running no.
Sympotm Desc	Description
Time_use_days	Estimate time use for repair = Days
Time_use_hrs	Estimate time use for repair = Hours
Time_use_min	Estimate time use for repair = Minute

Table F.5. Data Dictionary of Repair Method Table.

Field Name	Meaning
Repairno	Repair no format is RRRRR RRRRR = Running no.
Repair_Desc	Description
Inactive date	Date of repair method active

Table F.6. Data Dictionary of Cause Table.

Field Name	Meaning
Cause code	Cause code format is RRRRR RRRRR = Running no.
Cause_Desc	Description
Inactive date	Date of repair method active
Time_use_days	Estimate time use for repair = Days
Time_use_hrs	Estimate time use for repair = Hours
Time_use_min	Estimate time use for repair = Minute

Table F.7. Data Dictionary of Sub Inventory Table.

Field Name	Meaning
Subinv_code	Subinventory Code
Subinv_desc	Subinventory Name
Start_time	Start time of working days
End_time	End time of working days
Work_Hours	Hours of working days (days)

Table F.8. Data Dictionary of Step of Work Table.

Field Name	Meaning
Step code	Step no format is RRR RRR = Running no.
Step Desc	Description
Inactive date	Date of step active

Table F.9. Data Dictionary of Job Order Table.

Field Name	Meaning
Subinv_code	Subinventory Code
Jobno	JOBNO Format is JOSSSSYYMMRRRRR JO = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Cust_Serv_Code	Customer Service Code Format is CSSSSSSYYMMRRRRR CS = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Cus_ code	Customer Code Format is CSSSSYYMMRRRRR C = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Engineer_code	Engineer Code Format is ESSSSYYMMRRRRR E = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Job_Crddate	Date of create job order YYYYMMDD
Job_Crdtime	Time of crate job order HHMMSS
In_warr	IN = In Warranty Out = Out Warranty
Plan_findate	Estimate date for finish
Plan_fintime	Estimate time for finish
Item_code	Item code
Serial_imei	Serial Imei
Sim_code	Sim code
Phone_no	Phone no
Remark	Remark
Repair_fn_date	Actual date finished
Repair_fn_time	Actual time finished
Job_status	Status of job order

Table F.10. Data Dictionary of Job Symptom Detail Table.

Field Name	Meaning
Subinv_code	Subinventory Code
Jobno	JOBNO Format is JOSSSSYYMMRRRRR JO = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Symptom code	Symptom code format is RRRRR RRRRR = Running no.

Table F.11. Data Dictionary of Repair Detail Table.

Field Name	Meaning
Subinv_code	Subinventory Code
Jobno	JOBNO Format is JOSSSSYYMMRRRRR JO = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Repairno	Repair no format is RRRRR RRRRR = Running no.
Cause code	Cause code format is RRRRR RRRRR = Running no.

Table F.12. Data Dictionary of Update Status Table.

Field Name	Meaning
Subinv_code	Subinventory Code
Jobno	JOBNO Format is JOSSSSYYMMRRRRR JO = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Step code	Step no format is RRR RRR = Running no.
Upd_sts_date	Last update date
Upd_sts_time	Last update time
Remark	Remark

Table F.13. Data Dictionary of Service Charge Table.

Field Name	Meaning
Subinv_code	Subinventory Code
Jobno	JOBNO Format is JOSSSSYYMMRRRRR JO = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Charge no	Charge no Format is CHSSSSYYMMRRRRR CH = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
ReferInvoice	Invoice NO. Format = IVSSSSYYMMRRRR IV = Invoice SSSS = Subinventory Code(Shop Code) YY = last 2 digits of year MM = Month RRRR = Running No. in a month
Status	Status of Service Charge N = Normal (Not Cancel) C = Cancel
Tdispercent	Total percent discount
Tdistotal	Total discount bath
Total	Total amount
Vat_amount	Total vat amount
Net_total	Net total

Table F.14. Data Dictionary of Service Charge Detail Table.

Field Name	Meaning
Charge no	Charge no Format is CHSSSSYYMMRRRRR CH = Prefix SSSS = Subinventory Code(shop code) YY = last 2 digits of year MM = Month RRRRR = Running No. in a month
Seq no	Sequence no.
Item_code	Item code
Qty	Quantity
Price_unit	Price unit
Std_price	Standard price
Dispercent	Discount percent
Distotal	Discount total
Vat_amount	Vat amount
Net_total	Net total
Amount	Total sell amount in each item (Baht)

Table F.15. Data Dictionary of Standard Price Table.

Field Name	Meaning
Item code	Item code
Std_price	Standard price

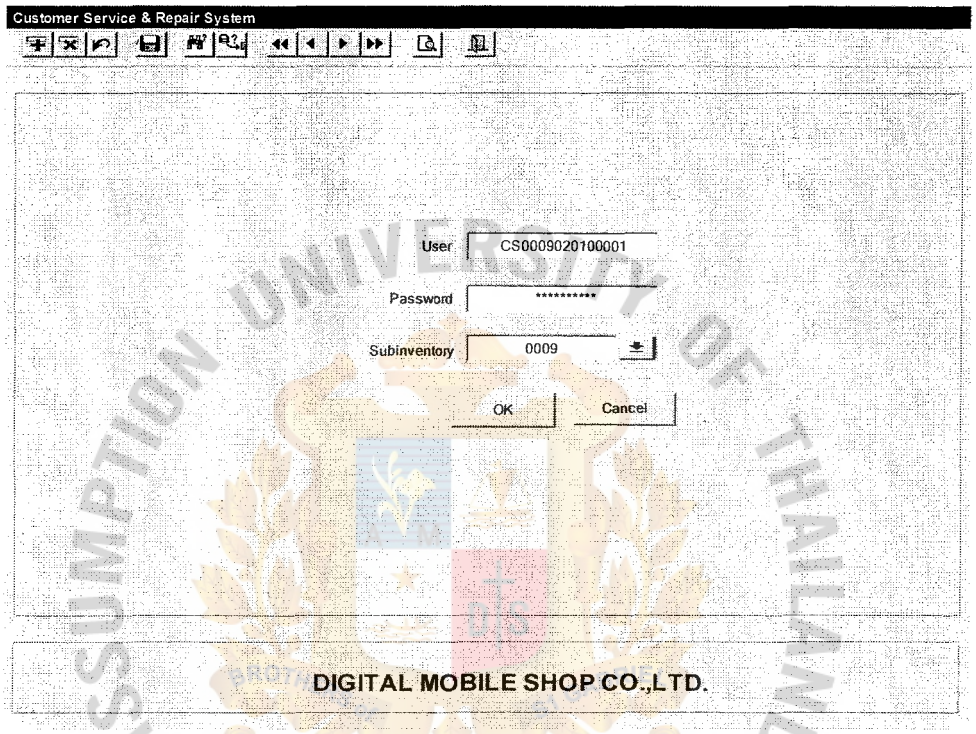

Figure G.1. Menu Log On.

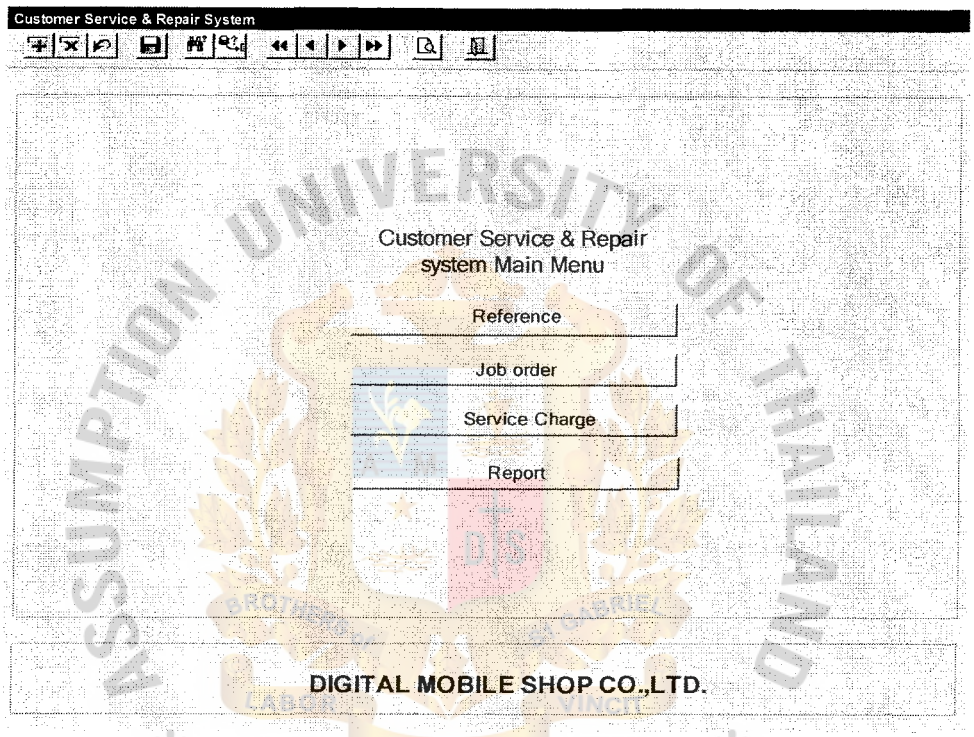

Figure G.2. Customer Service & Repair System Main Menu.

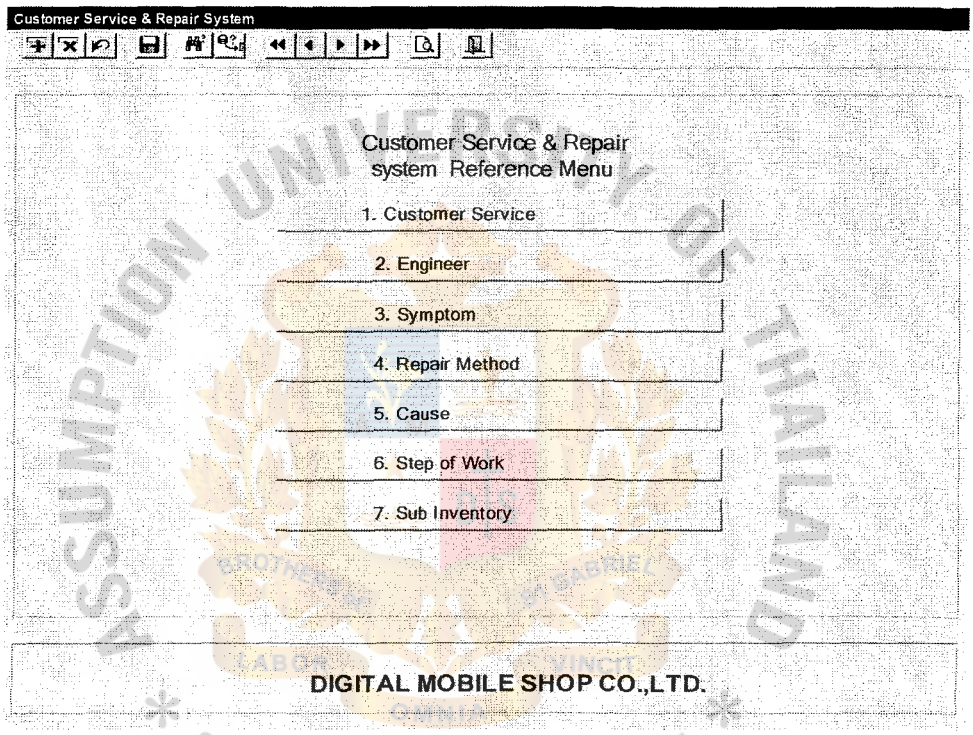

Figure G.3. Customer Service & Repair System Reference Menu.

