



Time Attendance Information System
for TT&T Public Co., Ltd.

by

Ms. Rapeepan Suwannakorn

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

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

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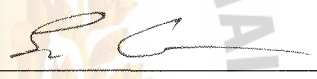
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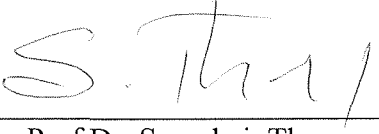
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ABSTRACT

Human Resource Department is known as an important department in the company like TT&T Public Co., Ltd. with the responsibility to provide the maintenance and storing of all employee records in the whole organization. Both manual and stand-alone information system are used to manage all data so there are some occurring problems in the existing system such as high error rates, data redundancy, and minimum data sharing while the company needs reliable, timely, and accurate information.

The result of primary study clearly represent that the most current problems concern with Time Management functions. Therefore, the field of study pointed views on Time Management that can be classified as working time and shift schedule management, working time and leave approval, and report generating. The data flow diagram is the structure tool to use in studying, analyzing, and designing the new centralized database system that works on Internet Computing Network to solve the current problems and support decision making at management level.

The new proposed Information System will be developed to replace the manual and existing computerized information system with Intranet System. All data are kept in the database server, Microsoft SQL Server 2000, and are accessed through the Web server, Microsoft Internet Information Services 5.0 on Microsoft Windows 2000 Server. The user interfaces are implemented on Web browser, Microsoft Internet Explorer 6.0. It will reduce the number of administrative staffs, solve the problem of the existing system and decrease the high maintenance cost.

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Finally, a special word of thanks goes to her parents for their encouragement throughout this project.

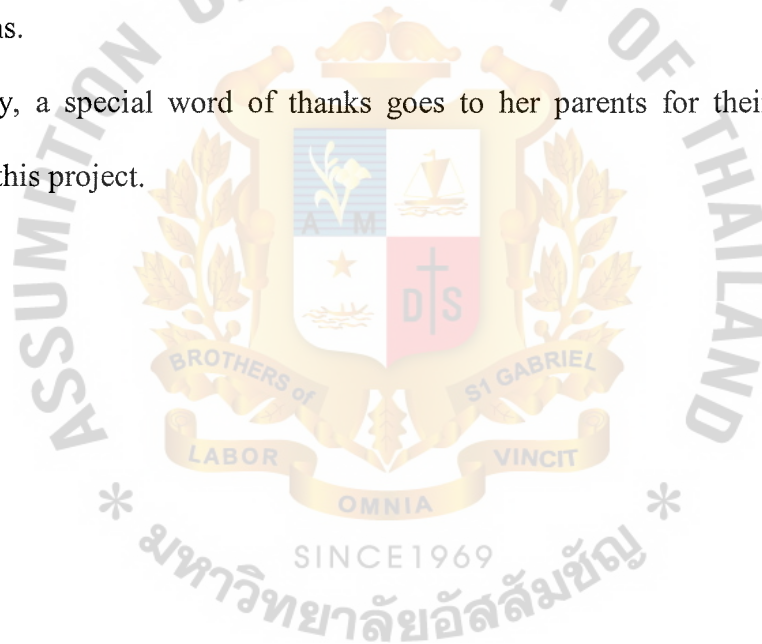


TABLE OF CONTENTS

<u>Chapter</u>	<u>Page</u>
ABSTRACT	i
ACKNOWLEDGEMENTS	ii
LIST OF FIGURES	v
LIST OF TABLES	viii
I. INTRODUCTION	1
1.1 Background of the Project	1
1.2 Objectives of the Project	2
1.3 Scope of the Project	3
1.4 Deliverables	4
1.5 Project Plan	5
II. THE EXISTING SYSTEM	7
2.1 Background of the Organization	7
2.2 Current Problems and Areas for Improvement	10
2.3 Existing Computer System	12
III. THE PROPOSED SYSTEM	14
3.1 System Requirements	14
3.2 Candidate Solution and Feasibility Analysis	15
3.3 System Design	21
3.4 Hardware and Software Requirement	23
3.5 Security and Control	27
IV. PROJECT IMPLEMENTATION	30
4.1 Overview of Project Implementation	30

<u>Chapter</u>	<u>Page</u>
4.2 System Construction	30
4.3 System Implementation	30
V. CONCLUSIONS AND RECOMMENDATIONS	34
5.1 Conclusions	34
5.2 Recommendations	36
APPENDIX A CONTEXT DIAGRAM	37
APPENDIX B DATA FLOW DIAGRAM	40
APPENDIX C PROCESS SPECIFICATION	48
APPENDIX D FILE STRUCTURE	55
APPENDIX E DATA DICTIONARY	64
APPENDIX F DATABASE DESIGN	67
APPENDIX G WEB INTERFACE DESIGN	71
APPENDIX H REPORT DESIGN	87
APPENDIX I ECONOMIC FEASIBILITY ANALYSIS	94
BIBLIOGRAPHY	114

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1.1 Project Plan of Time Attendance Information System	6
2.1 Organization Chart of TT&T Public Co., Ltd.	9
3.1 The Hardware Configuration of Human Resource Department	24
A.1 Context Diagram of Existing System	38
A.2 Context Diagram of Proposed System	39
B.1 Level 0 Data Flow Diagram of Existing System	41
B.2 Level 0 Data Flow Diagram of Proposed System	42
B.3 Level 1 Data Flow Diagram of Prerequisite Data Updating Process	43
B.4 Level 1 Data Flow Diagram of Time Importing Process	43
B.5 Level 1 Data Flow Diagram of Shift Generating Process	44
B.6 Level 1 Data Flow Diagram of Time/Leave Requesting Process	45
B.7 Level 1 Data Flow Diagram of Time/Leave Approving Process	46
B.8 Level 1 Data Flow Diagram of Report Generating Process	47
F.1 Context Data Model of Time Attendance Information System	68
F.2 Key-Based Data Model of Time Attendance Information System	69
F.3 Fully Attributed Data Model of Time Attendance Information System	70
G.1 System Login	72
G.2 User Permission Updating	72
G.3 User Permission Updating: Specify Employee ID	73
G.4 Traditional Holidays Updating	73
G.5 Traditional Holidays Updating (Continued)	74

<u>Figure</u>	<u>Page</u>
G.6 Traditional Holidays Updating: Specify Date	74
G.7 Default Time Updating	75
G.8 Default Time Updating: Specify Default Time ID	75
G.9 Leave Type Updating	76
G.10 Leave Type Updating: Specify Leave Type	76
G.11 Employee Proximity Card Updating	77
G.12 Employee Proximity Card Updating: Specify Employee ID	77
G.13 Shift Generating	78
G.14 In-Out Data Importing	78
G.15 Time Matching	79
G.16 Time Correction Requesting: Select Date	79
G.17 Time Correction Requesting: Select Date (Continued)	80
G.18 Time Correction Requesting: Edit Data	80
G.19 Time Correction Requesting: Edit Data (Continued)	81
G.20 Informed error message for Time Correction Requesting	81
G.21 Informed success message for Time Correction Requesting	82
G.22 Requesting Message via E-Mail	82
G.23 Time Approving	83
G.24 Time Approving (Continued)	83
G.25 Informed success message for Time Correction Approving	84
G.26 Approved Message via E-Mail	84
G.27 Approved Result Checking	85
G.28 Approved Result Checking (Continued)	85
G.29 Leave Requesting	86

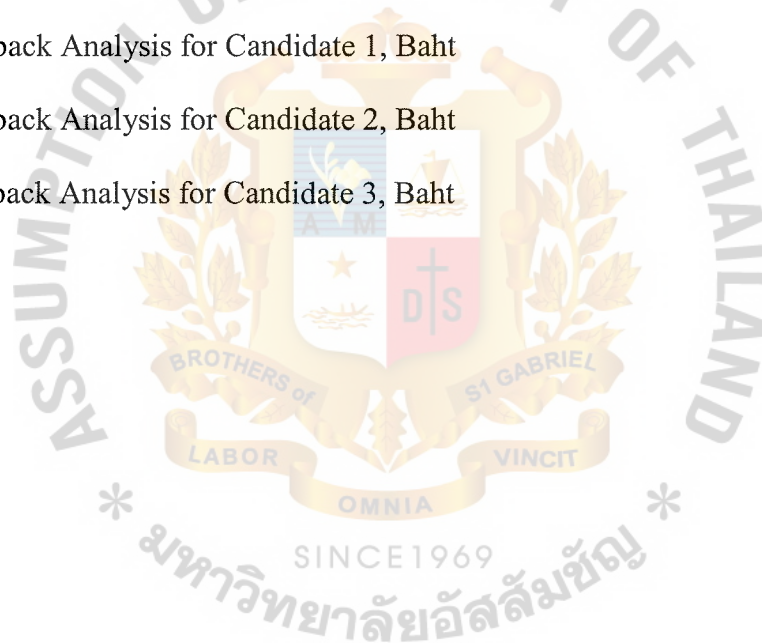
<u>Figure</u>	<u>Page</u>
G.30 Leave Approving	86
H.1 Timesheet for Normal Working Schedule	88
H.2 Timesheet for Normal Working Schedule (Continued)	88
H.3 Timesheet for Shift Working Schedule	89
H.4 Timesheet for Shift Working Schedule (Continued)	89
H.5 Leave: Department Screen Report	90
H.6 Leave: Individual Screen Report	90
H.7 Leave: Individual Screen Report (Continued)	91
H.8 Shift Schedule: Department Screen Report	91
H.9 Traditional Holidays: Screen Report	92
H.10 Unusual Time In-Time Out: Department Screen Report	92
H.11 Unusual Time In-Time Out: Department Screen Report (Continued)	93
I.1 Cost Comparison between Existing System and Candidate 1	102
I.2 Cost Comparison between Existing System and Candidate 2	103
I.3 Cost Comparison between Existing System and Candidate 3	104
I.4 Payback Analysis Graph for Candidate 1	111
I.5 Payback Analysis Graph for Candidate 2	112
I.6 Payback Analysis Graph for Candidate 3	113

LIST OF TABLES

<u>Table</u>	<u>Page</u>
3.1 Candidate System Matrix	15
3.2 Feasibility Analysis Matrix	20
3.3 The Hardware Specification for Web, Mail, and Database Server	25
3.4 The Hardware Specification for Web Clients and Development Tools	25
3.5 Other Hardware Specification	26
3.6 The Software Specification for Web, Mail, and Database Server	26
3.7 The Software Specification for Web Clients and Development Tools	27
5.1 Degree of Achievement of the Proposed System	35
C.1 Process Specification of Process 1.1	49
C.2 Process Specification of Process 1.2	49
C.3 Process Specification of Process 2.1	50
C.4 Process Specification of Process 2.2	50
C.5 Process Specification of Process 3.1	50
C.6 Process Specification of Process 3.2	51
C.7 Process Specification of Process 4.1	51
C.8 Process Specification of Process 4.2	52
C.9 Process Specification of Process 4.3	52
C.10 Process Specification of Process 5.1	53
C.11 Process Specification of Process 5.2	53
C.12 Process Specification of Process 6.1	54
C.13 Process Specification of Process 6.2	54

<u>Table</u>	<u>Page</u>
D.1 Structure of DEFA_TIME Table	56
D.2 Structure of DEPARTMENT Table	56
D.3 Structure of EMPLOYEE Table	57
D.4 Structure of HOLIDAY Table	58
D.5 Structure of IMPORT_TIME Table	58
D.6 Structure of LEAVE Table	59
D.7 Structure of LEAVE_TYPE Table	60
D.8 Structure of POSITION Table	60
D.9 Structure of PROX_EMP Table	61
D.10 Structure of SHIFT Table	61
D.11 Structure of TIME Table	62
D.12 Structure of USER Table	63
D.13 Structure of PROX_EMP_SHIFT Table	63
D.14 Structure of PROX_EMP_DEFA_TIME Table	63
E.1 Data Dictionary of Time Attendance System	65
I.1 Existing System Cost Analysis, Bath	95
I.2 Candidate 1 Cost Analysis, Bath	96
I.3 Candidate 2 Cost Analysis, Bath	97
I.4 Candidate 3 Cost Analysis, Bath	98
I.5 Five Years Accumulated Existing System Cost, Bath	99
I.6 Five Years Accumulated Candidate 1 Cost, Bath	99
I.7 Five Years Accumulated Candidate 2 Cost, Bath	100
I.8 Five Years Accumulated Candidate 3 Cost, Bath	100
I.9 The Comparison between Existing and Candidate 1 Costs, Baht	100

<u>Table</u>	<u>Page</u>
I.10 The Comparison between Existing and Candidate 2 Costs, Baht	101
I.11 The Comparison between Existing and Candidate 3 Costs, Baht	101
I.12 Tangible Benefits of Candidate 1, Baht	105
I.13 Tangible Benefits of Candidate 2, Baht	105
I.14 Tangible Benefits of Candidate 3, Baht	105
I.15 Payback Period of Candidate 1	106
I.16 Payback Period of Candidate 2	106
I.17 Payback Period of Candidate 3	106
I.18 Payback Analysis for Candidate 1, Baht	108
I.19 Payback Analysis for Candidate 2, Baht	109
I.20 Payback Analysis for Candidate 3, Baht	110



I. INTRODUCTION

1.1 Background of the Project

Nowadays many technologies have been improved a lot especially in computers; this makes great progress and development, in business. Human Resource Management System is one of the many systems that replaced with Computerized System.

Because of the important roles in the whole organization, Human Resource Management System is the best choice to be selected for study to improve the capability and work efficiency.

Appropriated system is able to save cost and operate for maximum performances in many areas of work, including decision making, managing budget and planning for the company.

Although, the Human Resource Management System covered many functions that can be classified as Recruitment, Payroll, Appraisal, Welfare, Personnel Information Management, and Training, this project is focused on Time Management. Because the primary study in Human Resource Management System of TT&T Public Company Limited, clearly represents many problems that have occurred due to the operation in the existing system such as the difficulty to manage time attendance of employees who are working on a shift basis or special working time schedule, high workload that brings high overhead of personnel staff in overtime working, time consuming in reports generating due to separate database of Time and Leave, high cost on the workflow of time and leave documents approval, lack of data security, high error rates because there are a lot of TT&T's branch offices in the provinces that separately manage time attendance data but all data will be sent to Head Office in Bangkok for monthly and

yearly reports generating, so data redundancy, data inconsistency, and report inaccuracy has occurred.

Therefore, Time Attendance Information System is introduced to solve these problems. Because this new system will be developed based on Intranet Technology and shared database system. It provides accurate shared data, less redundancy, support shift basis and special working time, accurate reports can be generated on time, provide electronic documents Requesting/Approving schedule, papers reducing and save cost, less overtime cost due to workload reducing, and high data security.

All the benefits effect the whole organization due to the important roles of Time Attendance Information System that concerns all departments.

1.2 Objectives of the Project

This project will design and develop the information system based on Web technology to support the on-line Time Attendance processes for TT&T Public Co., Ltd. The main objectives of this project comprises the following aspects

- (1) To analyze the existing system and identify current problems.
- (2) To design and develop an effective computerized Time Attendance Information System that supports shift and special working time, generate accuracy reports; all functions can utilized one integrated database with the full linkable capability between each function, and eliminate data redundancy.
- (3) To reduce documents cost by provide electronic documents approval that helps Human Resource Department and paper reducing, represent reports that can be distributed on Web, and optimize operation time by eliminating some repeated working between Head Office and Branch Offices such as

employee information that are repeatedly updated in Branch Offices, and time data are repeatedly updated in Head Office.

- (4) To improve the efficiency and effectiveness of Time Attendance Information System at TT&T Public Co., Ltd.

1.3 Scope of the Project

(1) Prerequisites

Before using the proposed system, user should set up some information that concerns Time Management including proximity card information, working time schedule, shift schedule, type of leave, holiday information, user permission, other personnel information such as personal data, position, organization, E-Mail address, etc. updated from other module in Human Resource Information System.

(2) Time Attendance Management

This section will help user to control the complicated working time. Most users need powerful software to manage various types of working time such as shift working, shift rotation, unscheduled day off, special time schedule, etc. This system can retrieve data from time and then check employees working time, absent, sick leaves, holidays, late coming automatically. The advantages and benefits are efficiency, accuracy and quicker than manual recording. The main work of this section can be classified as import Time-in, Time-out form Time Recorder, matching time data with working time schedule of each employee, and reports generating.

(3) Employee Self Service

This section will help user to control the complicated working time.

Each employee has User Name and Password to retrieve personnel working time history and use it for creating electronic Leave Form or Time Correction Form and then the system will generate E-Mail to the approver. After the approval is granted, data are retrieved for other processing. This section has main work that is very helpful for Human Resource Department as Web based workflow for Time Attendance Correction Requesting and Approving, Web based workflow for Leave Requesting and Approving, and On Screen Reports generating.

1.4 Deliverables

- (1) Project Introduction
 - (a) Background of the project
 - (b) Objectives of the project
 - (c) Scope of the project
- (2) Description of Existing System
 - (a) Background of the organization
 - (b) Current problems and area for improvement
 - (c) Existing computer system
- (3) Description of the Proposed New System
 - (a) System requirements
 - (b) Candidate solutions and Feasibility analysis
 - (c) System design

- (d) Hardware and software requirement
- (e) Security and controls
- (4) Project Implementation
 - (a) Overview of project implementation
 - (b) System Construction
 - (c) System Implementation
- (5) Conclusions and Recommendations
- (6) Data Dictionary

1.5 Project Plan

(1) Analysis of the Existing System

At first, plan to study current system by defining the objective and scope then study the existing problems and identify problems that involved the scope of system.

(2) Analysis and Design of the Proposed System

After the analysis of existing system is completed, process of the proposed system analysis and design start with cost and benefit analysis, Web interface design, report design, database design, network design, and program design.

(3) Implementation of the Proposed System

Implementation is the last step of this plan, including coding, testing, hardware installation, software installation, and data conversion.

The project plan of Time Attendance Information System is given in Figure 1.1.

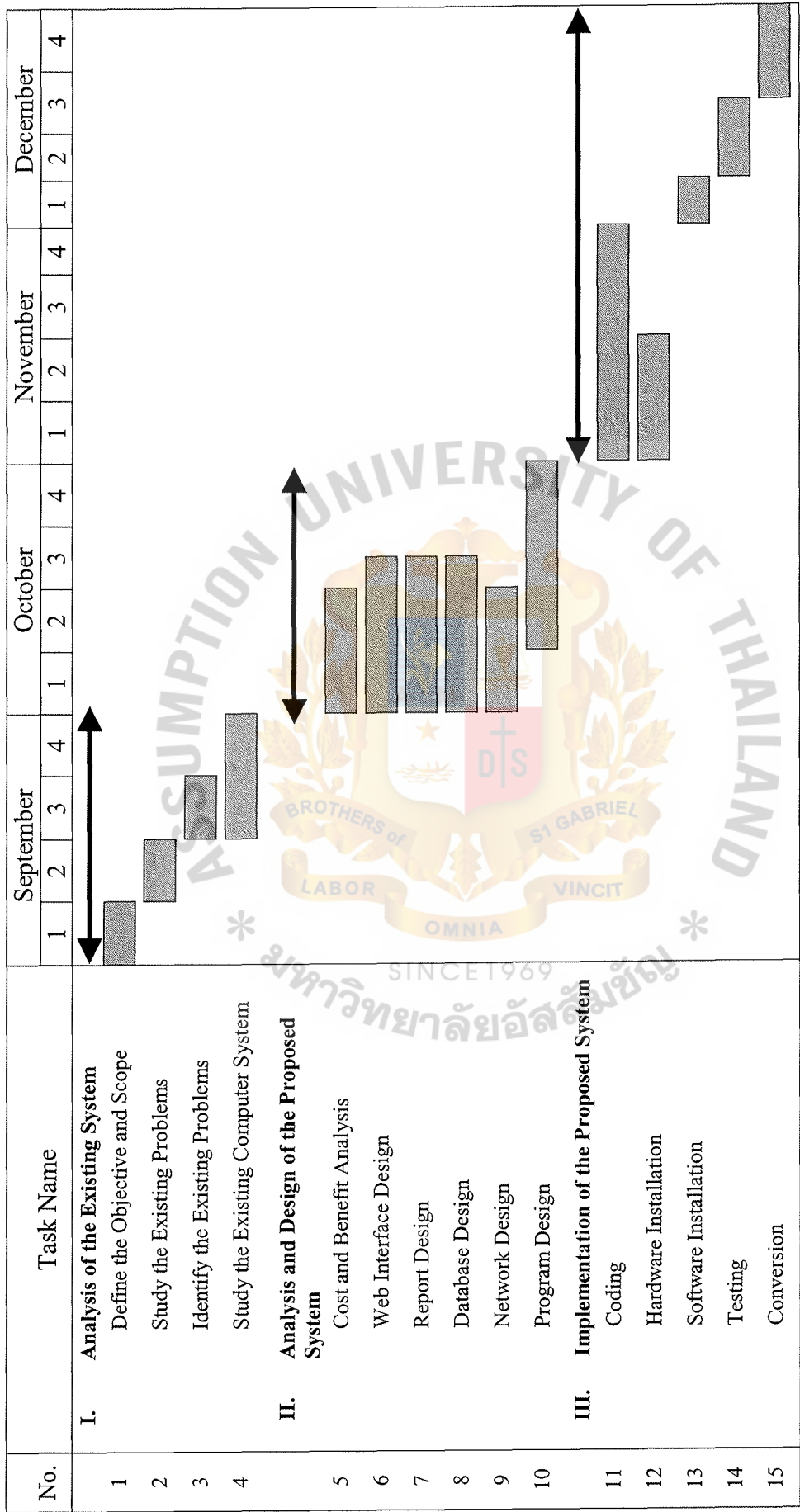


Figure 1.1. Project Plan of Time Attendance Information System.

II. THE EXISTING SYSTEM

2.1 Background of the Organization

TT&T Public Company Limited was established on June 29, 1992 to invest, implement and operate the provincial telephone network expansion. Under the concession granted by the Telephone Organization of Thailand (TOT), TT&T is responsible for building a fixed-line telephone network of 1.5 million lines in all the 72 provinces of Thailand, excluding the greater Bangkok metropolitan area. TT&T transferred ownership of the network assets to TOT under a Build-Transfer-Operate (BTO) scheme, but retains the rights to operate and generate revenues from the entire network for 25 years. Revenues are then shared with TOT at 43.1% for the first 1 million lines and 44.5% for the remaining 0.5 million lines. TT&T employs advanced telecommunications technologies for its network throughout Thailand. These include digital switching and fiber optics transmission from World Class Telecom Equipment vendors like Alcatel, Ericsson, NEC and Lucent. We are a leader in area coverage spanning across half a million square kilometers with the most advanced 12,000 km of optical fiber transmission links. All network components are regionally and centrally monitored and controlled through advanced network management systems. In four years after inception, our goal of connecting citizens across all provincial urban centers, and to the greater Bangkok, was accomplished. Customers are provided with the best services available through more than 90 customer care offices spreading Thailand. We are steadily introducing value-added services while continuing to strengthen both the technological capability and service quality for the healthy telecom-based development of the kingdom. As borders around the world continue to be removed by the

convergence of telecommunications and media, TT&T is enhancing and expanding our telephone network into an advanced information network. To bring Thailand to the forefront of the coming global information society, TT&T is laying the groundwork for an Information Superhighway. At the turn of the century, TT&T intends to become one of the largest network, service, and content providers in Thailand, and an international player participating in telecommunications projects in the Asian region.

The structure of TT&T organization is shown in Figure 2.1.



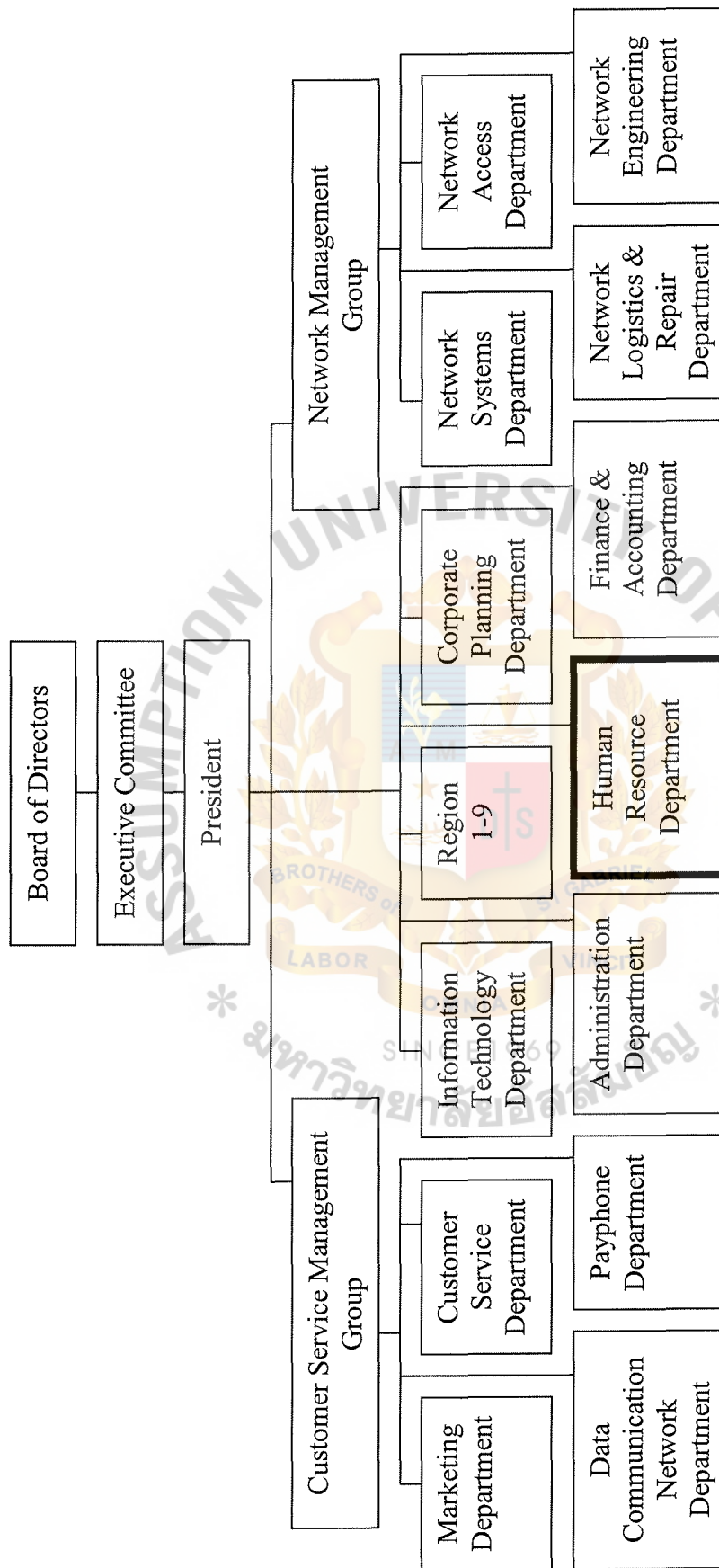


Figure 2.1. The Organization Chart of TT&T Public Co., Ltd.

2.2 Current Problems and Areas for Improvement

2.2.1 Current Problems

As TT&T Public Co., Ltd. use File Server Computing as distributed system architecture to support stand-alone information system like the existing Time Attendance Information System, head office and branch offices located in different provinces and work separately on time management but all reports need to be generated from head office. So all branch offices have to send time data to head office that causes many problems, classified as follows:

(a) Data Redundancy and Data Inconsistency.

Separated operation with own files in head office and branch offices cause data redundancy and data inconsistency problems, some data may be lost during the data importing process at head office.

- (b) Time consuming in reports generated due to data combination needs before reports generating.
- (c) High error rates.
- (d) Lack of data security due to the existing separated database system. It is easy to change and destroy data.
- (e) High workload brings high overhead costs of overtime.
- (f) The existing system does not support shift schedule.
- (g) Large volume of paperwork is generated for each employee, especially in time and leave approval.

2.2.2 Areas for Improvement

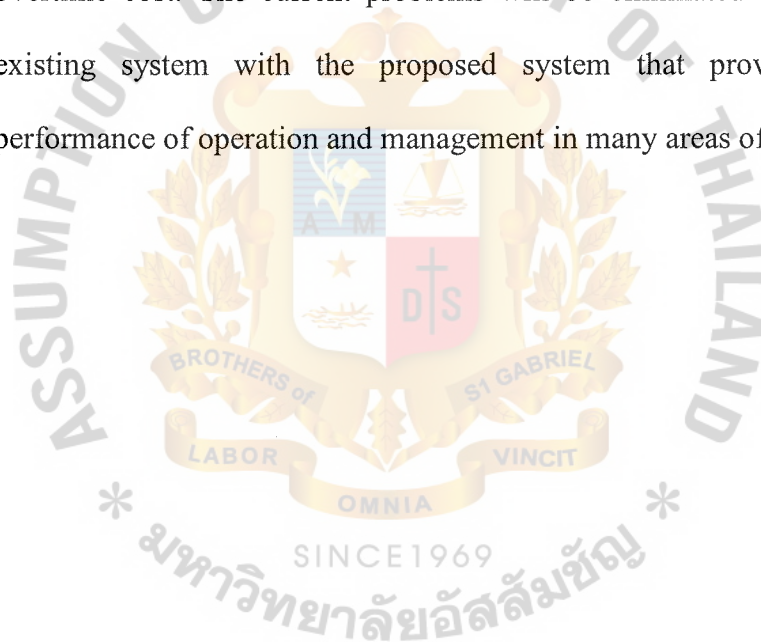
The proposed system focuses on Time Management that intends to improve capability and work efficiency in 3 areas as follows:

- (a) Working time, leave, and shift record handling.
- (b) Reports generating.

Increase accuracy and reduce time to generate reports.

- (c) Time and Leave approval.

Reduce manual workload and unnecessary cost in paperwork and overtime cost. The current problems will be eliminated by replacing the existing system with the proposed system that provided maximum performance of operation and management in many areas of work.



2.3 The Existing Computer System

At the beginning, TT&T use Proximity Card for working time recording only in Head Office, Bangkok so it is convenient to use software package that is purchased; 1 license to support operation of time management in Head Office. Currently, TT&T use Proximity Card in all Branch Offices and there are a lot of employees working on shift basis and special working time while the existing software package cannot support that environment. Moreover, Staffs at Head Office have to wait for time data of Branch Offices and process with Leave data that keeps separate database, bring time consuming reports generating and inaccurate reports that have occurred. The Application Architecture of the existing system can be classified as follows:

- (1) Data Architecture
 - (a) Use DBF File for Leave information.
 - (b) Use MDB File for Time information (exported from purchased software package), TT&T uses it for represent Time-in, Time-out of normally working time employee (8.00 AM-5.00 PM) on Web.
- (2) Process Architecture
 - (a) Use FOXPRO for Windows to develop Leave Application.
 - (b) Use purchased software package for Time Management.
- (3) Interface Architecture
 - (a) Input data via keyboard.
 - (b) Represent Employee Timesheet on Web, other information such as detail of employee who absent without leave, leave record, and shift schedule are reported on papers.

(4) Network Computing Architecture

(a) Windows 98 with LAN connection

The process of existing system can be shown in Appendix A Context Diagram and Appendix B Data Flow Diagram.

The next chapter represents the area of IT Technology including Cost and Benefit Analysis in the proposed system development.



III. THE PROPOSED SYSTEM

The next step after problems has been defined is the proposed system designing, including identifying system requirements, selecting the best solution from candidate feasibility analysis, system design, hardware and software requirement, and security and control meeting the present and future needs of the organization.

3.1 System Requirements

The proposed system specification is defined according to the needs of the Human Resource Departments as follows:

- (1) The new system supports shift working, flexible working time, and provide correct result from work hour, late, absent calculation in any working time.
- (2) Head office and all branch offices can manage time attendance on one integrated database.
- (3) All employees can make time and leave request for approval on this Web based system. After that the request information will inform their Manager for approval.
- (4) The reports can be generated either on screen or paper depending on an access permission of each report.
- (5) Each user has different levels of system access permission depending on an agreement of Human Resource Department Manager.
- (6) The system must be easy to use and understood.
- (7) The system can import data from time recorder.
- (8) The system must support prerequisite data updating process.

3.2 Candidate Solution and Feasibility Analysis

3.2.1 Candidate Solution

Three Candidate Solutions are proposed for this project as shown in Table 3.1.

Table 3.1. Candidate System Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized	Support Employee Working Time Management, Shift Generating, and workflow for Time/Leave Requesting/Approving	Same as Candidate 1	Same as Candidate 1
Benefits	Fully supports user requirements	Fully supports user requirements. Plus more efficient interaction with the system, employee can login to system anytime and anywhere as well as they can connect to the company's Intranet System	Same as Candidate 2
Servers and Workstations	(1) Database Server, (1) Application Server, (7) Clients	(1) Database Server, (1) Web Server, (1) Mail Server, (7) Web Clients	(1) Web Server, (1) Mail Server, (7) Web Clients

Table 3.1. Candidate System Matrix (Continued).

Characteristics	Candidate 1	Candidate 2	Candidate 3
Application Software	Custom Solution	Same as Candidate 1	Same as Candidate 1
Method of Data Processing	Client/Server	Internet-Based	Same as Candidate 2
Output Devices and Implications	(5) Laser Printers	Same as Candidate 1	Same as Candidate 1
Input Devices and Implications	Keyboard & mouse, (1) Scanner	Same as Candidate 1	Same as Candidate 1
Storage Devices and Implications	ORACLE:DBMS with 20 GB Capability	SQL : DBMS with 20 GB Capability	MS Access

3.2.2 Feasibility Analysis

The important activity to evaluate the alternative candidate solution is feasibility analysis. Economic Feasibility is the first one that we should consider because Information System is a major capital investment that must be justified, just as marketing must justify a new product so Cost and Benefit Analysis is used to estimate and compare costs and benefits of existing and candidate solutions.

(1) Cost Analysis

Cost can be divided into two categories. The first category concern is about developing the system, and the second is associated with system operating. System development costs are usually onetime costs that will not recur after the project has been completed whereas operating costs tend to recur throughout the lifetime of the system.

(1.1) Development Costs

To analyze the Cost Analysis, Investment Cost is the first direct cost that is concerned with the following:

- (a) Hardware Purchase
- (b) Software Purchase
- (c) Personnel hours for analysis, design, coding, testing, changeover from old to new system, and conversion from old to new system format.

(1.2) Operating Costs

The recurring cost can be determined as follows:

- (a) Day-to-day personnel costs, including systems administrator, computer operations, and end-user costs.
- (b) Computer supplies
- (c) Ongoing training

Cost Comparison of Existing and Candidate Solutions are shown in Appendix I.

(2) Benefit Analysis

Two types of proposed system benefits, tangible and intangible, make advantages in the company. Tangible benefit not only decreases paperwork, job procedure and responding time but also reduces cost of company. Intangible benefits can improve confidential control, higher decisions making and more accurate information.