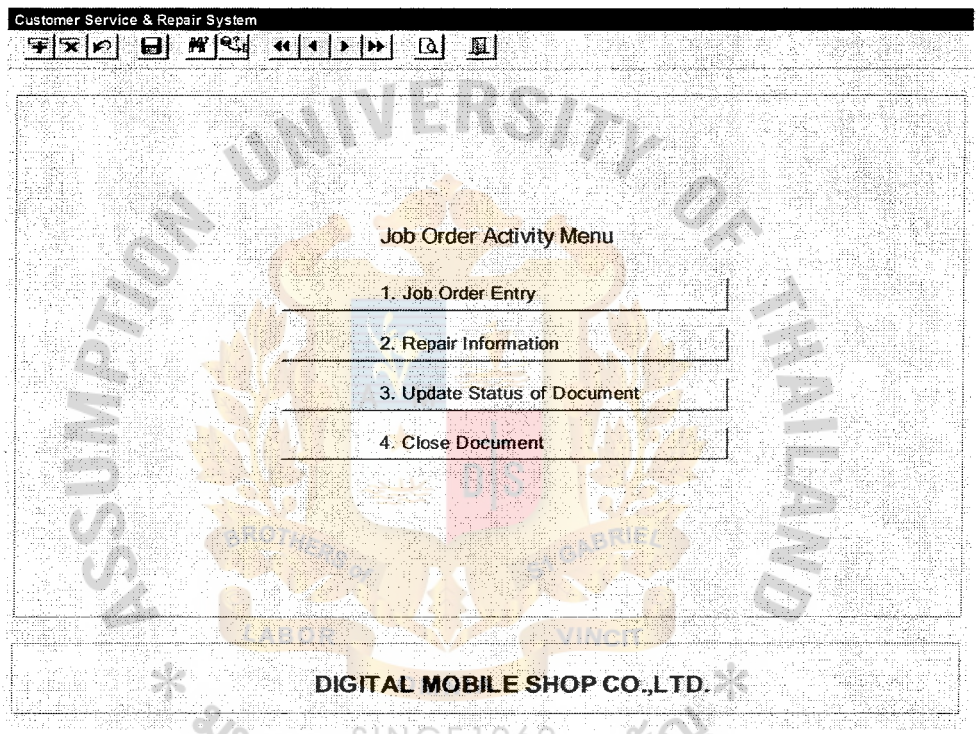

Figure G.4. Customer Service & Repair System Activity Menu.

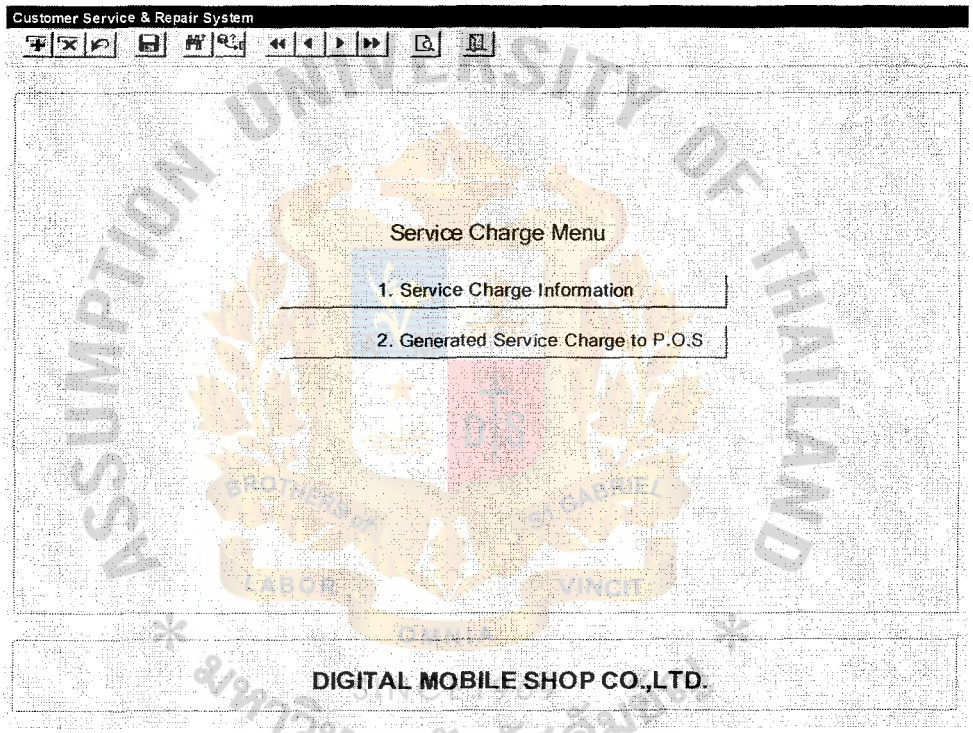

Figure G.5. Customer Service & Repair System Service Charge Menu.

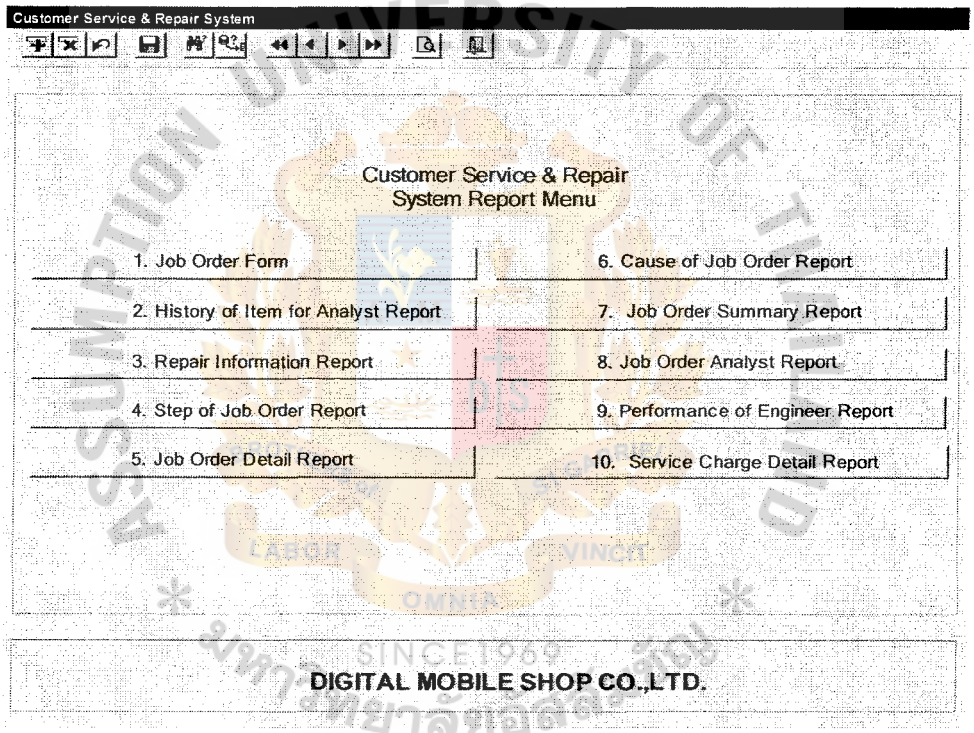

Figure G.6. Customer Service & Repair System Report Menu.

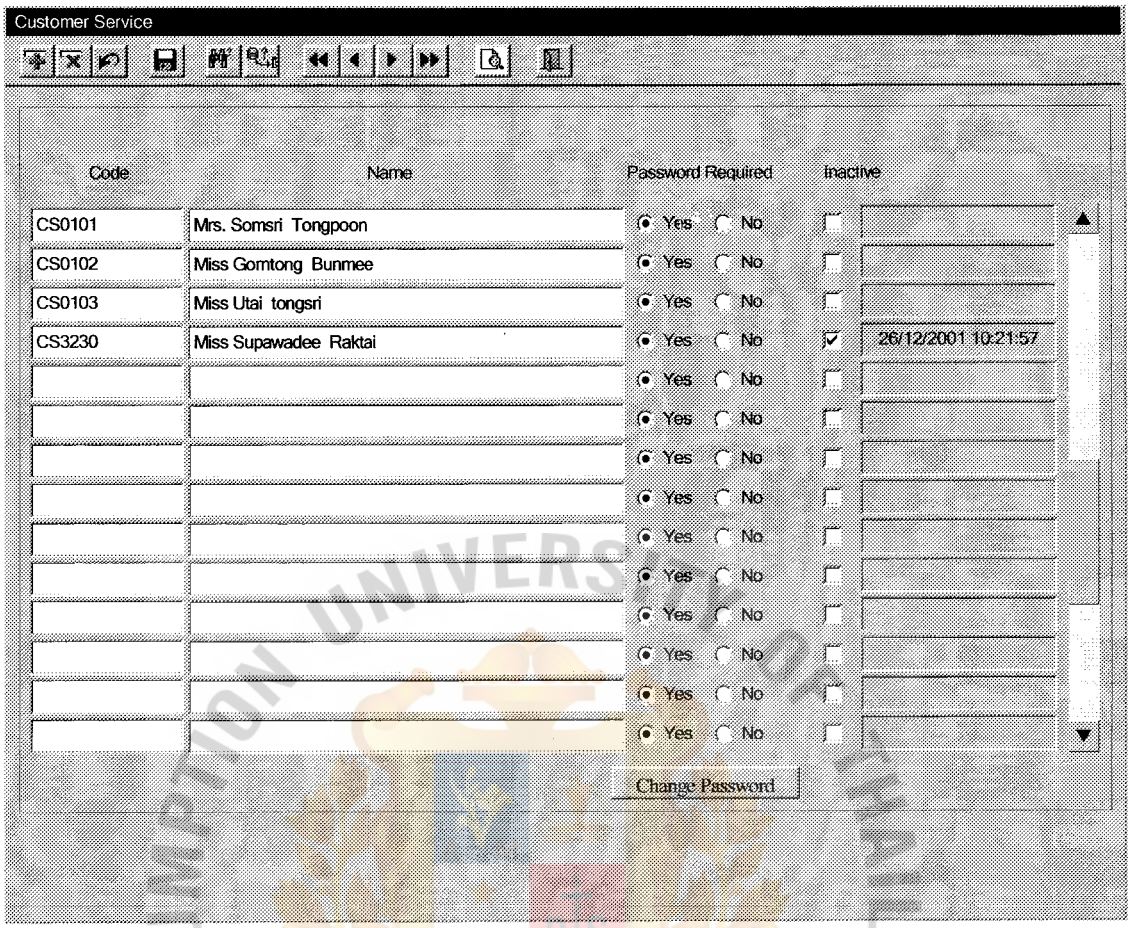

Figure G.7. Registration of Customer Service Screen.

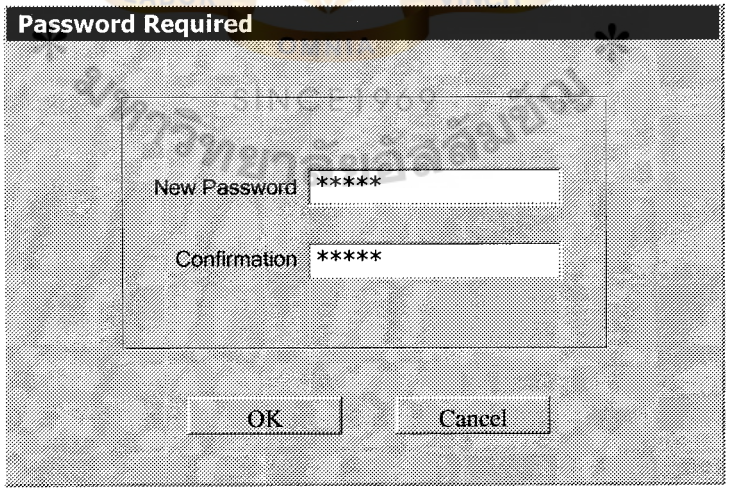

Figure G.8. Change Password in Case Never Assign Password Before.

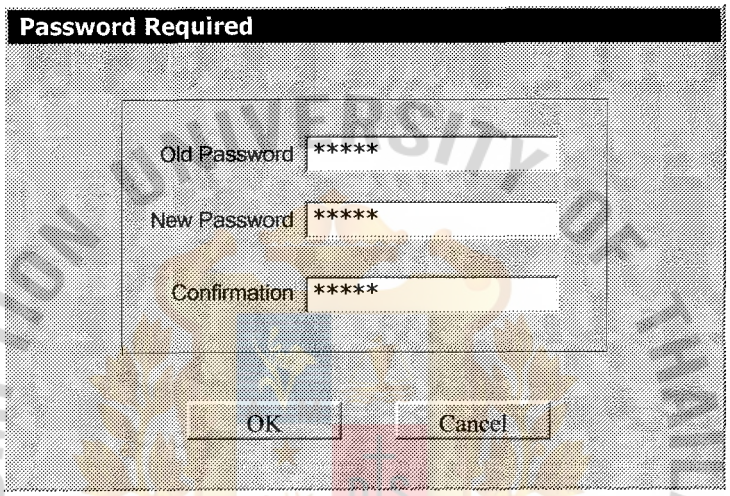

Figure G.9. Change Password in Case Have the Old Password.

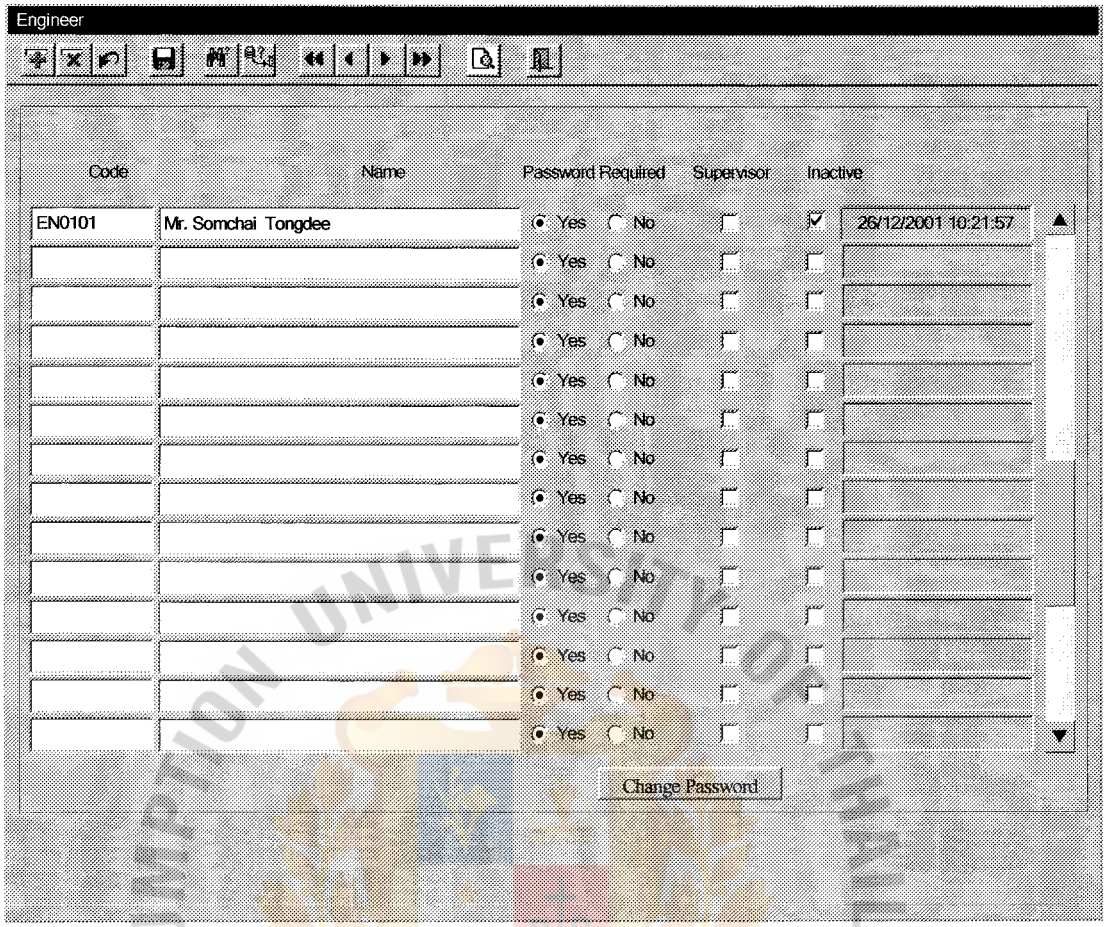

Figure G.10. Registration of Engineer and Assign User and Password of each Engineer.

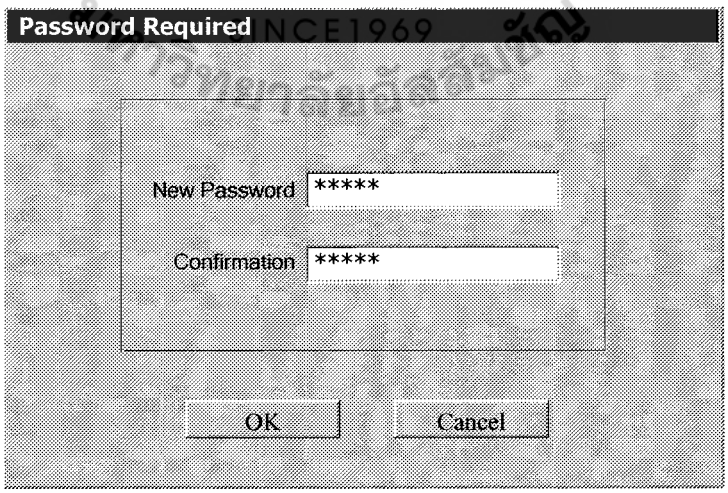

Figure G.11. Change Password in Case Never Assign Password Before.

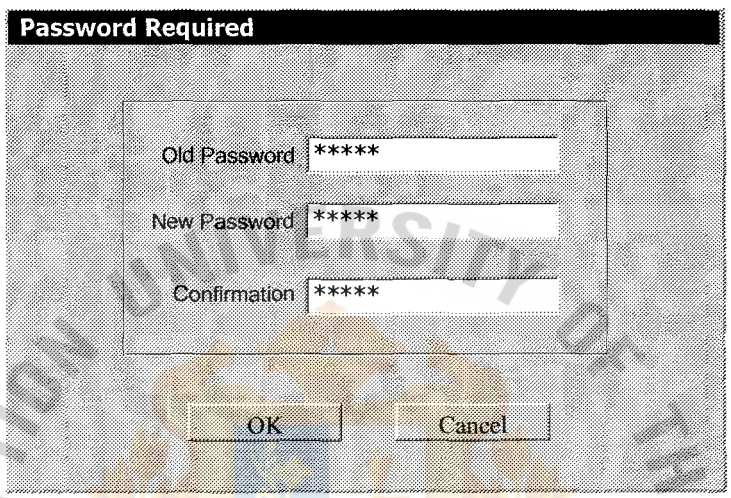

Figure G.12. Change Password in Case Have the Old Password.

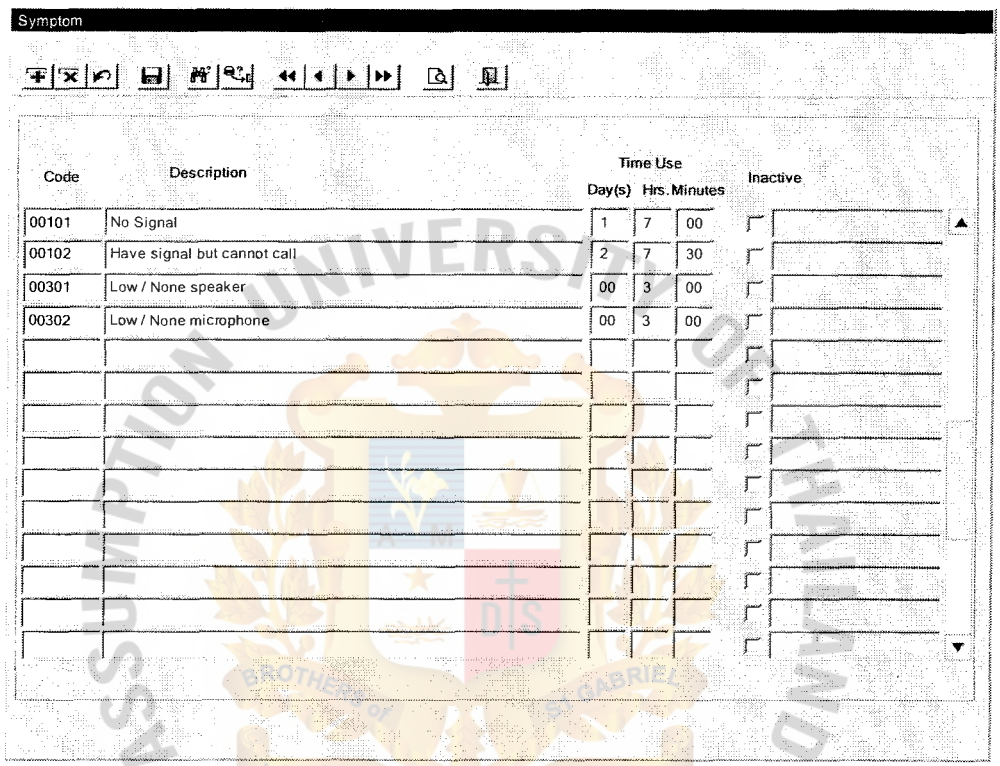

Figure G.13. Assign and Maintain Symptom Screen.