(2.1) Tangible benefits

Tangible benefits can be measured and calculated. The value is measured in Baht currency. After implementing the proposed system, the tangible benefits can show the reducing costs as follows:

- (a) To reduce the processing time
- (b) To reduce overtime cost
- (c) To reduce lost of paperwork and document used in management and decisions making.

Tangible benefits of each candidate solution are shown in Appendix I.

(2.2) Intangible benefits

Intangible benefits cannot be measured monetarily. However, it can increase benefits to the company in several ways as follows:

- (a) Enhance the decisions making
- (b) Improving time management
- (c) * Improving manpower management *
- (d) Improving confidential control
- (e) Improving information management
- (f) Improving speed of operations

(3) Payback Analysis

The payback analysis technique is a simple and popular method for determining when an investment will pay for itself. Because systems development costs are incurred long before benefits begin to accrue, it will take some time for the benefits to overtake the costs.

After implementation, we will incur additional operating expenses that must be recovered. Payback analysis determines how much time will lapse before accrued benefits overtake accrued and continuing costs. This period of time is called the Payback period.

Calculation of Payback Analysis

This is used for estimating the amount of investment in proposed system to find out worth of investment.

Formula $P = I / (1 - T)R$

Where $P =$ Payback period

$I =$ Investment or capital expenditure

$T =$ Tax rate (10%)

$R =$ Annual saving realized by investment
(Tangible benefits subtracted by operational cost)

Payback period of each candidate solutions are shown in Appendix I.

The result from Cost and Benefits Analysis are used together with other criteria to evaluate the candidate solution as shown in Table 3.2.

Table 3.2. Feasibility Analysis Matrix.

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility Functionality	30%	Support user requirements in Time, Leave and Shift management Score: 95	Same as Candidate 1 Score: 95	Same as Candidate 1 Score: 95
Technical Feasibility Technology	30%	Need install Application on each Client so it's hard for maintenance	User can login to system with any web clients, with high security and support large amount data	User can login to system with any web clients to access Database that cannot support large amount data
Expertise		Require to hire or train ORACLE Developer 2000 expertise to perform application development and Database Administration Score : 70	Current Staff is comfortable with SQL Server and Active Server Page Score : 100	Current Staff is comfortable with MS Access and Active Server Page Score : 60

Table 3.2. Feasibility Analysis Matrix (Continued).

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Economic Feasibility Cost to develop: Payback period (discounted): Net present value: Detailed calculations:	30%	Approximately 1,581,500 Approximately 2.3 years Approximately 1,700,631.81 See Appendix I Score : 95	Approximately 1,609,000 Approximately 3.4 years Approximately 840,330.81 See Appendix I Score : 85	Approximately 1,298,000 Approximately 2.8 years Approximately 1,100,670.92 See Appendix I Score : 90
Schedule Feasibility	10%	12 months Score : 70	4 months Score : 90	Less than 4 months Score : 95
Ranking	100%	85	93	83

From the result of above Feasibility Analysis, we can compare all candidates and select Candidate 2 as the best solution.

3.3 System Design

3.3.1 Input Design

There are two ways for data entry as follows:

- (1) Import time data, using text file that is generated by time recorder.
- (2) Input data via keyboard, using the input forms for the following information:
 - (a) Annual Traditional Holidays

- (b) Working Time Schedule
- (c) Shift Schedule
- (d) Type of Leave
- (e) User Permission
- (f) Time Correction and Leave information, needed for requesting and approving.

3.3.2 Output Design

Most outputs are in the form of reports as shown in Appendix H followed by the following items:

- (1) Traditional Holidays (On Screen Report)
- (2) Shift Schedule: Department (On Screen Report)
- (3) Timesheet: Individual (On Screen Report)
- (4) Leave: Individual (On Screen Report)
- (5) Leave: Department (On Screen Report)
- (6) Unusual Time-in and Time-out: Department (On Screen Report)

3.3.3 Screen Design

The screen design will be shown in Appendix G.

3.3.4 Process Design

The new process can be shown in Appendix A Context Diagram and Appendix B Data Flow Diagram, and the process specification illustrated in Appendix C.

3.3.5 Database Design

Stored data in tabular form is distributed in relational database concept as shown in Appendix D.

3.4 Hardware and Software Requirement

The proposed system will be built on Network Computing Solution which the actual user interface implemented in client-side Web browsers using any process that runs on Web application server, which connects database server on the back side

The Application Architecture of the proposed system can be classified as follows:

- (1) Data Architecture
 - (a) Centralized Relational Database, SQL Server
- (2) Process Architecture
 - (a) ASP, HTML, JAVA Scripts, VB Scripts, SQL Statement
- (3) Interface Architecture
 - (a) Input data via keyboard and text file importing
 - (b) Represent report on paper and Web
- (4) Network Computing Architecture (Internet-Based Computing Architecture)
 - (a) Windows 2000 Clients
 - (b) Windows 2000 SQL Database Server
 - (c) Windows 2000, IIS Web Applications Server

The hardware configuration is illustrated in Figure 3.1 and the hardware specifications are described in Tables 3.3-3.5.

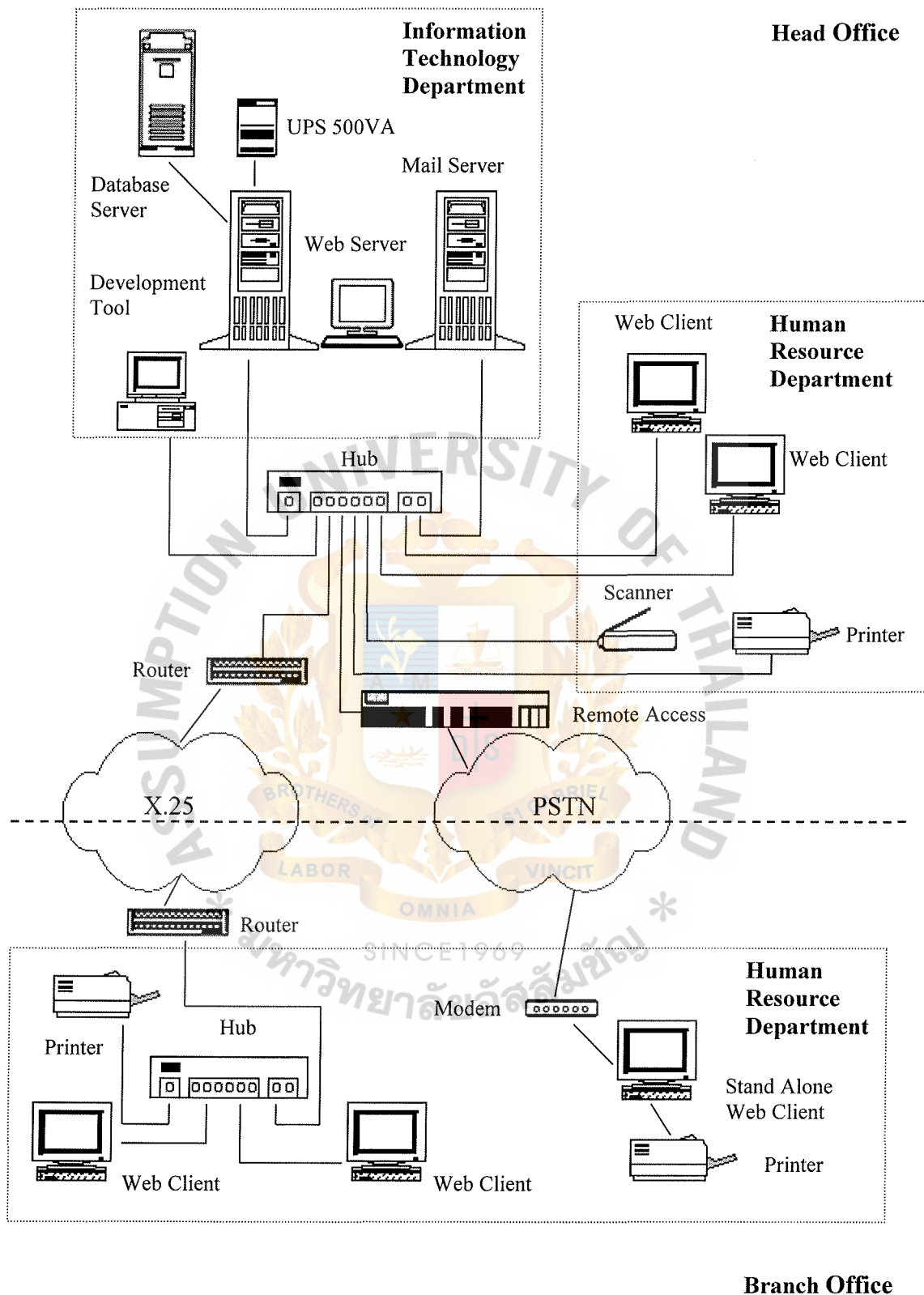


Figure 3.1. The Hardware Configuration of Human Resource Department.

Table 3.3. The Hardware Specification for Web, Mail, and Database Server.

Hardware	Specification
CPU	Pentium III 1.26 GHz
Memory	256 MB ECC SDRAM
Hard Disk	20 GB
CD-ROM Drive	40X
Floppy Disk Drive	1.44 MB
Network Adapter	3COM 10/100 Mbps
Display Adapter	SVGA card
Display	17" monitor

Table 3.4. The Hardware Specification for Web Clients and Development Tools.

Hardware	Specification
CPU	Pentium III 550 MHz
Memory	64 MB SDRAM
Hard Disk	4.3 GB
CD-ROM Drive	40X
Floppy Disk Drive	1.44 MB
Network Adapter	3COM 10/100 Mbps
Display Adapter	SVGA card
Display	14" monitor

Table 3.5. Other Hardware Specification.

Hardware	Specification
Printer	HP LaserJet 1100
Scanner	HP ScanJet 5200c
UPS	LEONICS OA4 500VA
Existing Network Equipment (Remote Access, Router, HUB, Cable)	

The software specification, required by new Web Based System are described in Tables 3.6 and 3.7.

Table 3.6. The Software Specification for Web, Mail and Database Server.

Software	Specification
Operating System	Microsoft Windows 2000 Server
Web Server	Microsoft Internet Information Services 5.0
Application Server	Microsoft Active Server Pages
Mail Server	Microsoft Exchange 2000 Server
E-Mail Component	W3 JMail 4.3
Database Server	Microsoft SQL Server 8.0
Security Control	Norton AntiVirus Corporate Edition

Table 3.7. The Software Specification for Web Clients and Development Tools.

Software	Specification
Operating System	Microsoft Windows 2000 Professional
Web Browser	Microsoft Internet Explorer 6.0
Application Software	Microsoft Office 2000 Professional Edition
Development Tools	Microsoft Frontpage 2000 EditPlus Text Editor 2.0 Adobe Photoshop 6.0

3.5 Security and Control

Because the security is very important for all areas of work, including computer area, it is necessary to promote security of Time Attendance Information System in both Physical Protection and Logical Protection.

3.5.1 Physical Protection

The system should be available at all times so it needs to be protected from physical problems such as the system should be equipped with UPS to help continue the operations when the electricity runs down, and it is possible to recover the database if it is damaged or destroyed due to unexpected situations. The concerning physical protection can be classified as follows:

(1) Access Control

All servers should be kept in the computer center that have access control to make sure that anyone who does not have permission cannot access the computer room, user can only access to data.

(2) Inventory Control

Both hardware and software that is unregistered cannot connect or run into the server.

(3) Backup & Recovery

Data can be destroyed physically by harddisk failure so backup tapes are needed for data recovery.

(4) Virus Protection

The anti-virus software should be installed and updated at all times. There are several anti-virus programs such as Norton Anti-Virus that is an efficient program to scan and protect virus.

3.5.2 Logical Protection

Data Integrity should be promoted in all systems so Input, Output, and Process should be controlled as follows:

(1) Input Control

To make sure that all input data is complete, correct and in time by providing the following aspects:

(a) Data Verification

The sensitive data should have two times data entry such as when users need to change their password, they should type password and retype it for verification.

(b) Data Validation

Data should be validated by using the nature of data itself such as Date must not be 30 February, Employee Time-in should not be later than Employee Time-out, and so on.

(c) Timeliness

Put timestamp to record after finishing data entry.

(2) Output Control

Output should be processed on time in right format and distributed to the right person and not given to the wrong person.

(3) Process Control

Data should be kept secret, each employee owns accessing security level by applying policy for accessing the system.

Process should be controlled by providing the following aspects:

(a) Identification

Only an authorized person is allowed to access into system.

(b) Authentication

Users have own password and user ID for access into system.

(c) Authorization

Users have own permission level. They can read, write, edit, and delete some authorized data depending on the policy.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

After finishing the process of analysis and design, the project would be implemented. The new system was constructed and delivered into day-to-day operation.

The major functions of the Project Implementation are:

- (1) System Construction
- (2) System Implementation

4.2 System Construction

The proposed system construction consists of three tasks as follows:

4.2.1 Hardware and software installation

Hardware and software installation for Web server, Mail server, Database server, and development tools

4.2.2 Build and test database

The database schema is required to build unpopulated database that provides security controls together with backup and recovery.

4.2.3 Write and test new program

To develop a functional system that fulfills business and design requirements.

4.3 System Implementation

The Proposed System Implementation consists of three tasks as follows:

4.3.1 Hardware and Software Installation for Web Clients

4.3.2 System Test

Testing includes verification of the basic logic of each program and the effectiveness of the entire system. It is absolutely important that the system works correctly before distributing to users. System Testing, includes two steps as follows:

(1) Preparation

All systems needed this preparation before testing. The preparation can be classified as follows:

(a) Assign the Test Team

Test team, including System Analyst, Users, and Auditor that are responsible for System Testing.

(b) Test schedule

This schedule represents time when to do what and by whom.

(c) Test script

This script represents step for testing such as name list of test team with testing part details, testing flow, what data to be put in, and how to do.

(d) Test data

Actual data should be prepared for putting in the system.

(e) Base Case Test Evaluation

Test team should expect test result and keep all test cases in Base Case.

(2) Actual Test

(a) Validation Test

Testing for validation of system, including Unit Test, Module Test, System Test, and Integration Test to make sure that the system work correctly.

(b) Security Test

Testing for security, including Security Function Test such as authentication and authorization test, and Backup & Recovery Test.

(c) Performance Test

Testing for performance concerns Response Time testing, and System Under Stress Condition testing.

4.3.3 Conversion

Once system testing is complete, the project team can begin to integrate people, software, hardware, and data into the operational information system. This normally involves the conversion from the existing system to the new one. Conversion is task of transforming the users' current files, and data in existing database to the format required by new system, including the following strategies:

- (1) Users have to identify and prepare all necessary data for the system conversion.
- (2) To populate the new database with existing data from the old system.
- (3) System acceptance test, using real data for validation, security, and performance test.

- (4) Parallel conversion, both existing and proposed system are operated for sometime period until the project team is confident that the new system is working properly.
- (5) Abrupt cut over, the old system is terminated and the new system is placed into operation.

4.3.4 Training

Training is the final task of the System Implementation. System users should be trained and provided with documentations that guide them to using the new system.

The agenda for the 5 days training program are as follows:

- (a) Purposes and objectives of the system
- (b) Differences between the existing system and the new one
- (c) Orientation with the new system
- (d) Demonstration of the new one
- (e) Familiarization with the new system practice together with database test

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The effectiveness of a system is determined by the time and cost required to operate the system versus the benefits derived from the system. The part of Cost and Benefit Analysis, Cost Comparison between Existing and Proposed System represents that cost of the proposed system higher than cost of existing system in the first year but in the later year, the proposed system cost will be lower than the existing system cost. Furthermore, the Payback Analysis represents that payback period of the proposed system is within 3.4 years so it is a good investment.

Time Attendance Information System is designed to solve existing problems such as data redundancy, lack of data sharing, time consuming in reports generating, and serves need of the organization, especially improving more efficiency in the existing workload and enhancing the overall system performance, including responding the user requirement with the following:

- (1) The proposed system provides data entry validation, faster and correct processes, and distributed output to authorized persons, so it helpful for management.
- (2) Web Based Information System decreases time for access and manipulate data over the network.
- (3) The proposed system reduces workload of Human Resource Department by providing a centralized database on Network Computing System. This new structural and flexible system is easy for maintenance so it can reduce workload of IT Department as well.

- (4) Security Control together with Backup & Recovery performed for data protection.
- (5) Web based workflow is helpful for paper and overtime cost reducing.

Table 5.1. Degree of Achievement of the Proposed System.

Process	Existing System	Proposed System
Create Shift Schedule	20 minutes	10 minutes
Stored Time records	40 minutes	10 minutes
Stored Leave records	20 minutes	7 minutes
Stored Employee records	20 minutes	5 minutes
Search Employee Time records	10 minutes	3 minutes
Search Employee Leave records	15 minutes	5 minutes
Reports generating	20 minutes	10 minutes
Total	145 minutes	50 minutes

Degree of Achievement of the proposed system in Table 5.1 is much faster than the existing system and saves a lot of time spent in Time Attendance Management. Since the existing system is based on PC stand alone, the problems about paperwork and human error often occur in searching, manipulation and reports generating. In the new system, Human Resource staffs can search, manipulate and generate reports for analysis. Thus, the other processes in the old system take much time to achieve. The result, in the proposed system can save much time in operation and make the result more accurate, and also help the staff work efficiently.