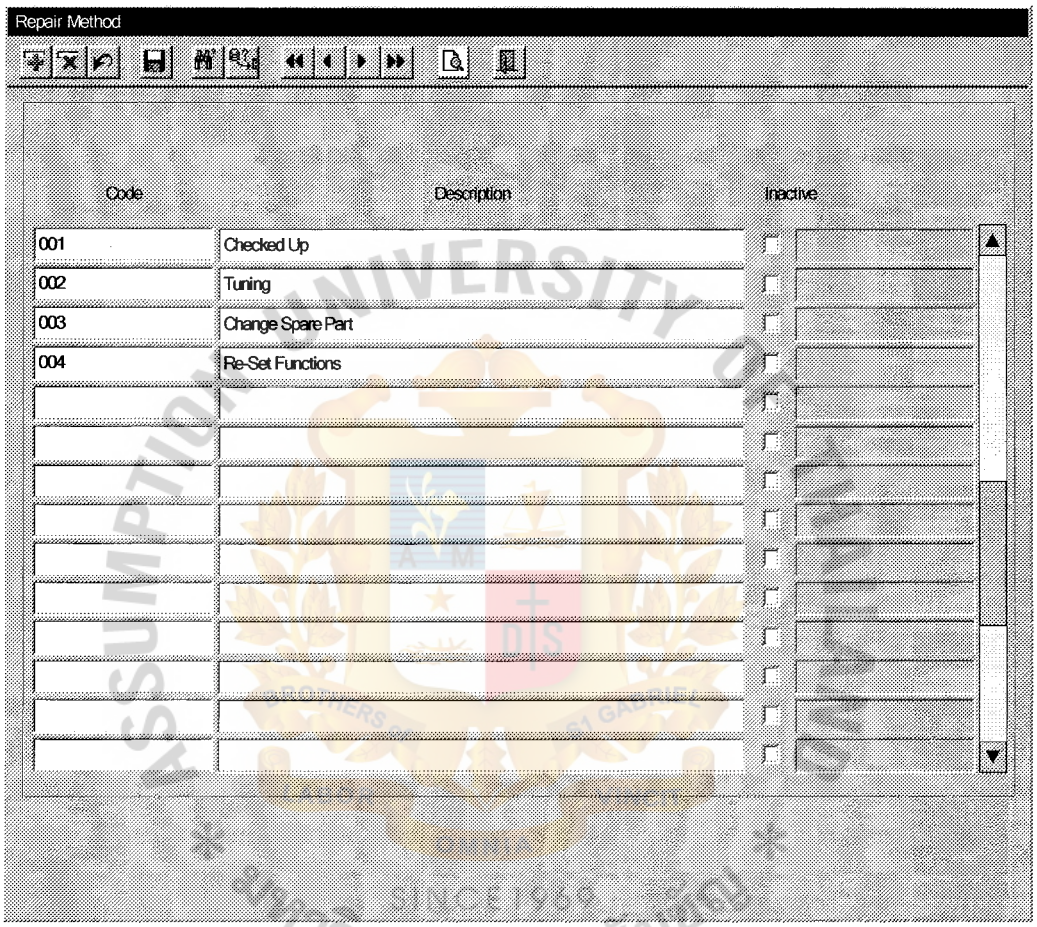

Figure G.14. Assign and Maintain Repair Method Screen.

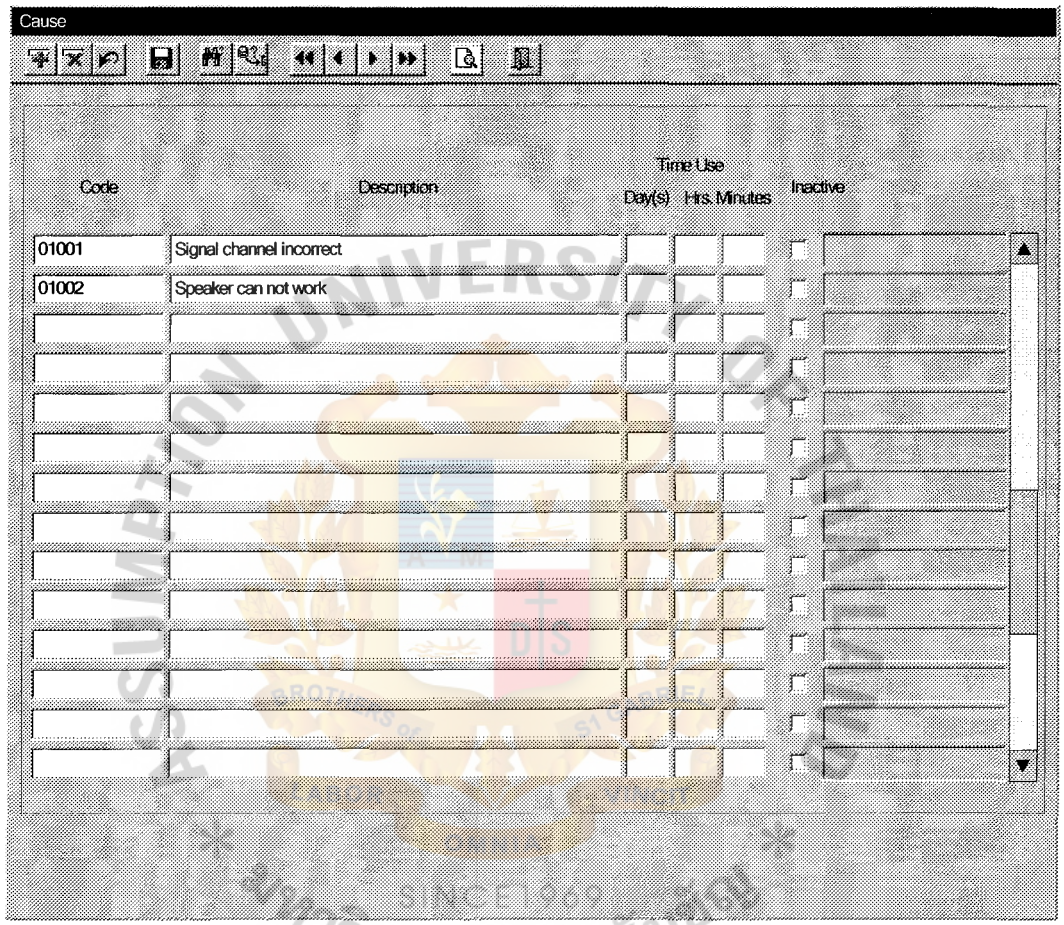

Figure G.15. Assign and Maintain Cause that Make Product cannot Work.

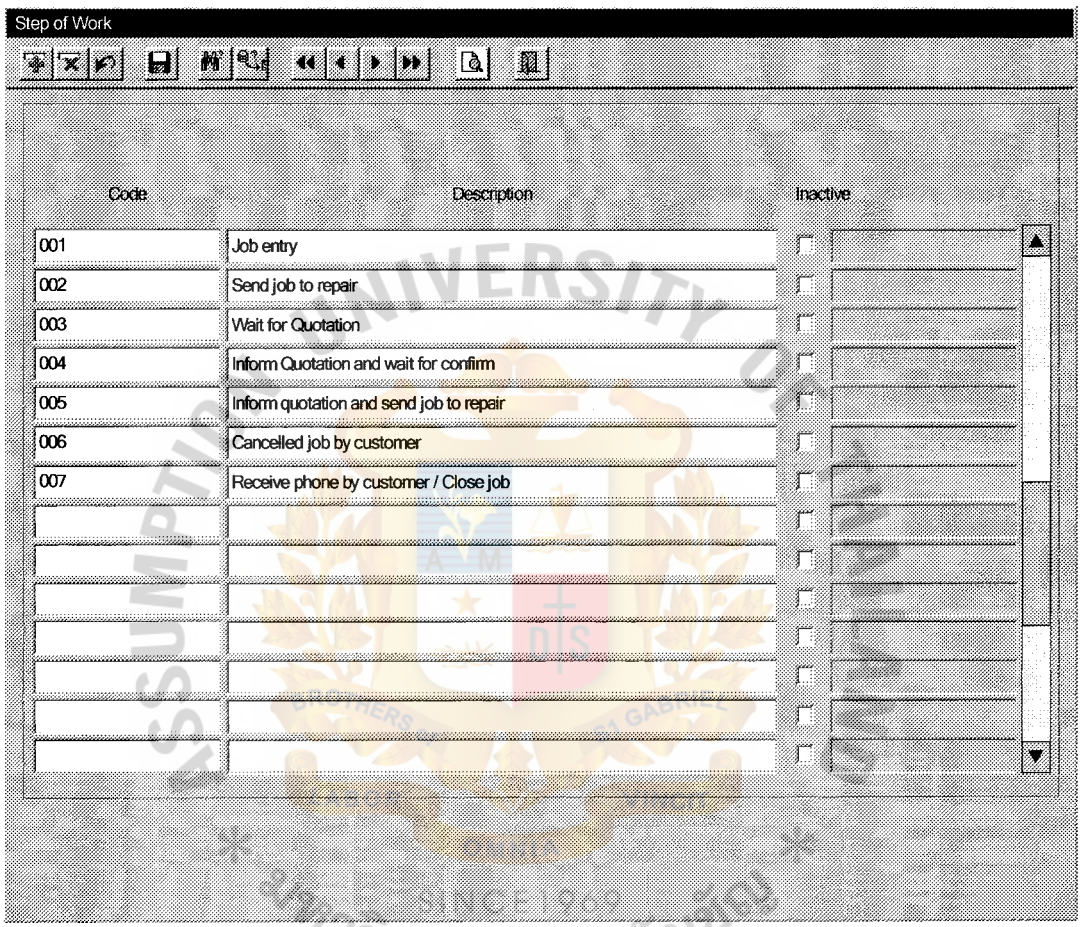

Figure G.16. Assign and Maintain Step of Work.

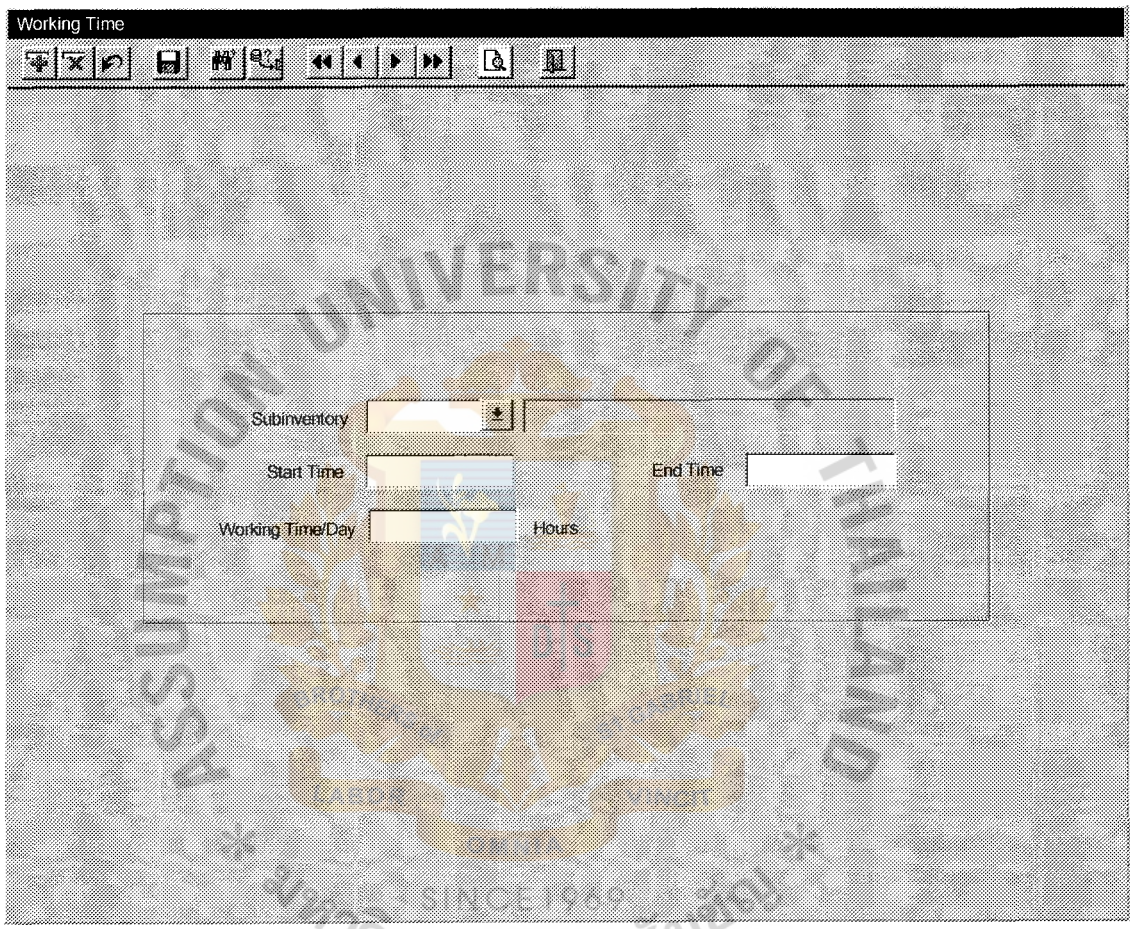

Figure G.17. Assign and Maintain Working Time of Sub Inventory on each Day.

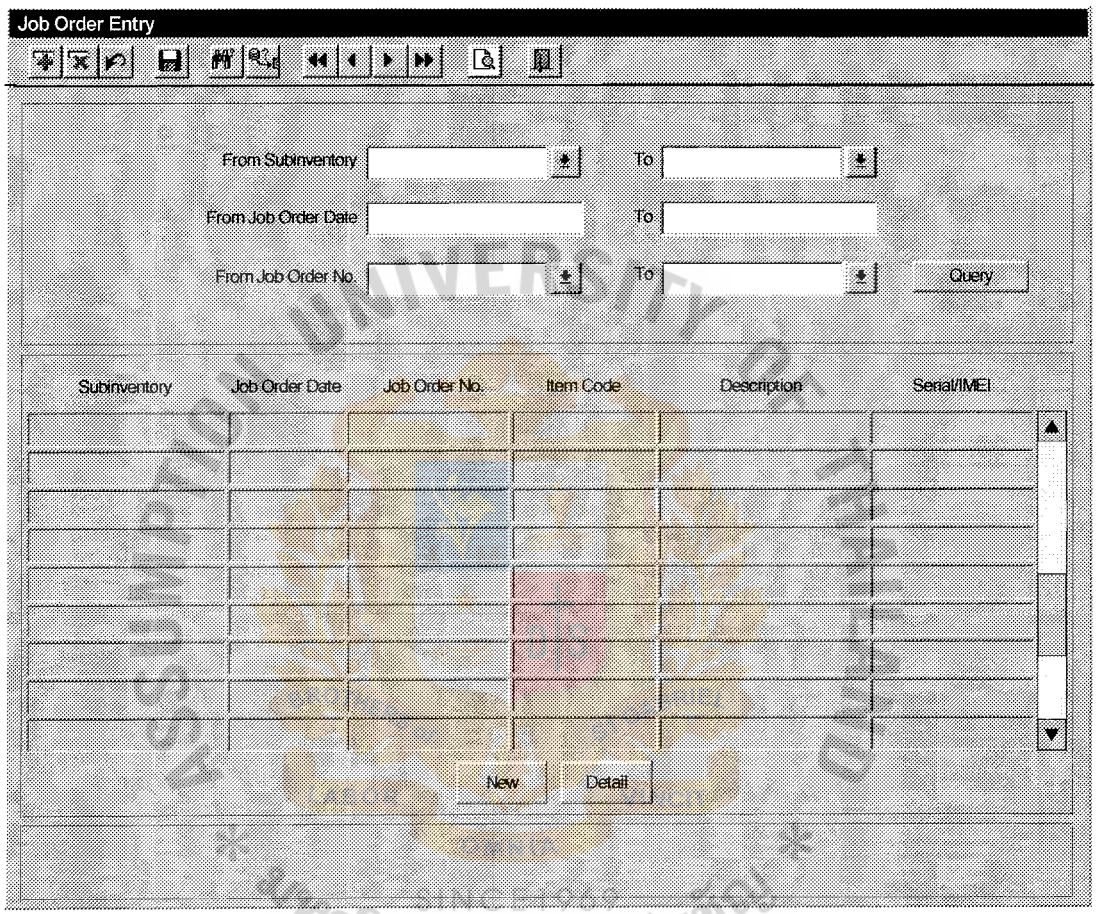

Figure G.18. Input Criteria for Select Order Information or Create New Job Order No.

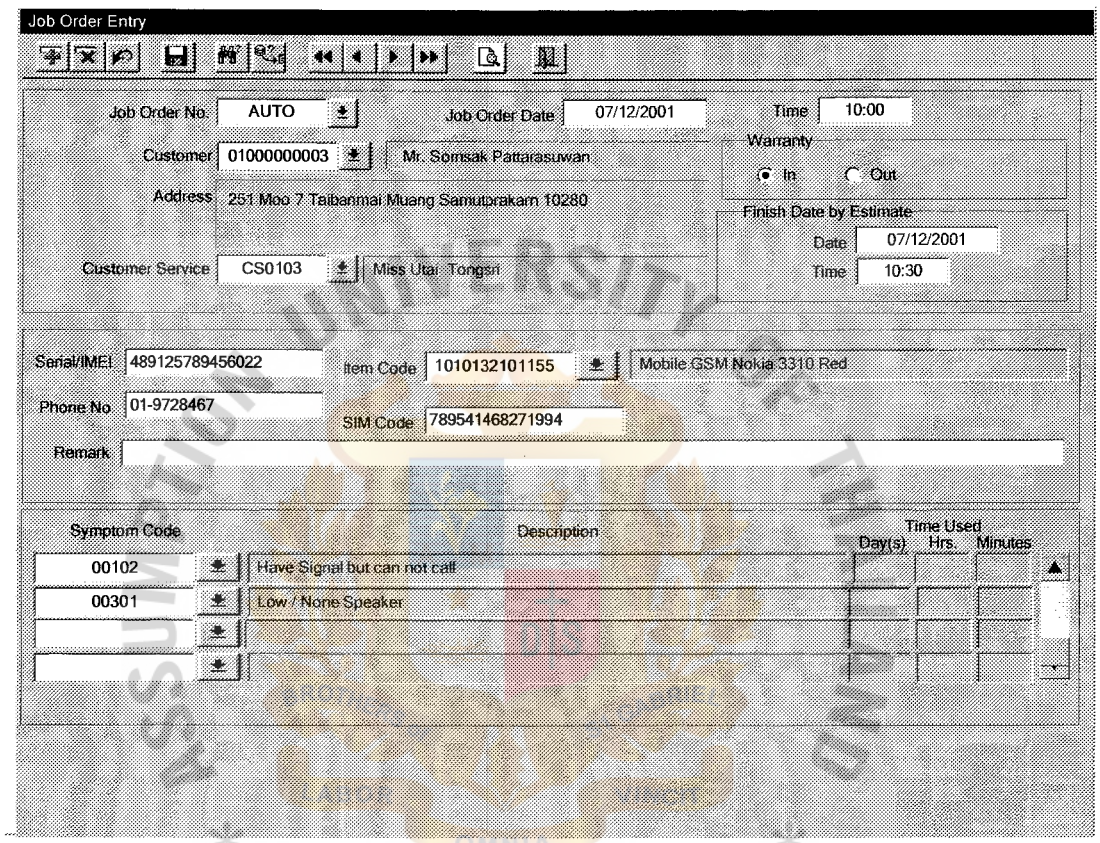

Figure G.19. Input Detail of Order Entry.

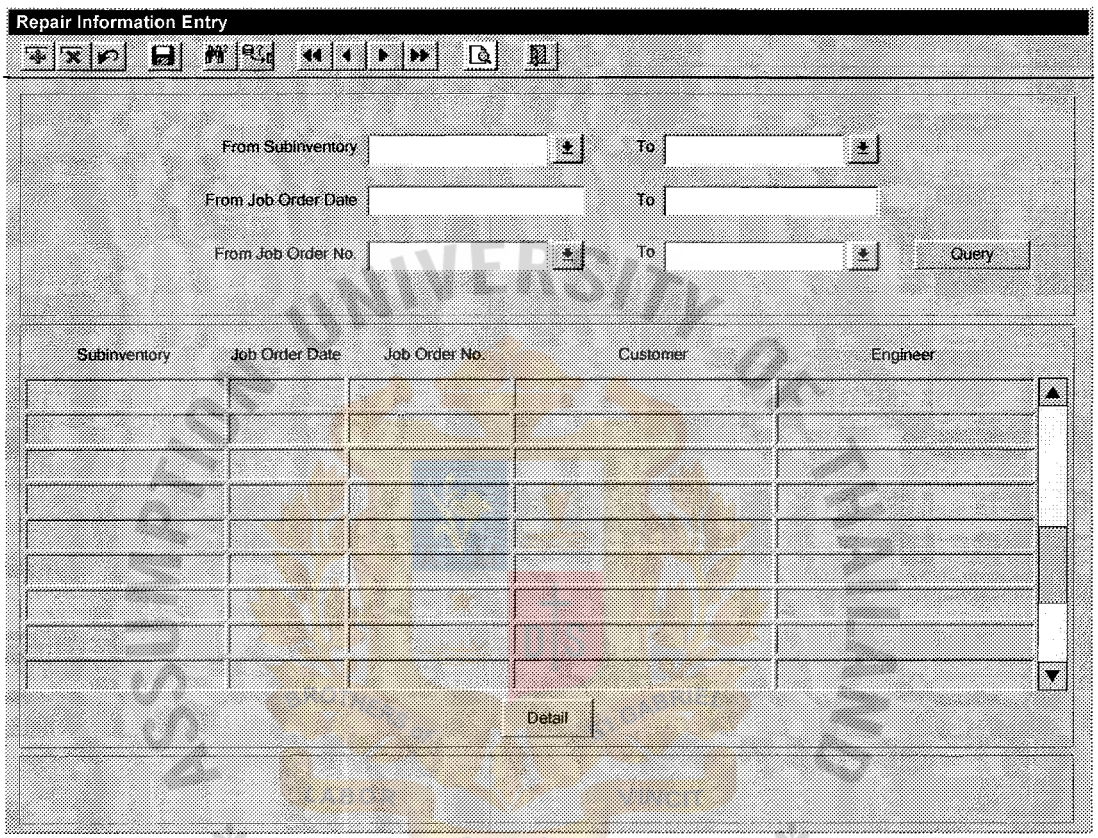

Figure G.20. Input and Maintain Information of Repair.