5.2 Recommendations

Because, the proposed system has been designed to solve existing problems and meet the requirements of Human Resource Department together with Top Management of the company and the Business Rules may change in the future, there are some points that should be improved in order to make this system better as follows:

- (1) Integrate Time Attendance Section with other sections in major Human Resource Information System especially with Payroll section such as when employees leave over the limit, the system can directly send concerning information to payroll section for confirmation before deducting employee's salary.
- (2) Develop Overtime Management function and merge into Time Attendance section to make completeness for this section and link this function to Payroll section for confirmation before adding overtime to employee's salary.
- (3) In the future, we can improve this system by replacing existing time recorder with the new one and connect it together in all branch offices and head office for directly importing time data to system without importing by Human Resource staffs.
- (4) Improve Security Control of this system and publish Leave workflow over the Internet through company's Web sites, providing Web based workflow for all employees anytime and anywhere.



APPENDIX A

CONTEXT DIAGRAM

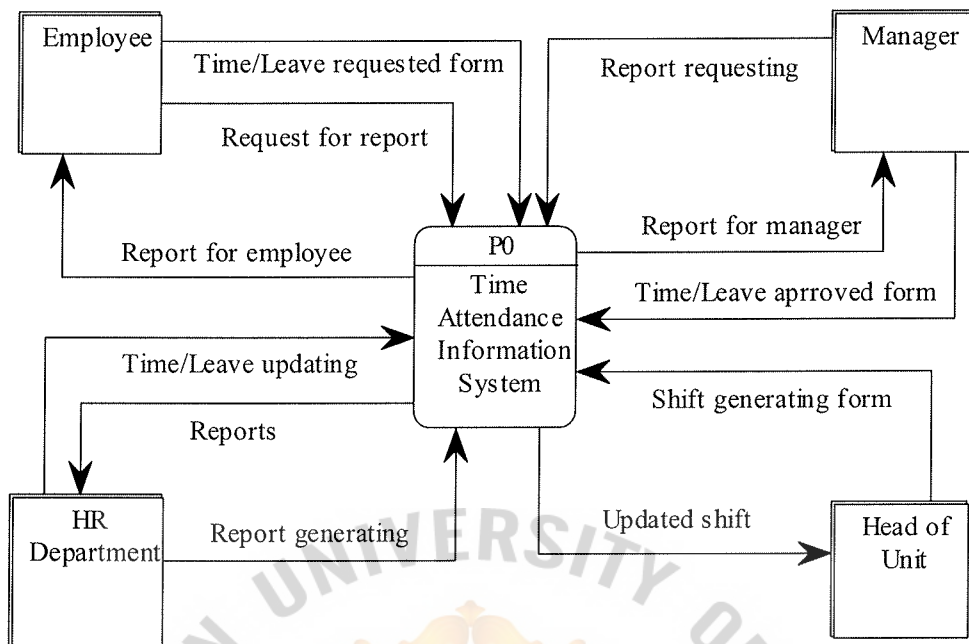


Figure A.1. Context Diagram of Existing System.

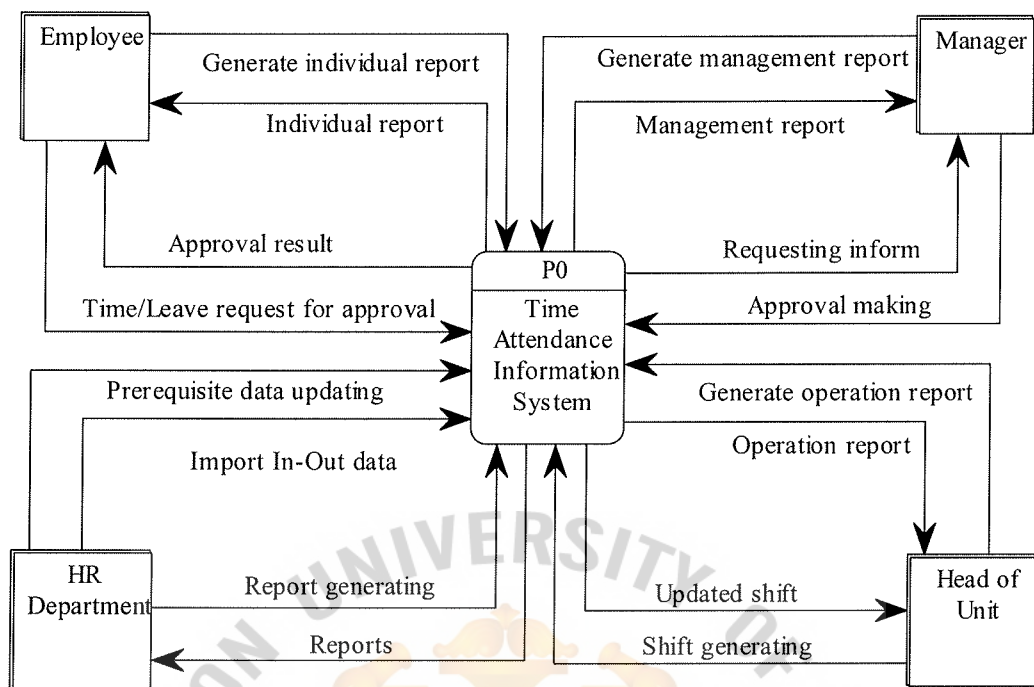
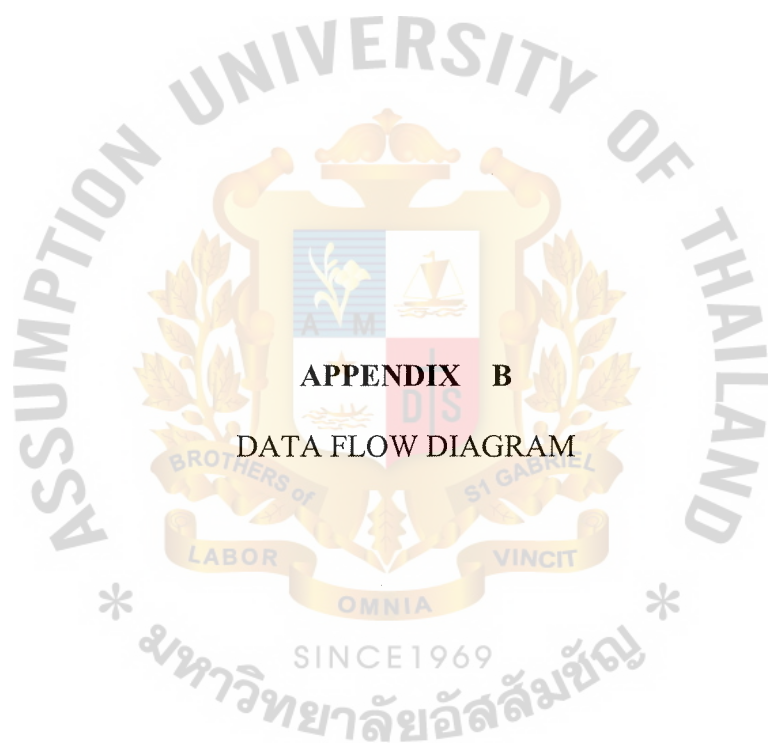


Figure A.2. Context Diagram of Proposed System.



APPENDIX B

DATA FLOW DIAGRAM

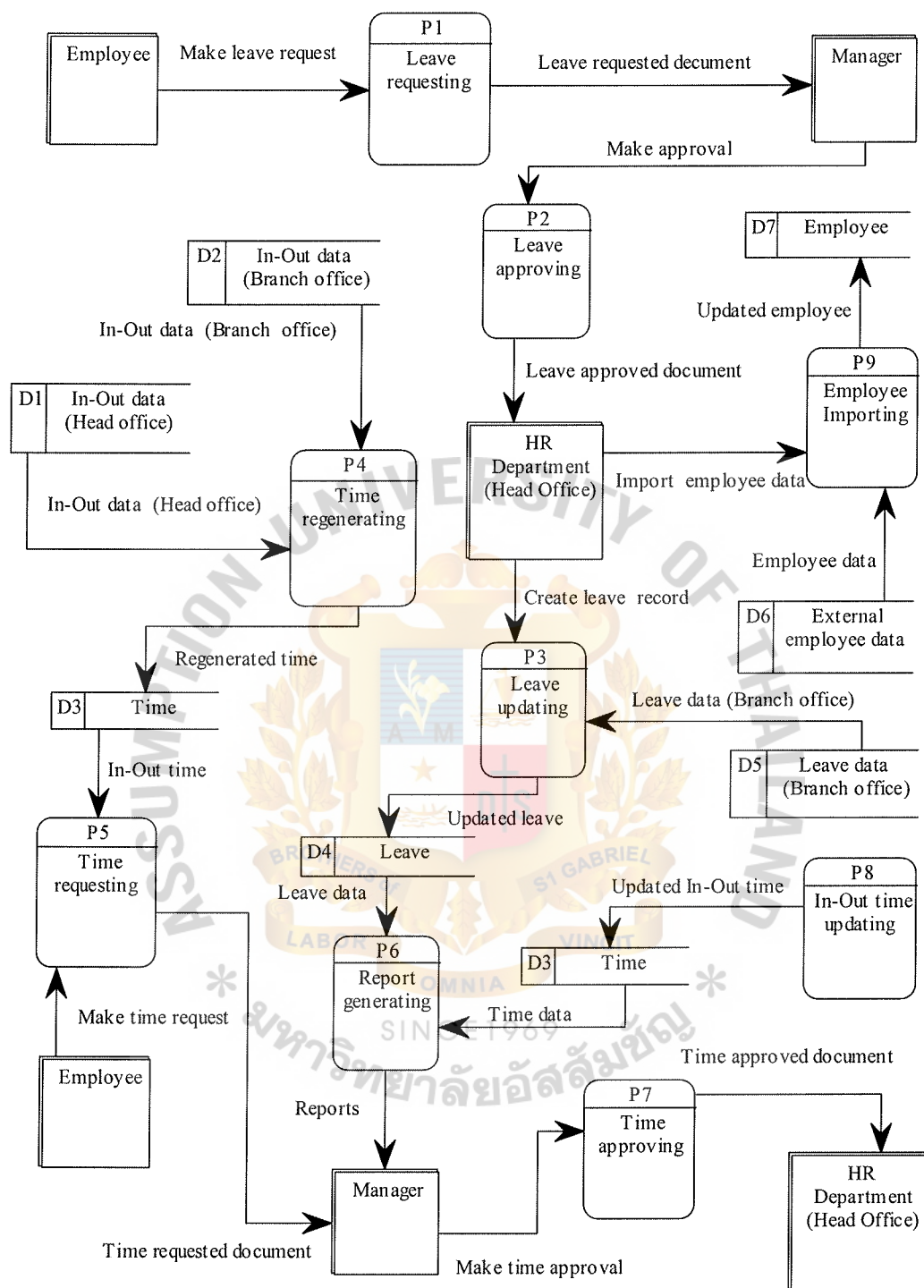


Figure B.1. Level 0 Data Flow Diagram of Existing System.

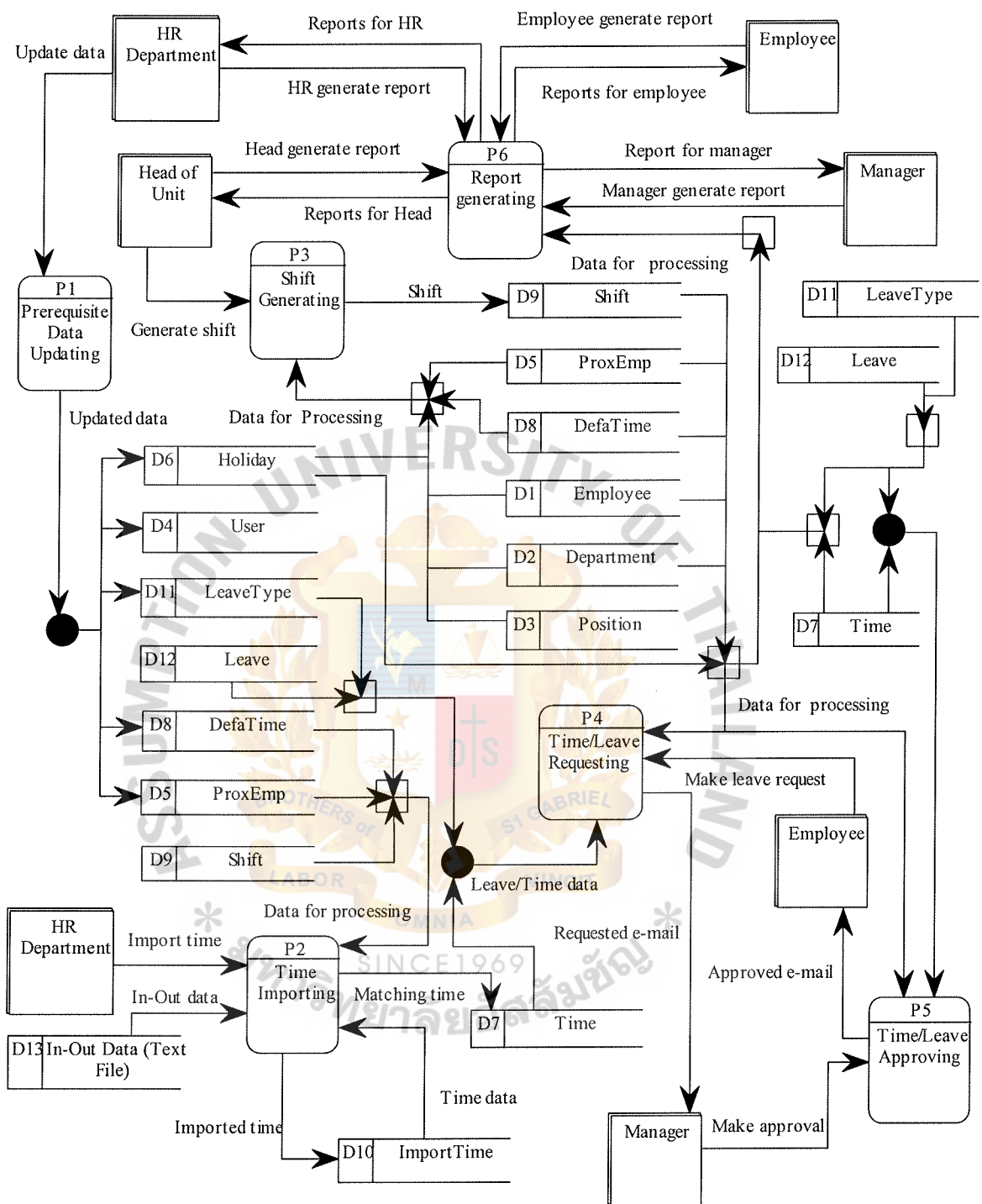


Figure B.2. Level 0 Data Flow Diagram of Proposed System.

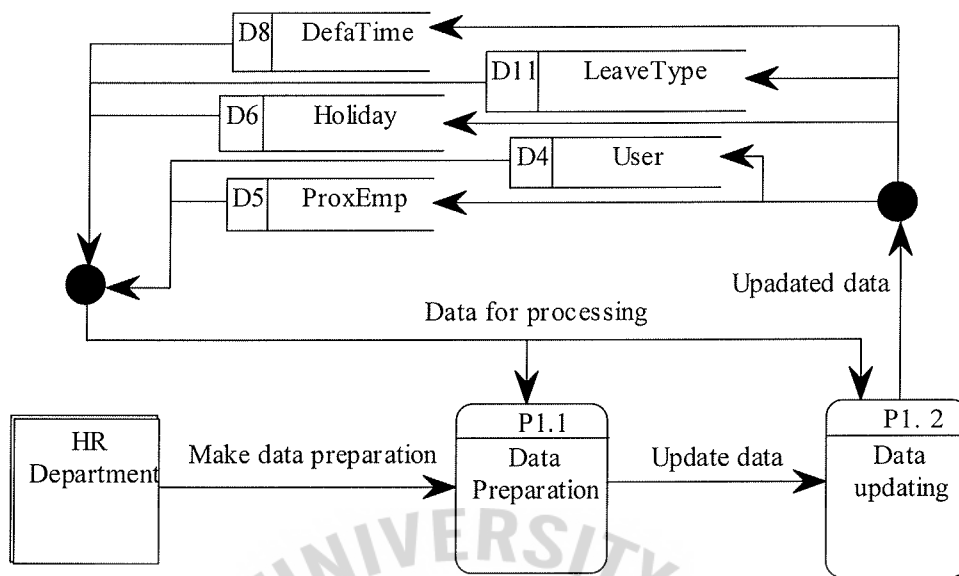


Figure B.3. Level 1 Data Flow Diagram of Prerequisite Data Updating Process.

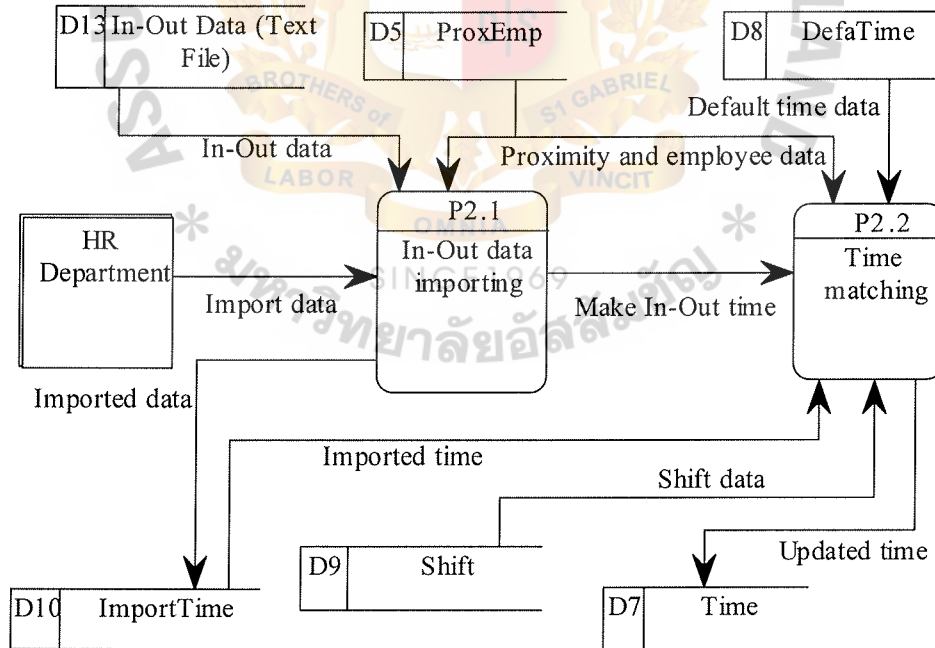


Figure B.4. Level 1 Data Flow Diagram of Time Importing Process.