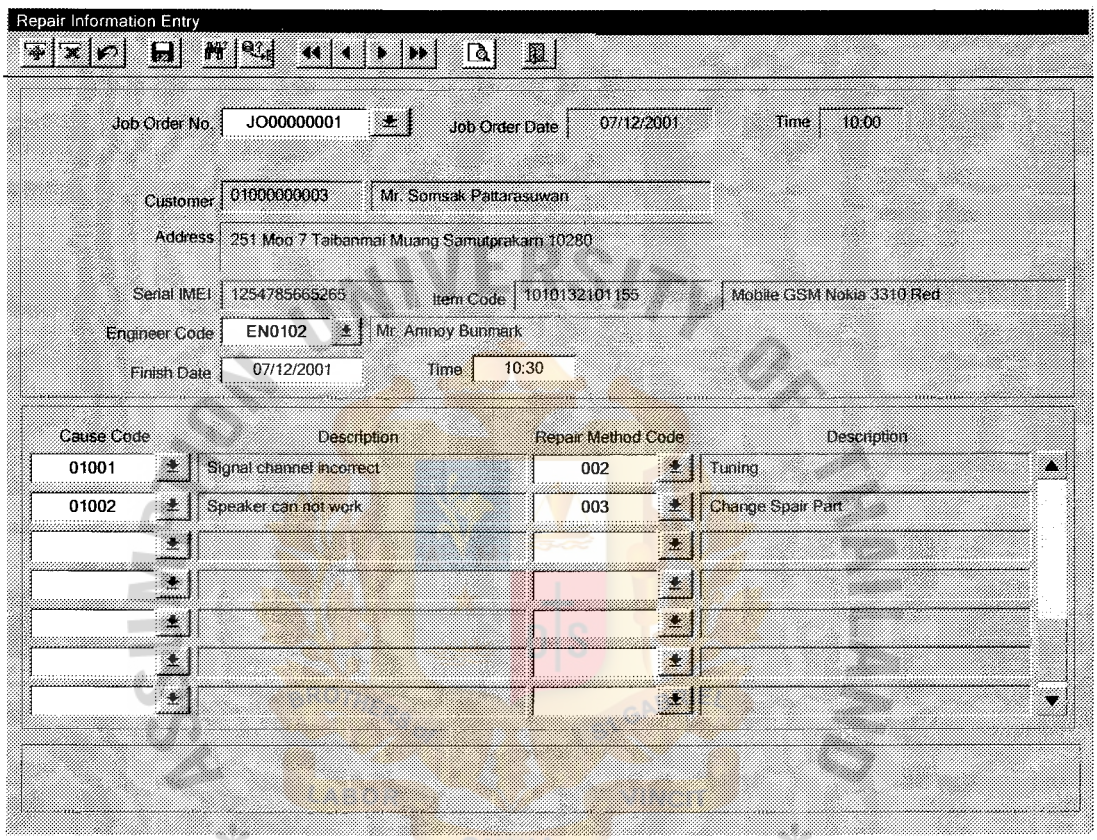

Figure G.21. Input Detail of Repair Information Entry.

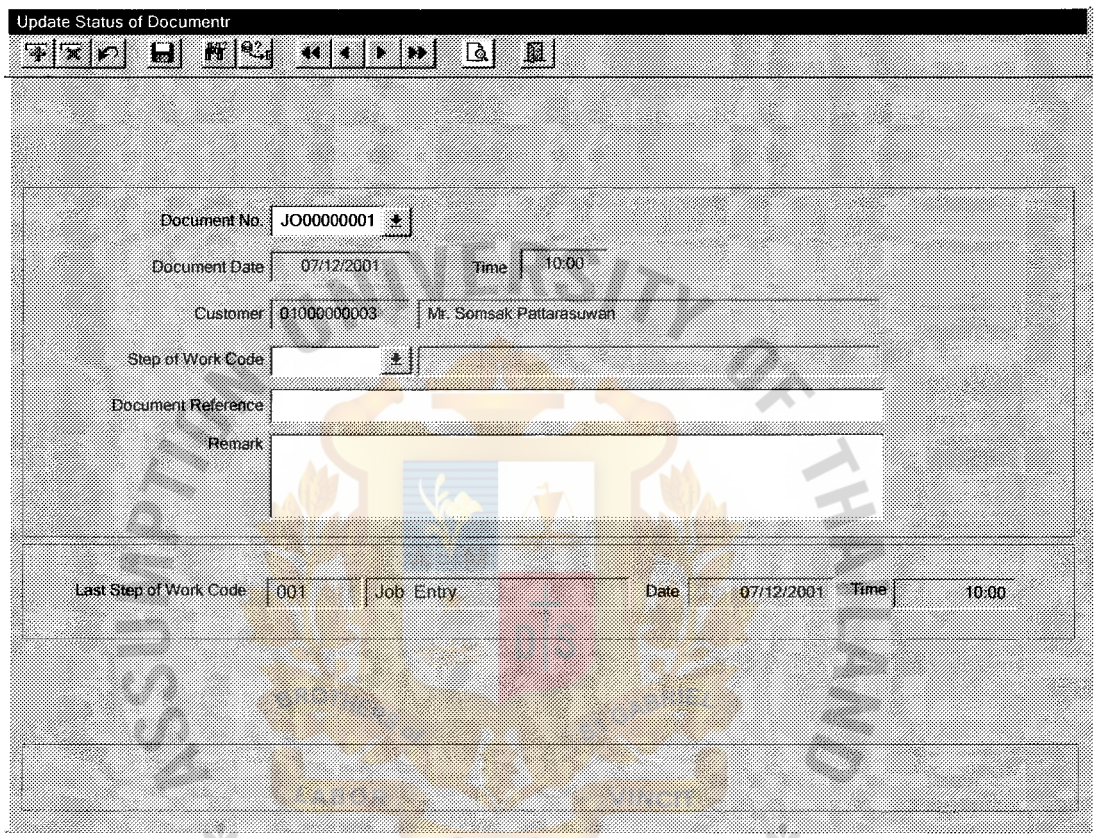

Figure G.22. Update and Maintain Information of Status of Document.

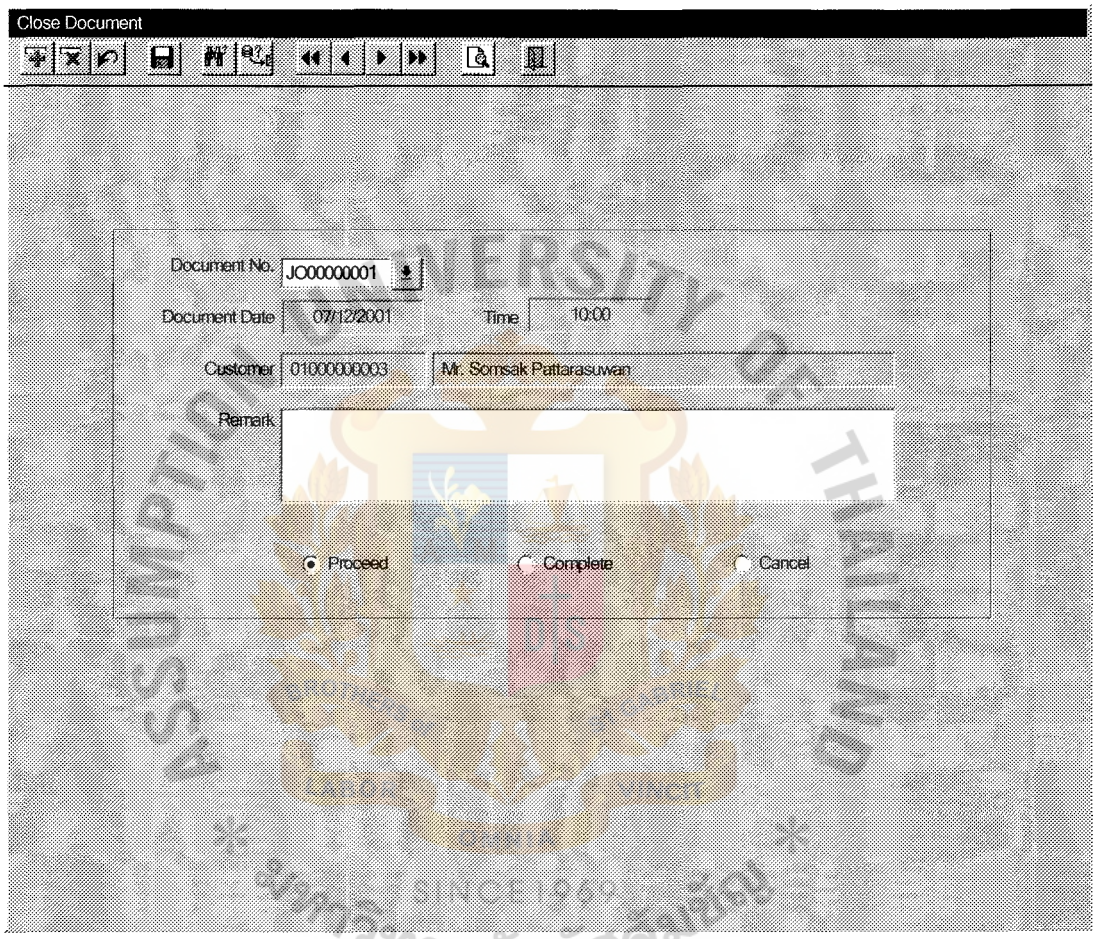

Figure G.23. Input Criteria for Select Information of Document No. and Update Information of Document and Close Document.