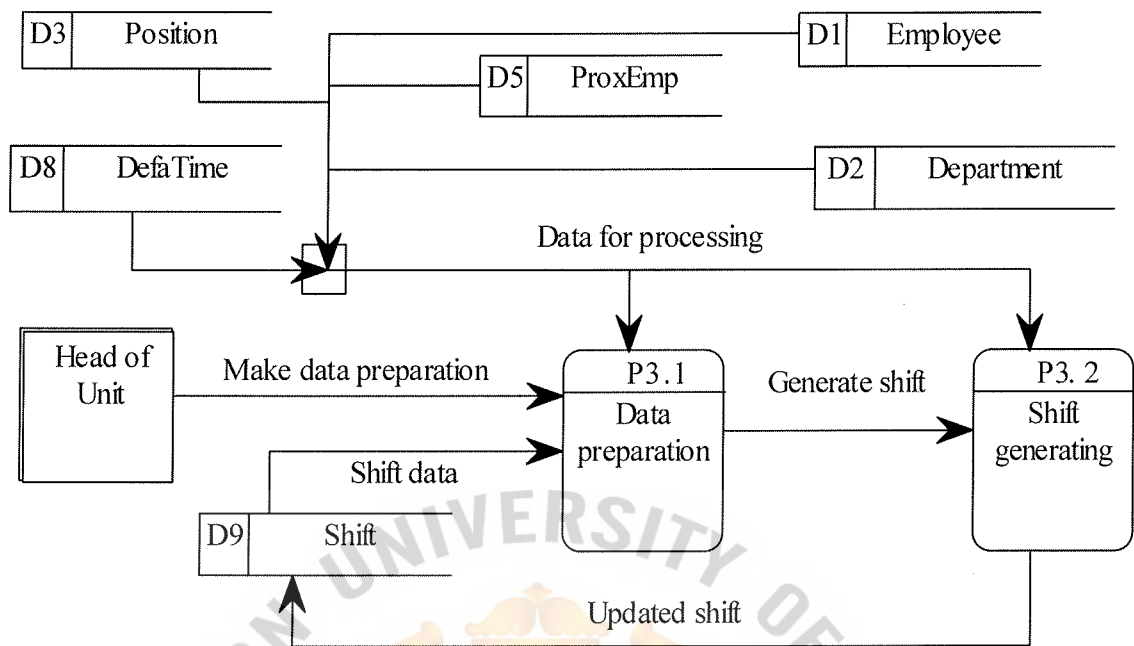


Figure B.5. Level 1 Data Flow Diagram of Shift Generating Process.

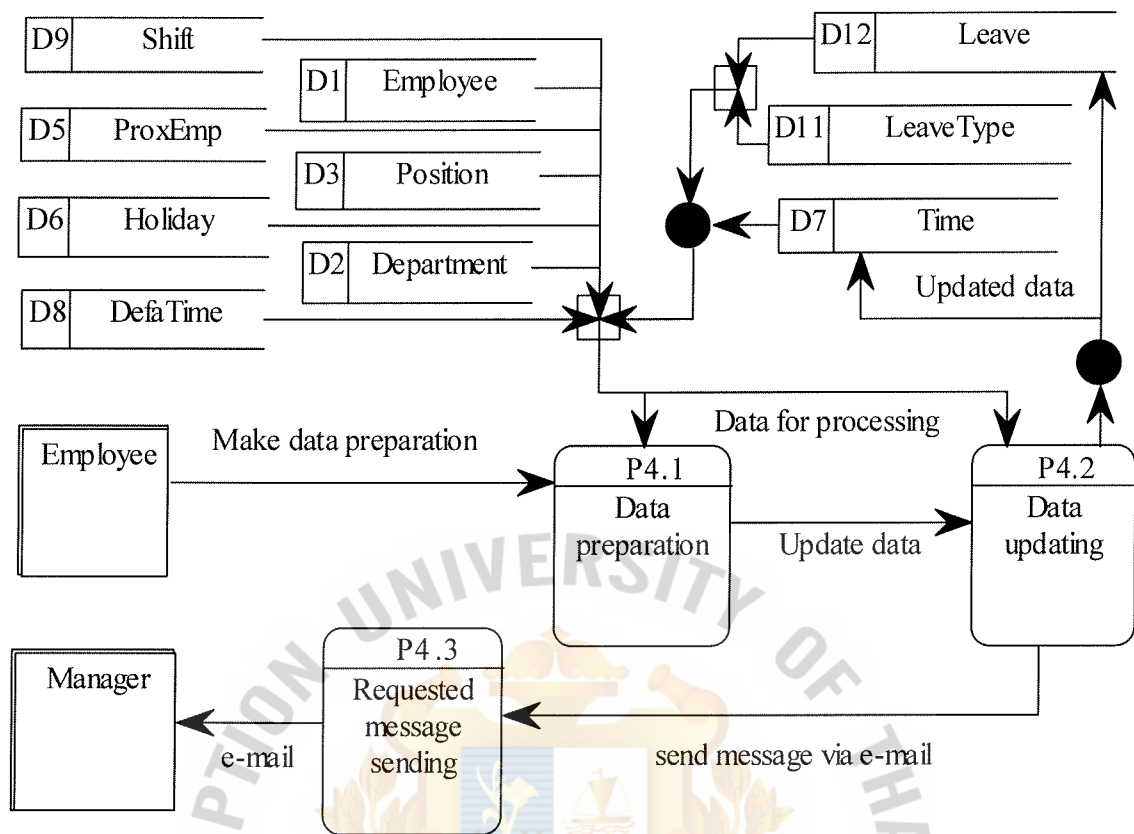


Figure B.6. Level 1 Data Flow Diagram of Time/Leave Requesting Process.

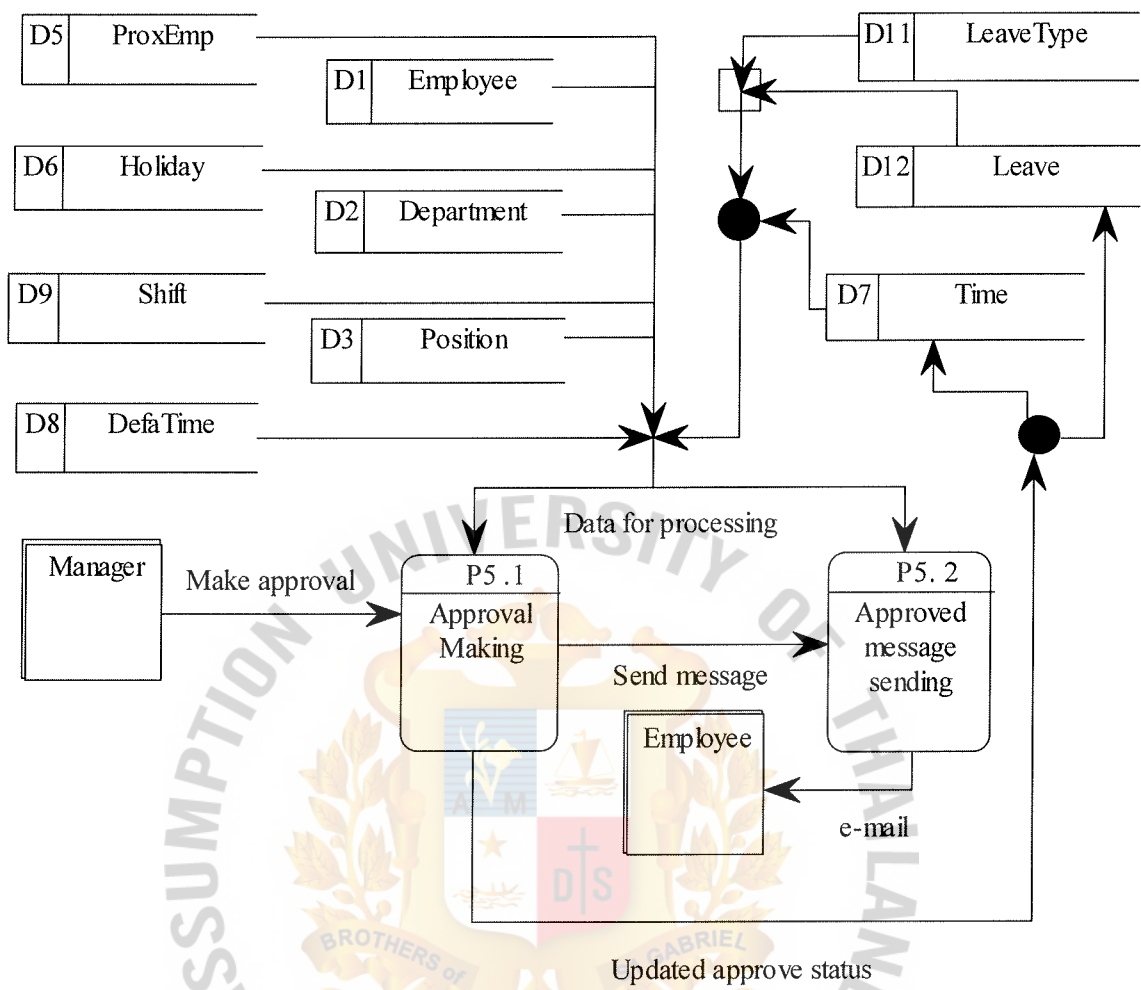


Figure B.7. Level 1 Data Flow Diagram of Time/Leave Approving Process.

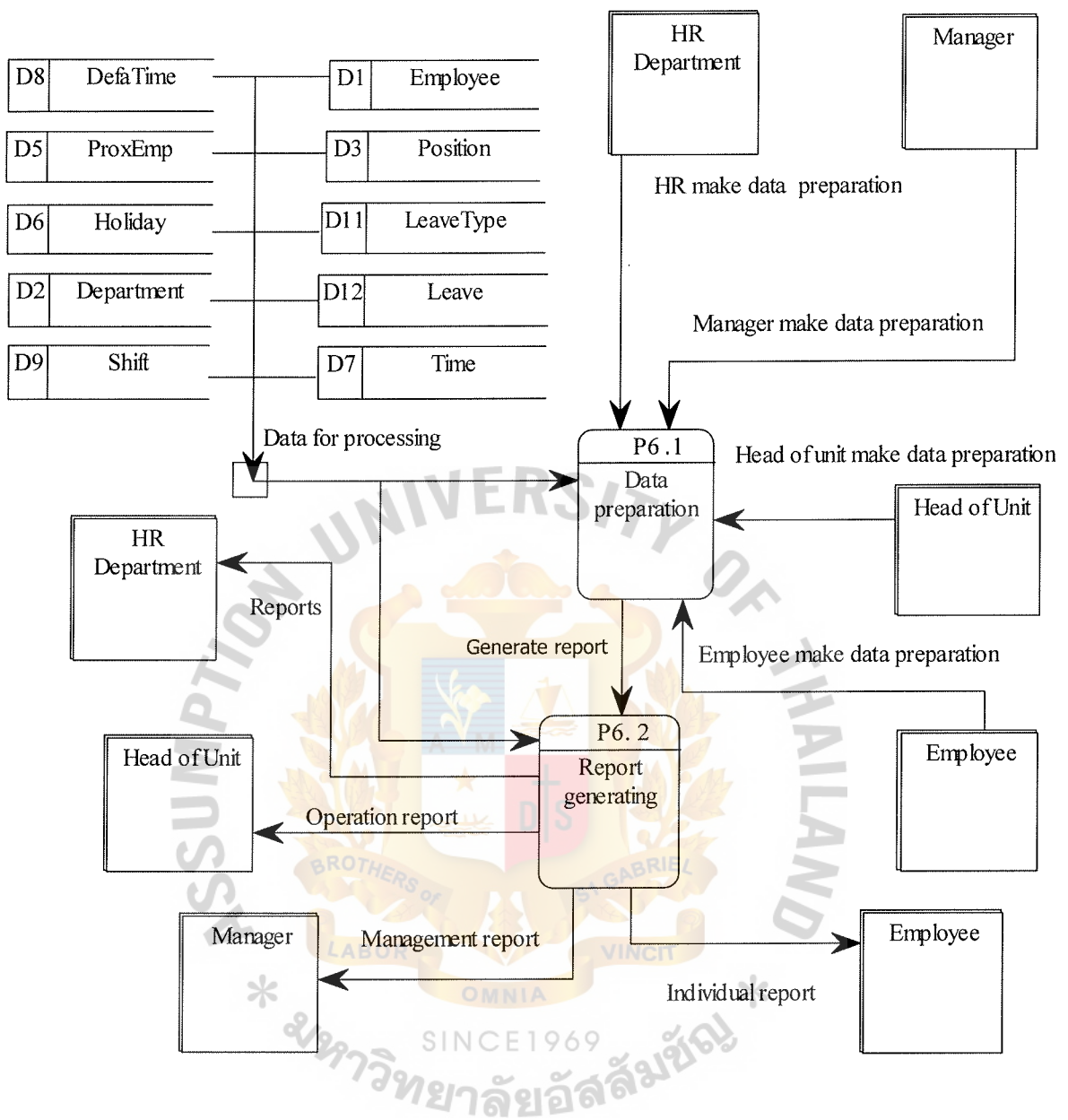


Figure B.8. Level 1 Data Flow Diagram of Report Generating Process.



APPENDIX C

PROCESS SPECIFICATION

PROCESS SPECIFICATION

Table C.1. Process Specification of Process 1.1.

Process Name:	Data preparation for Prerequisite Data Updating
Data In:	Default Time Traditional Holiday Employee Proximity Card Leave Type System User
Data Out:	Selected data for updating
Process:	(1) Get necessary employee data, proximity card, default time, etc. depend on updating need of user (2) Users select data that they want to update or select for new one inserting (3) Send updated data to process 1.2
Attachment:	Data Store D4, D5, D6, D8, D11

Table C.2. Process Specification of Process 1.2.

Process Name:	Prerequisite Data Updating
Data In:	Default Time Traditional Holiday Employee Proximity Card Leave Type System User
Data Out:	Updated prerequisite data
Process:	(1) Updated selected data (2) Record all updated data
Attachment:	Data Store D4, D5, D6, D8, D11

Table C.3. Process Specification of Process 2.1.

Process Name:	In-Out Data Importing
Data In:	Text file of In-Out data Employee Proximity card
Data Out:	Imported In-Out data
Process:	(1) Get necessary employee data, proximity card, and In-Out data. (2) Import data and record
Attachment:	Data Store D5, D13, D10

Table C.4. Process Specification of Process 2.2.

Process Name:	Time Matching
Data In:	Default Time Shift schedule Employee Proximity Card Imported In-Out data
Data Out:	Updated time
Process:	(1) Matching In-Out data with default time and shift schedule (2) Record updated time
Attachment:	Data Store D5, D7, D8, D9, D10

Table C.5. Process Specification of Process 3.1.

Process Name:	Data Preparation for Shift Generating
Data In:	Employee Position Department Employee Proximity card Default time
Data Out:	Required data for shift generating
Process:	(1) Get necessary data (2) Provide data for process 3.2
Attachment:	Data Store D1, D2, D3, D5, D8

Table C.6. Process Specification of Process 3.2.

Process Name:	Shift Generating
Data In:	Employee Position Department Employee Proximity card Default time
Data Out:	Shift schedule
Process:	(1) Generate shift (2) Record generated shift
Attachment:	Data Store D1, D2, D3, D5, D8, D9

Table C.7. Process Specification of Process 4.1.

Process Name:	Data Preparation for Time/Leave Requesting
Data In:	Employee Position Department Employee Proximity card Default time Shift Leave Leave Type Time
Data Out:	Prepared data for Time/Leave requesting
Process:	(1) Get necessary data (2) Provide data for process 4.2
Attachment:	Data Store D1, D2, D3, D5, D6, D7, D8, D9, D11, D12

Table C.8. Process Specification of Process 4.2.

Process Name:	Data Updating for Time/Leave Requesting
Data In:	Employee Position Department Employee Proximity card Default time Shift Leave Leave Type Time
Data Out:	Updated time
Process:	(1) Edit Time data (2) Record edited time (3) Provide data for process 4.3
Attachment:	Data Store D1, D2, D3, D5, D6, D7, D8, D9, D11, D12

Table C.9. Process Specification of Process 4.3.

Process Name:	Requested Message Sending
Data In:	Employee Position Department
Data Out:	Requested message via e-mail
Process:	(1) Get necessary data (2) Send message via e-mail
Attachment:	Data Store D1, D2, D3

Table C.10. Process Specification of Process 5.1.

Process Name:	Data Preparation for Time/Leave Approving
Data In:	Employee Position Department Employee Proximity card Default time Shift Leave Leave Type Time
Data Out:	Approved Time/Leave data
Process:	(1) User receive e-mail and get necessary data (2) Record approved status (3) Provide data for process 5.2
Attachment:	Data Store D1, D2, D3, D5, D6, D7, D8, D9, D11, D12

Table C.11. Process Specification of Process 5.2.

Process Name:	Approved Message Sending
Data In:	Employee Position Department
Data Out:	Approved message via e-mail
Process:	(1) Get necessary data (2) Send message via e-mail
Attachment:	Data Store D1, D2, D3

Table C.12. Process Specification of Process 6.1.

Process Name:	Data Preparation for Report Generating
Data In:	Employee Position Department Employee Proximity card Default time Shift Leave Leave Type Time
Data Out:	Prepared data for report generating
Process:	(1) Get necessary data (2) Provide data for process 6.2
Attachment:	Data Store D1, D2, D3, D5, D6, D7, D8, D9, D11, D12

Table C.13. Process Specification of Process 6.2.

Process Name:	Report Generating
Data In:	Employee Position Department Employee Proximity card Default time Shift Leave Leave Type Time
Data Out:	Generated reports
Process:	(1) Generate report (2) Display on screen
Attachment:	Data Store D1, D2, D3, D5, D6, D7, D8, D9, D11, D12



Time Attendance Database

Table D.1. Structure of DEFA_TIME Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Defa_id	character (2)	Y				Primary Key
2	Defa_out	character (5)					Attribute
3	Defa_in	character (5)					Attribute
4	End_break	character (5)					Attribute
5	Begin_break	character (5)					Attribute
6	SS_holiday	character (1)				Can be Y or N	Attribute

Table D.2. Structure of DEPARTMENT Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Dept_code	character (12)	Y				Primary Key
2	Dept_abbrv	character (5)					Attribute
3	Dept_name	character (20)					Attribute

Table D.3. Structure of EMPLOYEE Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Emp_id	character (12)	Y				Primary Key
2	Position_code	character (5)					Attribute
3	Level	character (20)					Attribute
4	Resign_date	date(10)		Y		> Start_date	Attribute
5	Title	character (10)					Attribute
6	Name	character (25)					Attribute
7	Surname	character (30)					Attribute
8	Dept_code	character (12)			POSITION		Attribute
9	Gender	character (1)					Attribute
10	Telephone	character (20)		Y			Attribute
11	Address	character (255)		Y			Attribute
12	Start_date	date (10)				< Resign_date	Attribute
13	Email	character (20)					Attribute

Table D.4. Structure of HOLIDAY Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Ck_date	date (10)	Y				Primary Key
2	Update_user	character (5)					Attribute
3	Detail	character (20)					Attribute
4	Update_date	date (10)					Attribute

Table D.5. Structure of IMPORT_TIME Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Import_id	character (6)	Y				Primary Key
2	IO_time	character (5)					Attribute
3	IO_date	date (10)					Attribute
4	Emp_id	character (4)			PROX_EMP		Attribute

Table D.6. Structure of LEAVE Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Leave_req_id	Character (6)	Y				Primary Key
2	Req_date	Date (10)					Attribute
3	Appr_date	Date (10)					Attribute
4	Emp_id	Character (4)			PROX_EMP		Attribute
5	Fromdate	Date (10)				< To_date	Attribute
6	Todate	Date (10)				> From_date	Attribute
7	Fromtime	Character (5)					Attribute
8	Totime	Character (5)					Attribute
9	Appr_user	Character (4)					Attribute
10	Remark	Character (100)					Attribute
11	Status	Character (1)				Can be W, Y, N	Attribute
12	Lock	Character (1)				Can be Y, N	Attribute
13	Leave_id	Character (2)			LEAVE_TYPE		Attribute

Table D.7. Structure of LEAVE_TYPE Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Leave_id	Character (2)	Y				Primary Key
2	Leave_desc	Character (50)					Attribute
3	Limit	Character (1)				Can be Y, N	Attribute
4	Max	Integer (2)					Attribute

Table D.8. Structure of POSITION Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Position_code	Character (6)	Y				Primary Key
2	Update_date	Date (10)					Attribute
3	Update_user	Character (4)					Attribute
4	Position_name	Character (40)					Attribute
5	Emp_id	Character (4)					Attribute

Table D.9. Structure of PROX_EMP Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Emp_id	Character (6)	Y				Primary Key
2	Card_id	Character (10)					Attribute
3	Begin_date	Date (10)					Attribute
4	End_date	Date (10)					Attribute
5	Update_date	Character (4)					Attribute
6	Update_user	Character (4)					Attribute
7	Defa_id	Character (2)					Attribute

Table D.10. Structure of SHIFT Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Shift_id	Character (6)	Y				Primary Key
2	Offday	Character (1)					Attribute
3	Defa_id	Character (2)			DEFA_TIME		Attribute
4	Sh_date	Date (10)					Attribute

Table D.11. Structure of TIME Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Time_id	Character (6)	Y				Primary Key
2	Time_out	Character (5)					Attribute
3	Time_in	Character (5)					Attribute
4	Ck_date	Date (10)			HOLIDAY		Attribute
5	Date_in	Date (10)				< Date_out	Attribute
6	Emp_id	Character (4)			PROX_EMP		Attribute
7	Date_out	Date (10)				> Date_in	Attribute
8	Status	Character (1)				Can be W, Y, N	Attribute
9	Req_date	Date (10)					Attribute
10	Appr_user	Character (4)					Attribute
11	Appr_date	Date (10)					Attribute
12	Lock	Character (1)				Can be Y, N	Attribute
13	Remark	Character (50)					Attribute
14	Defa_id	Character (2)			DEFA_TIME		Attribute

Table D.12. Structure of USER Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Emp_id	Character (4)	Y				Primary Key
2	Permission	Character (1)				Can be 1-4	Attribute
3	Password	Character (2)			DEFA_TIME		Attribute
4	Update_user	Character (4)					Attribute
5	Update_date	Date (10)					Attribute

Table D.13. Structure of PROX_EMP_SHIFT Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Emp_id	Character (4)	Y		PROX_EMP		Primary Key
2	Shift_id	Character (6)			SHIFT		Primary Key

Table D.14. Structure of PROX_EMP_DEFA_TIME Table.

No.	Field Name	Field Type	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Emp_id	Character (4)	Y		PROX_EMP		Primary Key
2	Defa_id	Character (2)			DEFA_TIME		Primary Key



DATA DICTIONARY

Table E.1. Data Dictionary of Time Attendance Database.

Field Name	Meaning
Address	Address of each employee
Appr_date	Time/Leave approving date
Appr_user	User who approve Time/Leave request
Begin_break	Time of the beginning break in work day
Begin_date	First date of proximity card using for each employee
Card_id	ID of each proximity card
Ck_date	Real date in month
Date_in	Date that employee start working in each day
Date_out	Date that employee stop working in each day
Defa_id	ID of each default time in working time schedule
Defa_in	Time that employee have to start working in each day
Defa_out	Time that employee can stop working in each day
Dept_abbrev	Department abbreviation name
Dept_code	Department code
Dept_name	Department name
Detail	Detail of each traditional holiday
Email	E-Mail address of each employee
Emp_id	Employee ID
End_break	Time that employee should stop break in work day
End_date	Last date of proximity card using for each employee
Fromdate	Date that employee start leave
Fromtime	Time that employee start leave
Gender	Gender of each employee
IO_date	Date that employee record In-Out data
IO_time	Time that employee record In-Out data
Import_id	ID of each imported In-Out data
Leave_desc	Description of leave type
Leave_id	ID of leave type
Leave_req_id	ID of leave request
Level	Personnel level of each employee
Limit	Leave limit of leave type for each employee working lifetime
Lock	Status of record locking
Max	Maximum leave of each leave type
Offday	Status of each day, it can be offday or working day
Password	Password of user for login to system

Table E.1. Data Dictionary of Time Attendance Database (Continued).

Field Name	Meaning
Permission	Permission level of each user
Position_code	Code of position
Position_name	Name of position
Remark	Remark for Time/Leave requesting
Req_date	Date of Time/Leave requesting
Resign_date	Resign date of each employee
Shift_id	ID of each generated shift
Start_date	Work start date of each employee
Status	Status of Time/Leave requesting
Surname	Surname of each employee
Telephone	Telephone of each employee
Time_id	ID of Time requesting
Time_in	Real time that employee start working in each day
Time_out	Real time that employee stop working in each day
Todate	Date that employee stop leave
Totime	Time that employee stop leave
Update_date	Date that user update data
Update_user	User who update data
Sh_date	Date that set up shift
SS_holiday	Status of user's offday some user didn't work in Sunday and Saturday whereas other groups work in that day.



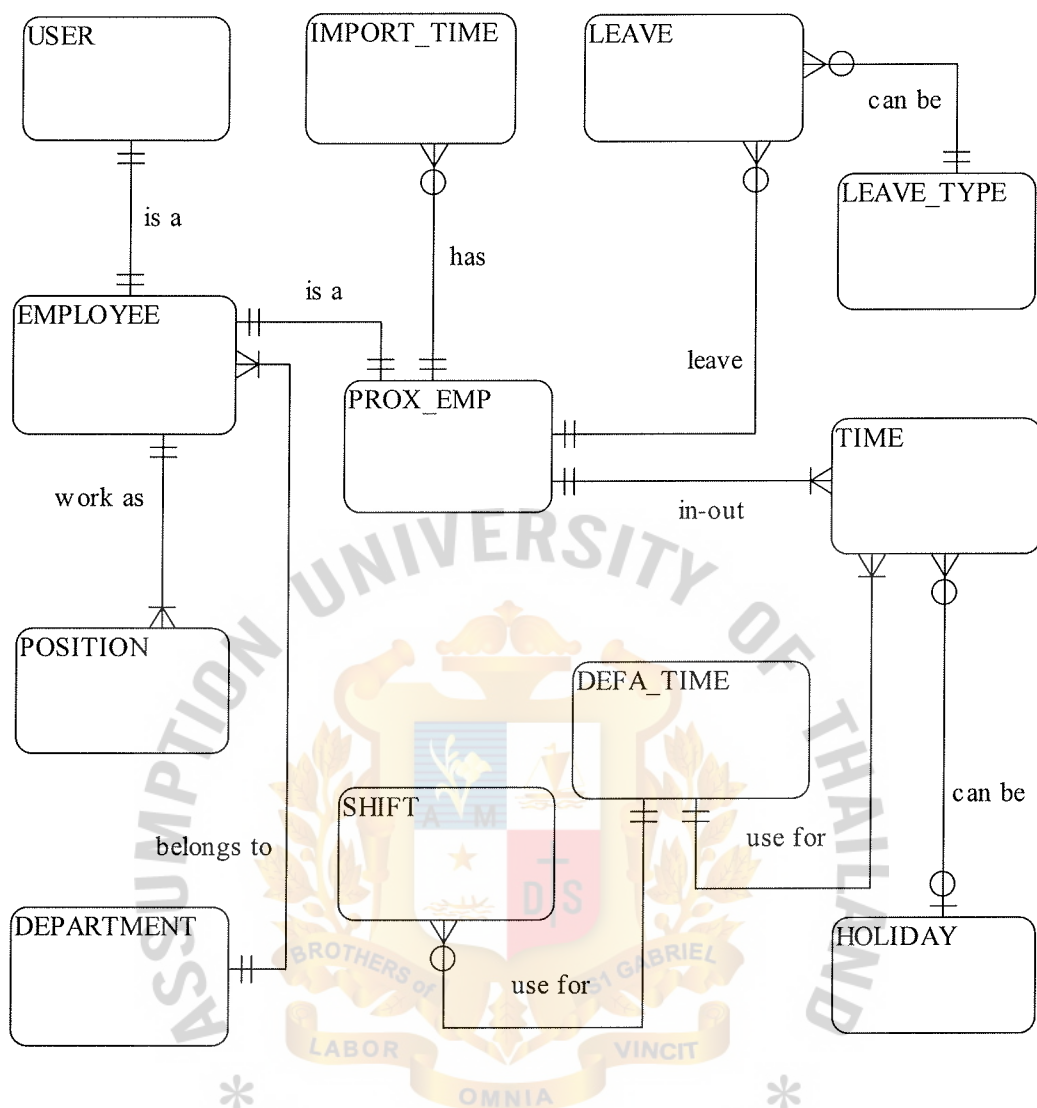


Figure F.1. Context Data Model of Time Attendance Information System.



APPENDIX G

WEB INTERFACE DESIGN

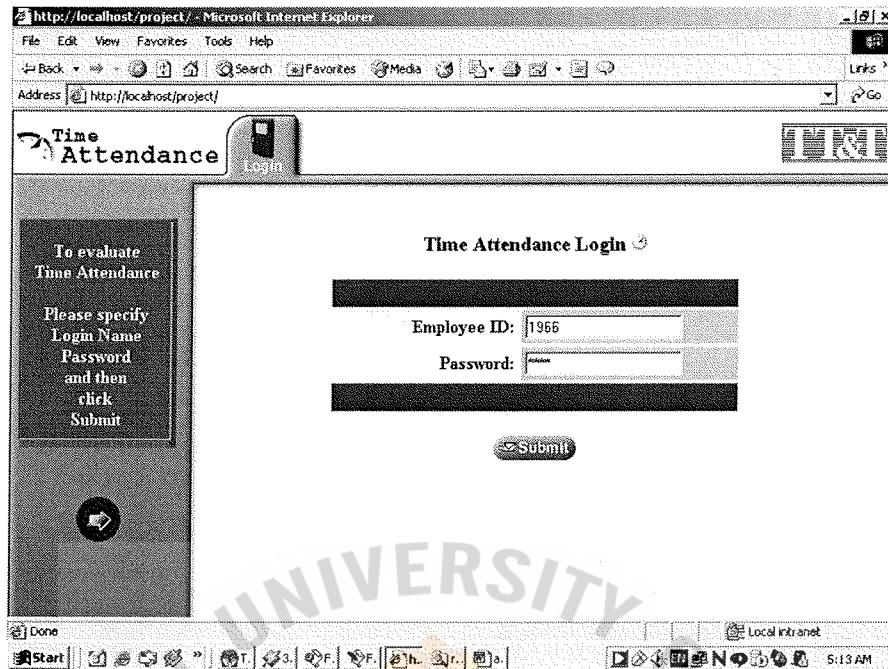


Figure G.1. System Login.

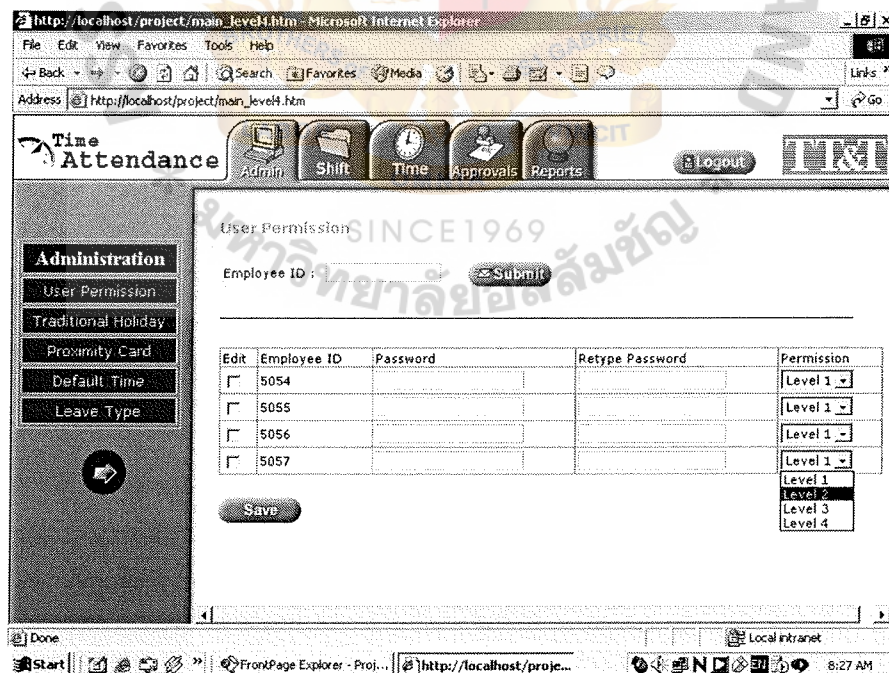


Figure G.2. User Permission Updating.

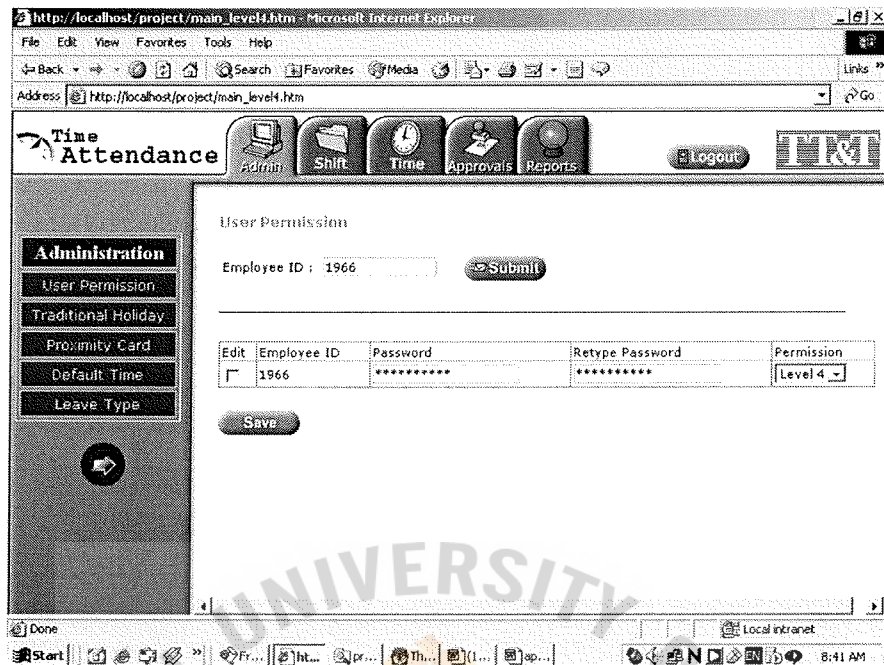


Figure G.3. User Permission Updating: Specify Employee ID.