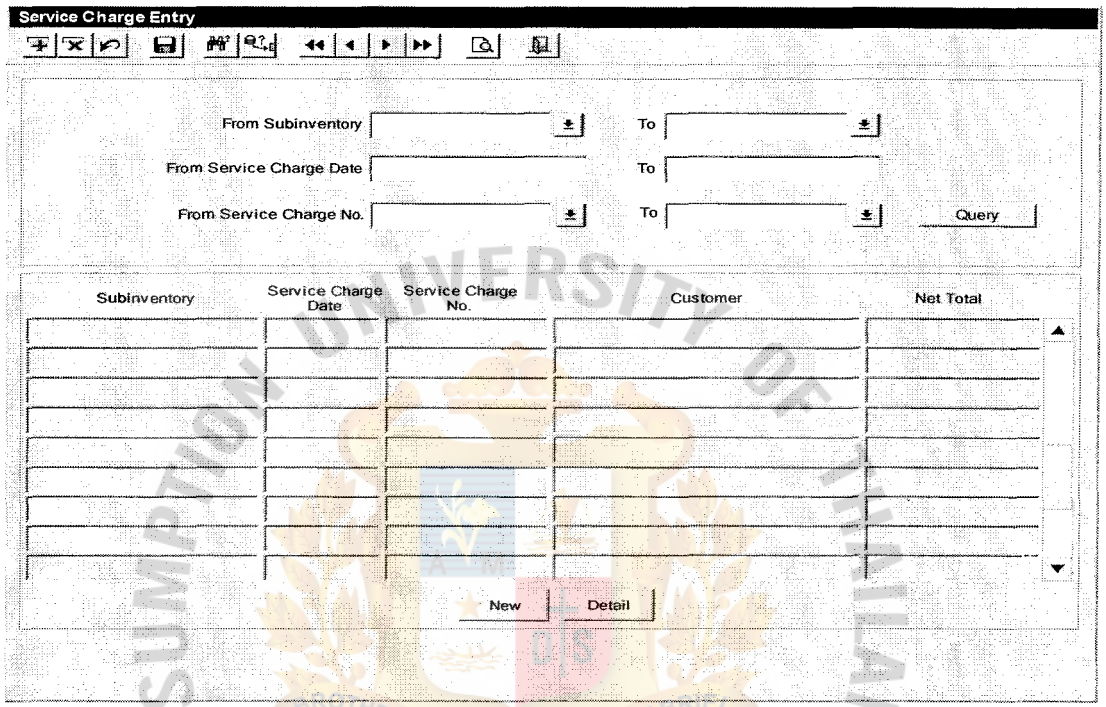

Figure G.24. Input Criteria for Select Service Charge No. or Create New Service Charge No.

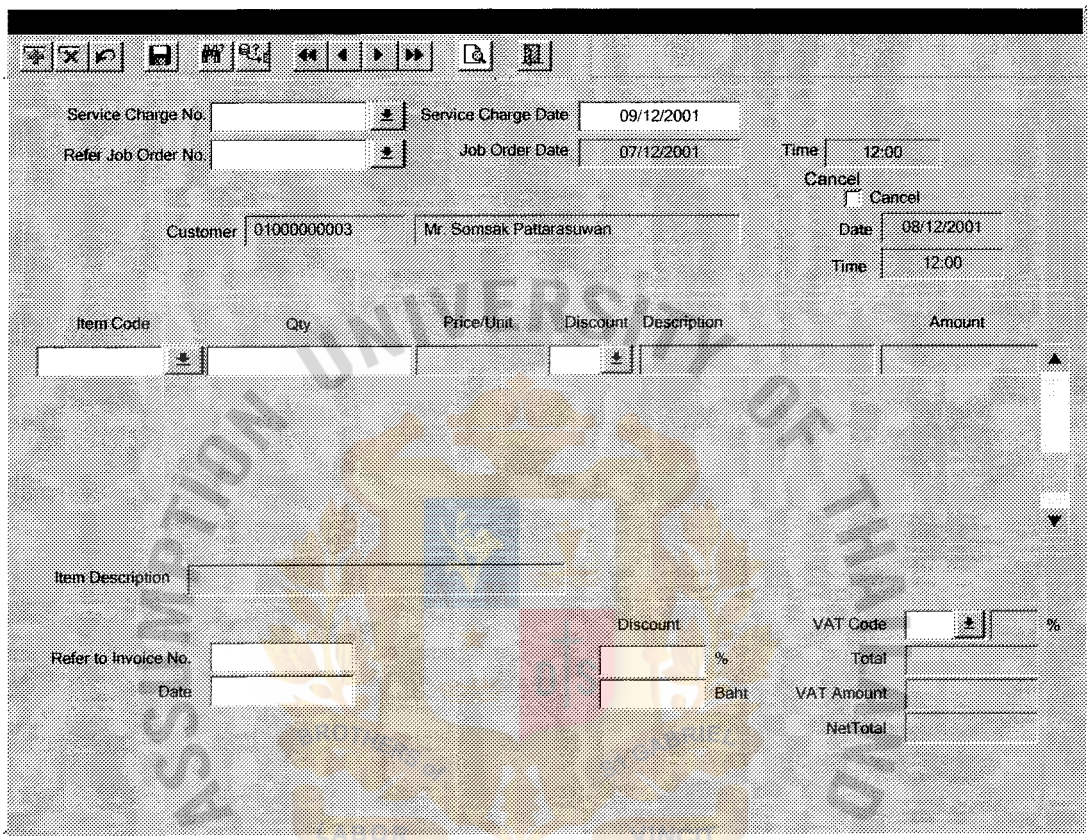

Figure G.25. Input Detail of Service Charge Information.

Program : JMSVRP 05 DIGITAL MOBILE SHOP CO .,LTD Page : 0001

User ID : SS-STAFF History of Item for Analyst Report Print Date : 11/10/2003 16 :24

From Subinventory : 0009 To : 0009

From Item Code :0000001 To: 0000004 From Job Order Date : 11 May 02 TO 7 Aug 03 From Job Order No .: JO0009020500001 To: JO0009031200008

Subinventory : 0009

Item Code	Item Name	Serial/IMEI	Job Order Date	Job Order No .	Expected Return	Actual Return
0000001	Nokia 8250 WH	758498512355685	2002-05-11	JO0009020500001	2002-05-16	2002-05-17
0000001	Nokia 8250 WH	758498512355685	2002-07-01	JO0009020700004	2002-07-06	2002-07-06
0000001	Nokia 8250 WH	758498512355685	2003-02-22	JO0009030200006	2003-02-27	2003-02-23
0000001	Nokia 8250 WH	758498512355685	2003-08-07	JO0009030800008	1900-01-00	2003-08-08
Total Job Order by Item : 4 record (s)						
0000002	Nokia 8850 S	759845862123333	2002-05-12	JO0009020500002	2002-05-17	2002-05-16
Total Job Order by Item : 1 record (s)						
0000003	Seimens C 55 WH	658895174154672	2002-06-05	JO0009020600003	2002-06-10	2002-06-07
Total Job Order by Item : 1 record (s)						
0000004	Motorolla V 88 Blk	558744589542789	2003-01-11	JO0009030100005	2003-01-16	2003-01-15
0000004	Motorolla V 88 Blk	558744589542789	2003-03-11	JO0009030300007	2003-03-16	2003-03-13
Total Job Order by Item : 2 record (s)						
Grand Total Job Order : 8 record (s)						

Figure H.1. History of Item for Analyst Report.

Program : JMSVRP15 DIGITAL MOBILE SHOP CO,LTD. Page: 0001

User ID : SS-STAFF Job Order Summary Report Print Date : 11/10/2003 17:12

From Subinventory: 0009 To : 0009

From Job Order Date: 11 May 02 To 7 Aug 03 From Job Order No : JO0009020500001 To : JO0009030800008

From Item code: 0000001 To : 0000004

Subinventory	Job Order Da	Job Order No	Customer	Item Name	Phone No	Serial/IMEI	Expect Return Date
0009	2002-05-11	JO0009020500001	C0009020500001 Mr. Sellew Mark	Nokia 8250 WH	035-350721	758498512355685	2002-05-16
0009	2002-05-12	JO0009020500002	C0009020500002 Mrs. Lowe Sonya	Nokia 8850 S	02-9591235	759845862123333	2002-05-17
0009	2002-06-05	JO0009020600003	C0009020600003 Mr. Meza Arturo	Seimens C55 WH	02-9962258	658895174154672	2002-06-10
0009	2002-07-01	JO0009020700004	C0009020500001 Mr. Sellew Mark	Nokia 8250 WH	035-350721	758498512355685	2002-07-06
0009	2003-01-11	JO0009030100005	C0009030100004 Mr. Avilla Carlos	Motorola V88 Blk	02-9594586	558744589542789	2003-01-16
0009	2003-02-22	JO0009030200006	C0009020500001 Mr. Sellew Mark	Nokia 8250 WH	035-350721	758498512355685	2003-02-27
0009	2003-03-11	JO0009030300007	C0009030100004 Mr. Avilla Carlos	Motorola V88 Blk	02-9594586	558744589542789	2003-03-16
0009	2003-08-07	JO0009030800008	C0009020500001 Mr. Sellew Mark	Nokia 8250 WH	035-350721	758498512355685	2003-08-12

Total Job Order: 8 record(s)

Figure H.2. Job Order Summary Report.

Program: JMSVRP04 DIGITAL MOBILE SHOP CO.,LTD. Page: 0001

User ID: SS-STAFF Performance of Engineer Report Print Date: 11/10/2003 17:13

From Subinventory 0009 To : 0009

From Engineer E0009020100001 TO E0009020100005 From Job Order Date 11 May 02 TO 7 Aug 03 From Job Order No JO0009020500001 To : JO0009031200008

Subinventory 0009

Engineer	Job Order Da	Job Order No	Item Code	Item Name	Est Day(s)	Est Hrs	Est Min	Act Day(s)	Act Hrs	Act Min	Diff Day(s)	Diff Hrs	Diff Min
E0009020100001 Mr. Saksit Adam	11-May-02	JO000902050000	0000001	Nokia8250WH	16-May-02	10	00:00	17-May-02	14	00:00	1.00	28.00	0
E0009020100001 Mr. Saksit Adam	1-Jul-02	JO000902070000	0000001	Nokia8250WH	6-Jul-02	14	00:00	6-Jul-02	16	00:00	0.00	2.00	0
E0009020100001 Mr. Saksit Adam	22-Feb-03	JO000903020000	0000001	Nokia8250WH	27-Feb-03	16	00:00	23-Feb-03	14	00:00	-4.00	-98.00	0
Total Job Order by Engineer 3 record(s)													
E0009020100002 Mr. Kevin weaver	12-May-02	JO000902050000	0000002	Nokia8850S	17-May-02	9	00:00	16-May-02	9	00:00	-1.00	-24.00	0
Total Job Order by Engineer 1 record(s)													
E0009020100003 Mr. Roland Lozonci	5-Jun-02	JO000902060000	0000003	Seimens C55 Wh	10-Jun-02	9	00:00	7-Jun-02	17	00:00	-3.00	-64.00	0
Total Job Order by Engineer 1 record(s)													
E0009020100004 Mr. Sabu Carlos	11-Jan-03	JO000903010000	0000004	Motorolla V88 Bl	16-Jan-03	11	00:00	15-Jan-03	10	00:00	-1.00	-25.00	0
E0009020100004 Mr. Sabu Carlos	7-Aug-03	JO000903080000	0000001	Nokia8250WH	12-Aug-03	13	00:00	8-Aug-03	14	00:00	-4.00	-95.00	0
Total Job Order by Engineer 2 record(s)													
E0009020100005 Mr. Avila Cosba	11-Mar-03	JO000903030000	0000004	Motorolla V88 Bl	16-Mar-03	11	00:00	13-Mar-03	14	00:00	-3.00	-69.00	0
Total Job Order by Engineer 1 record(s)													
GrandTotal Job Order 8 record(s)													

Figure H.3. Performance of Engineer Report.

Program: JMSVRP08 DIGITAL MOBILE SHOP CO,LTD. Page: 0001

User ID: SS-STAFF Service Charge Detail Report Print Date: 11/10/2003 17:13

From Subinventory: 0009 To : 0009

From Service Charge Date 17 May 02 To: 8 Aug 03 From Service Charge No: CH0009020500001TO CH0009030800008

Subinventory: 0009

SV Date	SV No.	Job Order No	Customer	Price List	Total	Disc(%)	Discount(Baht)	VAT(Baht)	Net Total
17-May-02	CH0009020500001	JO0009020500001	C0009020500001Mr. Sellew Mark	1	700	5	35	46.55	711.55
16-May-02	CH0009020500002	JO0009020500002	C0009020500002Mrs. Lowe Sonya	2	500	5	25	33.25	508.25
07-Jun-02	CH0009020600003	JO0009020600003	C0009020600003Mr. Meza Arturo	3	1000	5	50	66.5	1016.5
06-Jul-02	CH0009020700004	JO0009020700004	C0009020500001Mr. Sellew Mark	4	700	5	35	46.55	711.55
15-Jan-03	CH0009030100005	JO0009030100005	C0009030100004Mr. Avilla Carlos	5	1200	5	60	79.8	1219.8
23-Feb-03	CH0009030200006	JO0009030200006	C0009020500001Mr. Sellew Mark	6	1700	5	85	113.05	1728.05
13-Mar-03	CH0009030300007	JO0009030300007	C0009030100004Mr. Avilla Carlos	7	500	5	25	33.25	508.25
08-Aug-03	CH0009030800008	JO0009030800008	C0009020500001Mr. Sellew Mark	8	1000	5	50	66.5	1016.5
Total Service Chage: 8 record(s)				Grand Tota	7300	40	365	485.45	7420.45

Figure.H.4. Service Charge Detail Report.

Program : JMSVRP09 DIGITAL MOBILE SHOP CO.,LTD. Page : 0001

User ID : SS-STAFF Repair Information Report Print Date : 11/10/2003 17:02

From Subinventory : 0009 To : 0009

From Job Order Date : 11 May 02 TO 1 JUL 02 From Job Order No. : JO0009020500001 TO JO0009020700004

Subinventory : 0009

Job Order Date	Job Order No.	Est. Date	Finish Date	Engineer	Item Code	Item Name	Cause	Repair Method
11-May-02	JO0009020500001	16-May-02	17-May-02	Mr. Saksit Adam	0000001	Nokia 8250 WH	00001 Power supply IC failure	00001 Check Initial function 00003 Change part
12-May-02	JO0009020500002	17-May-02	16-May-02	Mr. Kevin weaver	0000002	Nokia 8850 S	00003 Speaker NG	00001 Check Initial function 00003 Change part
5-Jun-02	JO0009020600003	10-Jun-02	7-Jun-02	Mr. Roland Lozonci	0000003	Seimens C55 WH	00002 DSP IC failure	00001 Check Initial function 00003 Change part 00002 Tunning and adjustment
1-Jul-02	JO0009020700004	6-Jul-02	6-Jul-02	Mr. Saksit Adam	0000001	Nokia 8250 WH	00001 Power supply IC failure	00003 Change part 00001 Check Initial function

Total Job Order : 4 record(s)

Figure H.5. Repair Information Report.

Program : JMSVRP02 DIGITAL SHOP CO.,LTD. Page : 0001

User ID : SS-STAFF Job Order Detail Report Print Date : 11/10/2003 17:14

From Subinventory : 0009 To : 0009

From Job Order Date : 11 May02 To : 7 Aug 03 From Job Order No. : JO0009020500001 To : JO0009020700008

From Category Set : START To : END From Item code : 0000001 To : 0000003

Subinventory : 0009

Job Order Date	Job Order No.	Customer	Waranty	Repair	Item Code	Item Name	Serial/IMEI	SIM Code	Phone No.
11-May-02	JO0009020500001	C0009020500001 Mr. Sellew Mark	Y	Internal	0000001	Nokia 8250 WH	758498512355685	4957861254	035-350721
				Remark :		Step of work : 00006 Receive phone by customer / Close jc Date:			17-May-02
	Symptom Code :	0001 No power							
12-May-02	JO0009020500002	C0009020500002 Mrs. Lowe Sonya	Y	Internal	0000002	Nokia 8850 S	759845862123333	7512458945	02-9591235
				Remark :		Step of work : 00006 Receive phone by customer / Close jc Date:			16-May-02
	Symptom Code :	0003 No sound							
05-Jun-02	JO0009020600003	C0009020600003 Mr. Meza Arturo	Y	Internal	0000003	Seimens C55 WH	658895174154672	4458725652	02-9962258
				Remark :		Step of work : 00006 Receive phone by customer / Close jc Date:			07-Jun-02
	Symptom Code :	0004 Button mul function							
01-Jul-02	JO0009020700004	C0009020500001 Mr. Sellew Mark	N	Internal	0000001	Nokia 8250 WH	758498512355685	4957861254	035-350721
				Remark :		Step of work : 00006 Receive phone by customer / Close jc Date:			06-Jul-02
	Symptom Code :	0002 No picture							
		0003 No sound							

Total Job Order : 4 record(s)

Figure H.6. Job Order Detail Report.

Program: JMSVRP16 DIGITAL MOBILE SHOP CO.,LTD. Page: 0001

User ID: SS-STAFF Job Order Analyst Report Print Date: 11/10/2003 17:15

From Subinventory 0009 To : 0009

From Job Order Date 11 May 02 To : 1 July 02 From Job Order No: JO0009020500001 To : JO0009020700004

From Item code 0000001 To : 0000003

Subinventory: 0009

Job Date	Job Order No	Customer	Item Name	Serial/IMEI	Estimate Date	Finish Date	Amount	Step of work	Date
11-May-02	JO0009020500001	C0009020500001	Mr. Sellew Mark	Nokia8250WH	758498512355685	16-May-02	17-May-02	NN,NNNNN 00006	Receive phone by custome€Close job	17-May-02
	Symptom			Repair Method						
	0001 No power			00001 Check Initial function						
				00003 Change part						
12-May-02	JO0009020500002	C0009020500002	Mrs. Lowe Sonya	Nokia8850S	758498512355685	17-May-02	16-May-02	NN,NNNNN 00006	Receive phone by custome€Close job	16-May-02
	Symptom			Repair Method						
	0003 No sound			00001 Check Initial function						
				00003 Change part						
05-Jun-02	JO0009020600003	C0009020600003	Mr. Meza Arturo	Seimens C55 WH	658895174154672	10-Jun-02	07-Jun-02	NN,NNNNN 00006	Receive phone by custome€Close job	07-Jun-02
	Symptom			Repair Method						
	0004 Button mul function			00001 Check Initial function						
				00003 Change part						
				00002 Tunning and adjustment						

Total Job Order 3 record(s)

Figure H.7. Job Order Analyst Report.

Program : JMSVRP03 DIGITAL MOBILE SHOP CO .,LTD . Page : 0001

User ID : SS-STAFF Cause of Job Order Report Print Date : 11/10/2003 17 :19

From Subinventory : 0009 To : 0009

From Cause : 00001 Power supply IC failure TO: 00005 Display IC failure From Job Order No . : JO0009020500001 To: JO0009030800008

Subinventory : 0009

Cause	Job Order Date	Job Order No .	Item Code	Item Name	Serial /IMEI
00001 Power supply IC failure	11-May-02	JO0009020500001	0000001	Nokia 8250 WH	758498512355685
00001 Power supply IC failure	01-Jul-02	JO0009020700004	0000001	Nokia 8250 WH	758498512355685
00001 Power supply IC failure	22-Feb-03	JO0009030200006	0000001	Nokia 8250 WH	758498512355685
Total Job Order by Cause : 3 record (s)					
00002 DSP IC failure	05-Jun-02	JO0009020600003	0000003	Seimens C 55 WH	658895174154672
00002 DSP IC failure	07-Aug-03	JO0009030800008	0000001	Nokia 8250 WH	758498512355685
Total Job Order by Cause : 2 record (s)					
00003 Speaker NG	12-May-02	JO0009020500002	0000002	Nokia 8850 S	759845862123333
Total Job Order by Cause : 1 record (s)					
00004 LCD damage	11-Jan-03	JO0009030100005	0000004	Motorolla V 88 Blk	558744589542789
Total Job Order by Cause : 1 record (s)					
00005 Display IC failure	22-Feb-03	JO0009030200006	0000001	Nokia 8250 WH	758498512355685
00005 Display IC failure	11-Mar-03	JO0009030300007	0000004	Motorolla V 88 Blk	558744589542789
Total Job Order by Cause : 2 record (s)					
Grand Total Job Order : 9 record (s)					

Figure H.8. Cause of Job Order Report.

Program : JMSVRP10 DIGITAL MOBILE SHOP CO.,LTD. Page : 0001

User ID : SS-STAFF Step of Job Order Report Print Date : 11/10/2003 17:19

From Subinventory : 0009 To : 0009

From Job Order Date :11 May 02 To 5 June 02 From Job Order No. : JO0009020500001 To : JO0009020600003

Subinventory : 0009

Job Order Date	Job Order No.	Customer	Date	Time	Step of Work	Remark
11-May-02	JO0009020500001	C0009020500001 Mr. Sellew Mark	11 May 2002	10:00 AM	00001 Job Entry	
			12 May 2002	11:00 AM	00002 Initial analysis by Engineer	
			13 May 2002	12:00 PM	00003 Repair by Engineer	
			14 May 2002	1:00 PM	00003 Repair by Engineer	
			15 May 2002	2:00 PM	00003 Repair by Engineer	
			16 May 2002	3:00 PM	00003 Repair by Engineer	
			17 May 2002	4:00 PM	00006 Receive phone by customer/ Close job	
12-May-02	JO0009020500002	C0009020500002 Mrs. Lowe Sonya	12 May 2002	9:00 AM	00001 Job Entry	
			13 May 2002	10:00 AM	00002 Initial analysis by Engineer	
			14 May 2002	11:00 AM	00003 Repair by Engineer	
			15 May 2002	12:00 PM	00003 Repair by Engineer	
			16 May 2002	1:00 PM	00006 Receive phone by customer/ Close job	
5-Jun-02	JO0009020600003	C0009020600003 Mr. Meza Arturo	05 June 2002	9:00 AM	00001 Job Entry	
			06 June 2002	10:00 AM	00003 Repair by Engineer	
			07 June 2002	11:00 AM	00006 Receive phone by customer/ Close job	

Total Job Order : 3 record(s)

Figure H. 9. Step of Job Order Report.

DIGITAL MOBILE SHOP CO.,LTD.

1268 Zeer Rangsit 2nd Floor Kukot

Lamlukka Patumtanee 12150 Tel. 02-9580000

Job Order Form

Job Order No: JO0009020500001 **Job Order Date:** 2002-05-11

Customer : 0000902050000 1 Mr. Sellew Mark **Time:** 10:00 AM

Address : 41 Banlen Bang pa in Ayudthaya

Y	In Waranty
	Out Waranty

Item Code : 0000001

Item Name: Nokia8250WH

Serial/IMEI : 758498512355685

SIM Code : 4957861254

Phone No : 035-350721

Remark :

Symptom Code

0001 No power

Remark

1. Battery1 pcs.

Customer Service **Customer Signature**

Figure H.10. Job Order Form.

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