Figure G.4. Traditional Holidays Updating.



Figure G.5. Traditional Holidays Updating (Continued).

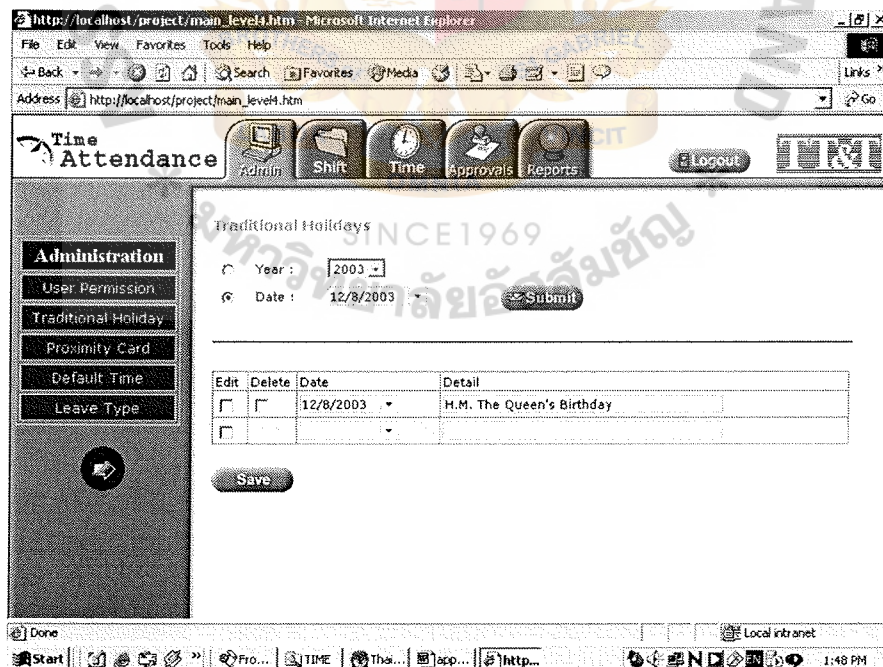


Figure G.6. Traditional Holidays Updating: Specify Date.

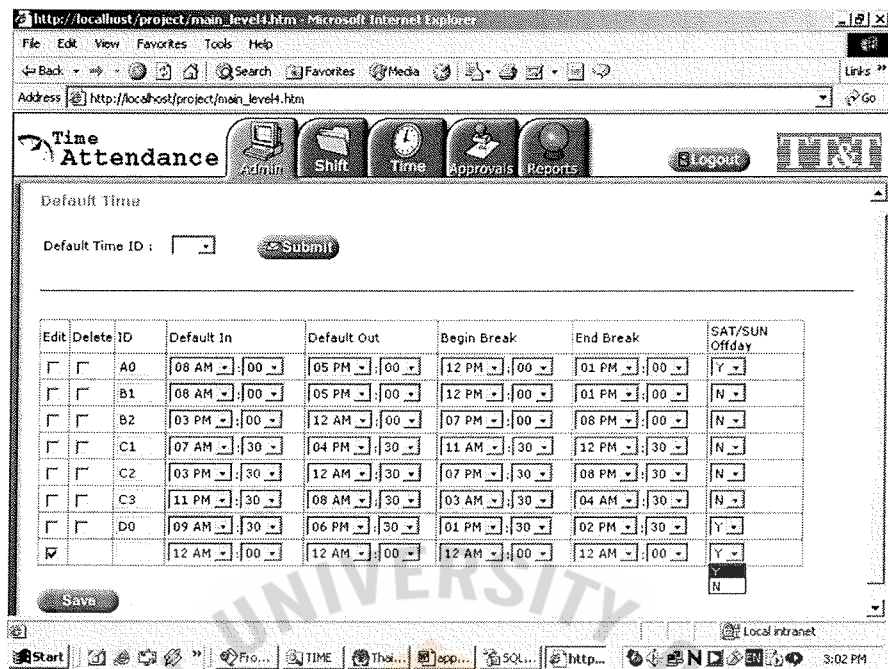


Figure G.7. Default Time Updating.

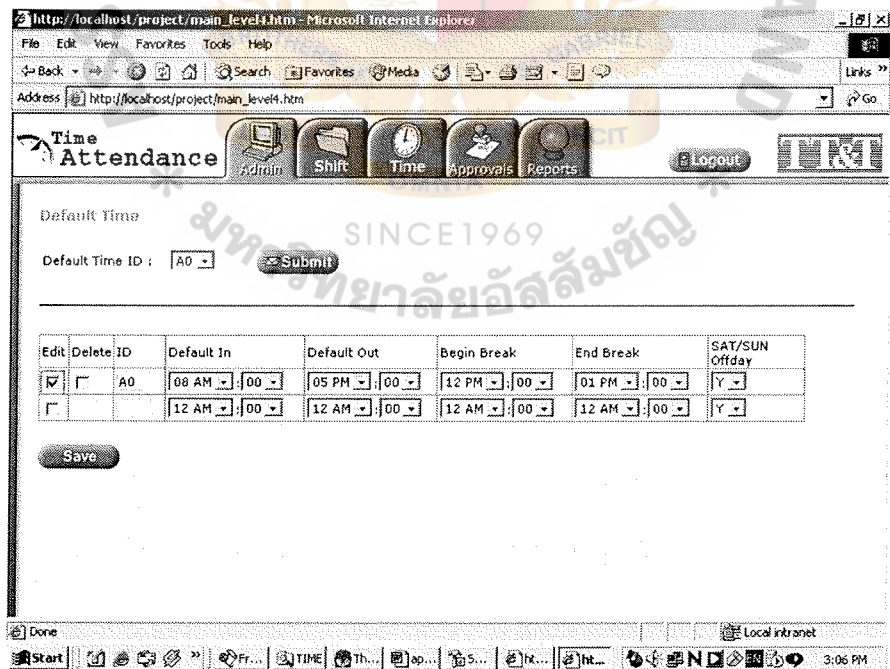


Figure G.8. Default Time Updating: Specify Default Time ID.

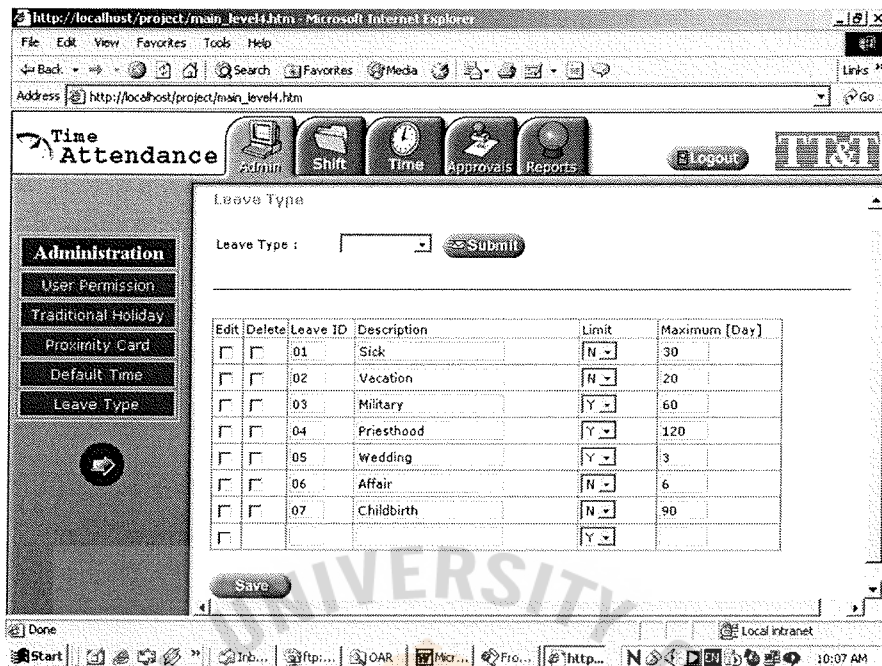


Figure G.9. Leave Type Updating.

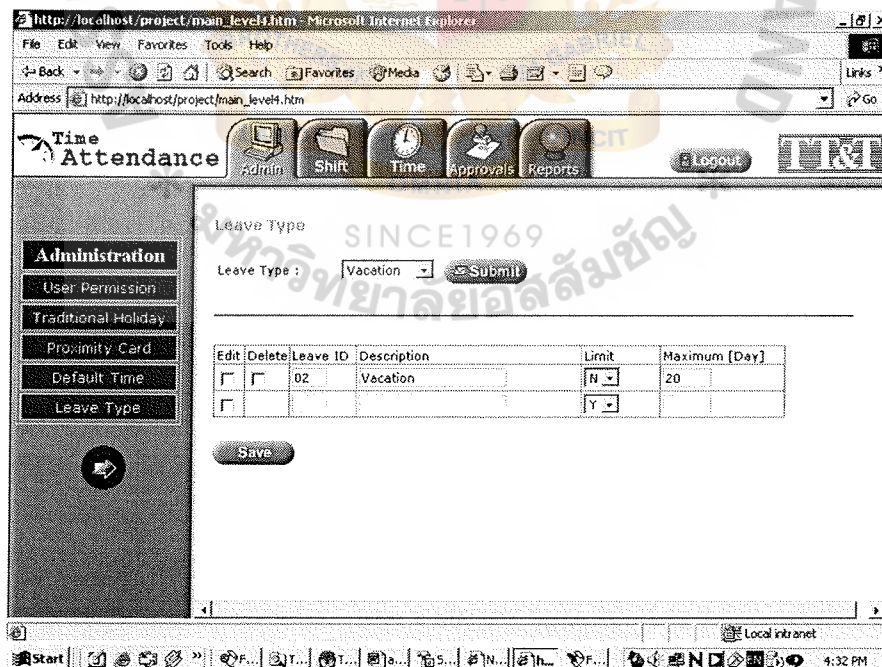


Figure G.10. Leave Type Updating: Specify Leave Type.

Time Attendance Administration

Employee Proximity Card

Employee ID : Submit

Edit	Card ID	Employee ID	Begin date	End date	Shift Type
<input type="checkbox"/>		5054	1/8/2003	16/7/2058	A
<input type="checkbox"/>		5055	1/8/2003	16/7/2058	A
<input type="checkbox"/>		5056	1/9/2003	16/7/2058	A
<input checked="" type="checkbox"/>	0299843740	5057	1/9/2003	16/7/2058	A

Save

SEPTEMBER 2003

Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Local intranet 11:53 AM

Figure G.11. Employee Proximity Card Updating.

Time Attendance Administration

Employee Proximity Card

Employee ID : 5038 Submit

Edit	Card ID	Employee ID	Begin date	End date	Shift Type
<input checked="" type="checkbox"/>	0299490790	5038	31/12/2002	16/7/2058	B

Save

DECEMBER 2002

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Local intranet 11:55 AM

Figure G.12. Employee Proximity Card Updating: Specify Employee ID.

http://aia-1966/project/menu2.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Links

Address http://aia-1966/project/menu2.asp Go

Time Attendance Admin Shift Time Approvals Reports Logout T&M

Shift Generating

Organization: Default Time Group: Month: Year:

C1 07:30 AM - 04:30 PM / C2 03:30 PM - 12:30 AM / C3 11:30 PM - 08:30 AM

Edit	ID	Name	1	2	3	4	5
<input checked="" type="checkbox"/>	5036	WEERAWIT SAKSITTIPITAK	C1 <input type="text" value="Off"/>	C1 <input type="text" value="Off"/>	C1 <input type="text" value="Off"/>	C1 <input type="text" value="Off"/>	C1 <input type="text" value="Off"/>
<input checked="" type="checkbox"/>	5067	SONGKRAM SIRICHREONWAT	C1 <input type="text" value="Off"/>	C1 <input type="text" value="Off"/>	C1 <input type="text" value="Off"/>	C1 <input type="text" value="Off"/>	C1 <input type="text" value="Off"/>
<input checked="" type="checkbox"/>	5068	SOMPOB NOPPACHAI	C2 <input type="text" value="Off"/>	C2 <input type="text" value="Off"/>	C2 <input type="text" value="Off"/>	C2 <input type="text" value="Off"/>	C2 <input type="text" value="Off"/>
<input checked="" type="checkbox"/>	5116	WALAILAK LACHAROJNE	C2 <input type="text" value="Off"/>	C2 <input type="text" value="Off"/>	C2 <input type="text" value="Off"/>	C2 <input type="text" value="Off"/>	C2 <input type="text" value="Off"/>
<input checked="" type="checkbox"/>	5119	PATTARAWADEE AEIMVJIT	C3 <input type="text" value="Off"/>	C3 <input type="text" value="Off"/>	C3 <input type="text" value="Off"/>	C3 <input type="text" value="Off"/>	C3 <input type="text" value="Off"/>
<input checked="" type="checkbox"/>	5180	APAKORN HETKATE	C3 <input type="text" value="Off"/>	C3 <input type="text" value="Off"/>	C3 <input type="text" value="Off"/>	C3 <input type="text" value="Off"/>	C3 <input type="text" value="Off"/>

Done Start Local intranet 7:03 PM

Figure G.13. Shift Generating.

http://localhost/project/menu3.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Links

Address http://localhost/project/menu3.asp Go

Time Attendance Admin Shift Time Approvals Reports Logout T&M

Time Attendance

Import In-Out Data

From Date: To Date:

Path:

OCTOBER 2003

Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Done Start Local intranet 7:11 PM

Figure G.14. In-Out Data Importing.

http://localhost/project/menu3.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Links

Address http://localhost/project/menu3.asp Go

Time Attendance Admin Shift Time Approvals Reports Logout

Time

Import text file

Matching time

Time Attendance

Matching In-Out Data

From Date: 12/10/2003 To Date: 13/10/2003

Employee ID: 5038

Save

OCTOBER 2003

Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4		
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Error on page.

Local intranet

Start

7:14 PM

Figure G.15. Time Matching.

http://localhost/project/menu4.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Links

Address http://localhost/project/menu4.asp Go

Time Attendance Admin Shift Time Approvals Reports Logout

Time Correction Request

Month: August 2003

Employee ID: 1966

Submit

Name: Miss. RAPEEPAN SUWANNAKORN

Position: APPLICATION DEVELOPMENT OFFICER

Organization: AIA

Default Time: 08:00 AM-05:00 PM

Edit	Delete	W/H	Date	Date In	Time In	Date Out	Time Out	Late	Absent	Remark	Status
<input type="checkbox"/>	<input type="checkbox"/>	W	01	01/08/2003	08:00 AM	01/08/2003	05:00 PM				
<input type="checkbox"/>	<input type="checkbox"/>	H	02	02/08/2003	01:00 PM	02/08/2003	01:00 PM				
<input type="checkbox"/>	<input type="checkbox"/>	H	03								
<input type="checkbox"/>	<input type="checkbox"/>	W	04	04/08/2003	08:30 AM	04/08/2003	05:00 PM	0.0:30			
<input type="checkbox"/>	<input type="checkbox"/>	W	05	05/08/2003	10:00 AM	05/08/2003	05:00 PM				

Done

Local intranet

Start

7:15 PM

Figure G.16. Time Correction Requesting: Select Date.

http://localhost/project/menut.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Links Go

Address http://localhost/project/menut.asp

Time Attendance Admin Shift Time Approvals Reports Logout

<input type="checkbox"/>	<input type="checkbox"/>	W	20	20/08/2003	08:00 AM	20/08/2003	05:00 PM			Train	Approved	
		W	21	22/08/2003	01:00 AM	22/08/2003	03:00 AM			Incomplete		
<input type="checkbox"/>	<input type="checkbox"/>	W	21	21/08/2003	08:00 AM	21/08/2003	05:00 PM			Train	Approved	
		W	22							Incomplete		
<input type="checkbox"/>	<input type="checkbox"/>	W	22	22/08/2003	08:00 AM	22/08/2003	05:00 PM			Forget Card	Approved	
<input type="checkbox"/>		H	23									
<input type="checkbox"/>		H	24									
<input type="checkbox"/>		W	25	25/08/2003	10:00 AM	25/08/2003	11:00 AM		0.7:00			
<input type="checkbox"/>		W	26	26/08/2003	02:00 PM	26/08/2003	03:00 PM		0.7:00			
<input checked="" type="checkbox"/>		W	27	27/08/2003	05:00 PM	28/08/2003	01:00 AM			Incomplete		
<input type="checkbox"/>		W	28							Leave 1.0:00		
<input type="checkbox"/>		W	29							Leave 1.0:00		
<input type="checkbox"/>		H	30									
<input type="checkbox"/>		H	31									
								0.1:00	5.5:00	Total		

Save

Done Local intranet 7:18 PM

http://localhost/project/menu4.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Mail News Links Go

Address http://localhost/project/menu4.asp

Time Attendance Admin Shift Time Approvals Reports Logout T&T

Time Correction Request

Name : Miss. RAPEEPAN SUWANNAKORN
Position : APPLICATION DEVELOPMENT OFFICER
Organization : AIA

Default Time : 08:00 AM-05:00 PM

	W/H	Date	Date In	Time In	Date Out	Time Out	Late	Absent	Remark
W	01	1/8/2003		08:00 AM	1/8/2003	05:00 PM			
H	02	2/8/2003		01:00 PM	2/8/2003	01:00 PM			
H	03								
W	04	4/8/2003		08:30 AM	4/8/2003	05:00 PM	0.0:30		
W	05	5/8/2003		10:00 AM	5/8/2003	05:00 PM		0.2:00	Leave 0.2:00
W	06	6/8/2003		02:00 PM	6/8/2003	05:00 PM		0.5:00	Leave 0.5:00
W	07	7/8/2003		05:00 PM	7/8/2003	05:06 PM			Incomplete
W	08	8/8/2003		07:00 AM	9/8/2003	02:00 AM			
H	09	9/8/2003		10:00 AM	9/8/2003	05:00 PM			
H	10								

Done Start Local intranet 7:20 PM

http://localhost/project/menu4.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Links

Address http://localhost/project/menu4.asp Go

Time Attendance Admin Shift Time Approvals Reports Logout

W	19	19/8/2003	07:00 AM	19/8/2003	07:30 AM		Incomplete
W	20	20/8/2003	05:00 PM	21/8/2003	03:00 AM		Incomplete
W	21	22/8/2003	01:00 AM	22/8/2003	03:00 AM		Incomplete
W	22						Incomplete
H	23						
H	24						
W	25	25/8/2003	10:00 AM	25/8/2003	11:00 AM	0.7:00	
W	26	26/8/2003	02:00 PM	26/8/2003	03:00 PM	0.7:00	
W	27	27/8/2003	05:00 PM	28/8/2003	01:00 AM		Incomplete
W	27	27/8/2003	08 AM	28/8/2003	01 AM		Seminar
W	28						Leave 1.0:00
W	29						Leave 1.0:00
H	30						
H	31						
						0.1:00 5.5:00	Total

Approved by : Mr.WIWAT MAHASARANONT (Head of Division : AIA)

Save

Done Local intranet 7:24 PM

Figure G.19. Time Correction Requesting: Edit Data (Continued).

http://localhost/project/menu4.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Links

Address http://localhost/project/menu4.asp Go

Time Attendance Admin Shift Time Approvals Reports Logout

Approvals

Time Request

Leave Request

Cannot send this e-mail, please contact your Administrator

Close

Done Local intranet 7:26 PM

Figure G.20. Informed error message for Time Correction Requesting.

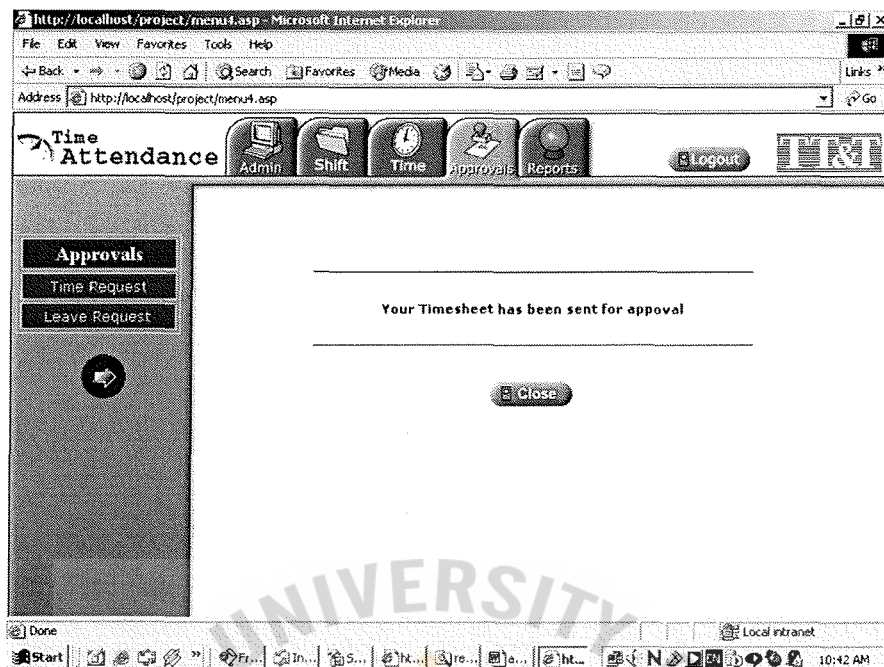


Figure G.21. Informed success message for Time Correction Requesting.

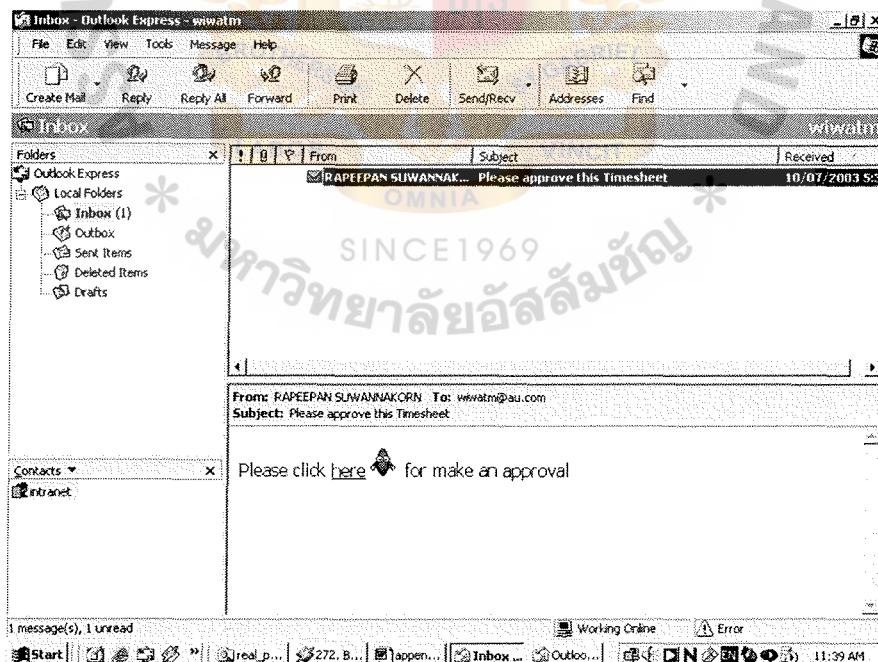


Figure G.22. Requesting Message via E-Mail.

New Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Mail News RSS Feeds

Address http://localhost/project/time/self_service/approvertime_main1.asp?id=19660820030647

Name : Miss. RAPEEPAN SUWANNAKORN
Position : APPLICATION DEVELOPMENT OFFICER
Organization : AIA

Default Time : 08:00 AM-05:00 PM

Edit	W/H	Date	Date In	Time In	Date Out	Time Out	Late	Absent	Remark	Approved
	W	01	01/08/2003	08:00 AM	01/08/2003	05:00 PM				
	H	02	02/08/2003	01:00 PM	02/08/2003	01:00 PM				
	H	03								
	W	04	04/08/2003	08:30 AM	04/08/2003	05:00 PM	0.0:30			
	W	05	05/08/2003	10:00 AM	05/08/2003	05:00 PM		0.2:00		
	W	06	06/08/2003	02:00 PM	06/08/2003	05:00 PM		0.5:00		
	W	07	07/08/2003	05:00 PM	07/08/2003	05:06 PM			Incomplete	
	W	08	08/08/2003	07:00 AM	09/08/2003	02:00 AM				
	H	09	09/08/2003	10:00 AM	09/08/2003	05:00 PM				
	H	10								
	W	11	11/08/2003	08:30 AM	11/08/2003	02:00 PM	0.0:30	0.3:00		
	H	12								
	W	13	13/08/2003	10:00 AM	13/08/2003	03:00 PM		0.4:00		
	W	14	14/08/2003	01:00 PM	14/08/2003	03:00 PM		0.6:00		
	W	15	15/08/2003	10:00 AM	15/08/2003	12:00 PM		0.6:00		
	H	16								
	H	17								
	W	18	18/08/2003	08:00 AM	18/08/2003	11:00 AM		0.5:00		

Done Local intranet 7:29 PM

Figure G.23. Time Approving.

New Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Mail News RSS Feeds

Address http://localhost/project/time/self_service/approvertime_main1.asp?id=19660820030647

	W	14	14/08/2003	01:00 PM	14/08/2003	03:00 PM		0.6:00		
	W	15	15/08/2003	10:00 AM	15/08/2003	12:00 PM		0.6:00		
	H	16								
	H	17								
	W	18	18/08/2003	08:00 AM	18/08/2003	11:00 AM		0.5:00		
	W	19	19/08/2003	07:00 AM	19/08/2003	07:30 AM			Incomplete	
	W	20	20/08/2003	05:00 PM	21/08/2003	03:00 AM			Incomplete	
	W	21	22/08/2003	01:00 AM	22/08/2003	03:00 AM			Incomplete	
	W	22							Incomplete	
	H	23								
	H	24								
	W	25	25/08/2003	10:00 AM	25/08/2003	11:00 AM		0.7:00		
	W	26	26/08/2003	02:00 PM	26/08/2003	03:00 PM		0.7:00		
	W	27	27/08/2003	05:00 PM	28/08/2003	01:00 AM			Incomplete	
<input checked="" type="checkbox"/>	W	27	27/08/2003	08:00 AM	28/08/2003	01:00 AM			Seminar	<input checked="" type="checkbox"/>
	W	28							Incomplete	
	W	29							Incomplete	
	H	30								
	H	31								
							0.1:00	5.5:00	Total	<input type="checkbox"/> Approved all

Save

Done Local intranet 7:30 PM

Figure G.24. Time Approving (Continued).

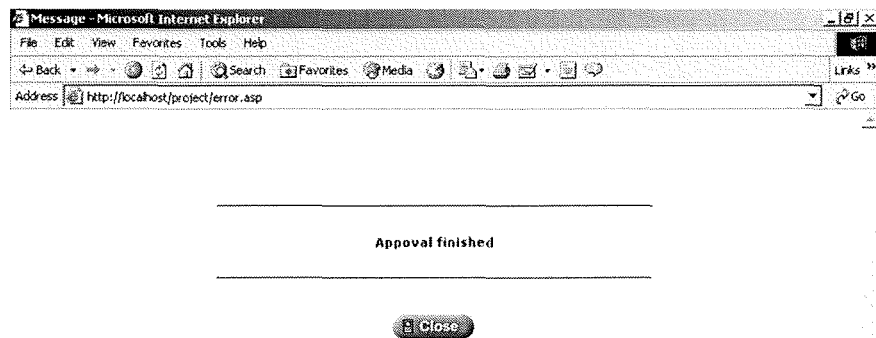


Figure G.25. Informed success message for Time Correction Approving.

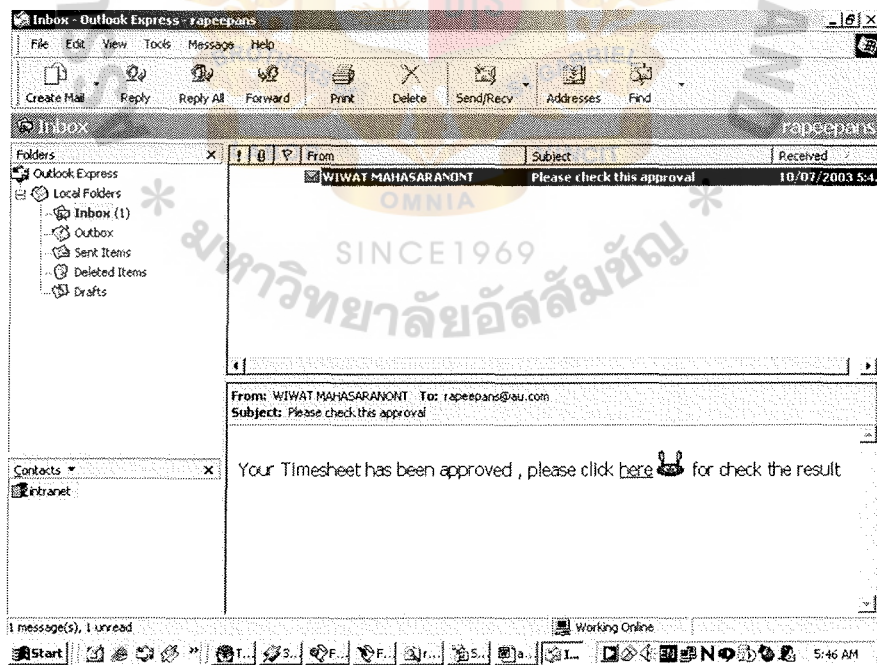


Figure G.26. Approved message via E-Mail.

New Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://localhost/project/time/self_service/approvetime_sub101.asp?id=1966082003

Name : Miss. RAPEEPAN SUWANNAKORN
Position : APPLICATION DEVELOPMENT OFFICER
Organization : AIA

Default Time : 08:00 AM-05:00 PM

Edit	W/H	Date	Date In	Time In	Date Out	Time Out	Late	Absent	Remark	Status
	W	01	01/08/2003	08:00 AM	01/08/2003	05:00 PM				
	H	02	02/08/2003	01:00 PM	02/08/2003	01:00 PM				
	H	03								
	W	04	04/08/2003	08:30 AM	04/08/2003	05:00 PM	0.0:30			
	W	05	05/08/2003	10:00 AM	05/08/2003	05:00 PM		0.2:00		
	W	06	06/08/2003	02:00 PM	06/08/2003	05:00 PM		0.5:00		
	W	07	07/08/2003	05:00 PM	07/08/2003	05:06 PM			Incomplete	
<input checked="" type="checkbox"/>	W	07	07/08/2003	05:00 PM	07/08/2003	05:06 PM				Approved
	W	08	08/08/2003	07:00 AM	09/08/2003	02:00 AM				
	H	09	09/08/2003	10:00 AM	09/08/2003	05:00 PM				
	H	10								
	W	11	11/08/2003	08:30 AM	11/08/2003	02:00 PM	0.0:30	0.3:00		
	H	12								
	W	13	13/08/2003	10:00 AM	13/08/2003	03:00 PM		0.4:00		
	W	14	14/08/2003	01:00 PM	14/08/2003	03:00 PM		0.6:00		
	W	15	15/08/2003	10:00 AM	15/08/2003	12:00 PM		0.6:00		
	H	16								

Done Local intranet

Start 5:47 AM

Figure G.27. Approved Result Checking.

New Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://localhost/project/time/self_service/approvetime_sub101.asp?id=1966082003

	H	17								
	W	18	18/08/2003	08:00 AM	18/08/2003	11:00 AM		0.5:00		
	W	19	19/08/2003	07:00 AM	19/08/2003	07:30 AM			Incomplete	
<input checked="" type="checkbox"/>	W	19	19/08/2003	08:00 AM	19/08/2003	05:00 PM			Train	Approved
	W	20	20/08/2003	05:00 PM	21/08/2003	03:00 AM			Incomplete	
<input checked="" type="checkbox"/>	W	20	20/08/2003	08:00 AM	20/08/2003	05:00 PM			Train	Approved
	W	21	22/08/2003	01:00 AM	22/08/2003	03:00 AM			Incomplete	
<input checked="" type="checkbox"/>	W	21	21/08/2003	08:00 AM	21/08/2003	05:00 PM			Train	Approved
	W	22							Incomplete	
<input checked="" type="checkbox"/>	W	22	22/08/2003	08:00 AM	22/08/2003	05:00 PM			Forget Card	Approved
	H	23								
	H	24								
	W	25	25/08/2003	10:00 AM	25/08/2003	11:00 AM		0.7:00		
	W	26	26/08/2003	02:00 PM	26/08/2003	03:00 PM		0.7:00		
	W	27	27/08/2003	05:00 PM	28/08/2003	01:00 AM			Incomplete	
<input checked="" type="checkbox"/>	W	27	27/08/2003	08:00 AM	28/08/2003	01:00 AM			Seminar	Approved
	W	28							Incomplete	
	W	29							Incomplete	
	H	30								
	H	31								
							0.1:00	5.5:00	Total	

Done Local intranet

Start 7:37 PM

Figure G.28. Approved Result Checking (Continued).

http://localhost/project/menu4.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Mail News Groups

Address http://localhost/project/menu4.asp Go

Time Attendance Admin Shift Time Approvals Reports Logout

Leave Requesting

Month: August Year: 2003

Employee ID: 1966 Submit

Edit	Delete	From Date	From Time	To Date	To Time	Leave Type	Remark
<input type="checkbox"/>	<input type="checkbox"/>	5/8/2003	08 AM :00	5/8/2003	10 AM :00	Sick	
<input type="checkbox"/>	<input type="checkbox"/>	6/8/2003	08 AM :00	6/8/2003	02 PM :00	Sick	
<input type="checkbox"/>	<input type="checkbox"/>	18/8/2003	11 AM :00	18/8/2003	05 PM :00	Affair	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	27/8/2003	08 AM :00	27/8/2003	05 PM :00	Vacation	Cancel
<input checked="" type="checkbox"/>	<input type="checkbox"/>	28/8/2003	08 AM :00	29/8/2003	05 PM :00	Vacation	

Save

Affair
Childbirth
Military
Priesthood
Sick
Vacation
Wedding

Local intranet

Start From... real... app... http... http... Fro... 10:19 AM

Figure G.29. Leave Requesting.

New Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Mail News Groups

Address http://localhost/project/time/leave/appr_main1.asp Go

Name : Miss, RAPEEPAN SUWANNAKORN
Position : APPLICATION DEVELOPMENT OFFICER
Organization : AIA

Default Time : 08:00 AM-05:00 PM

Edit	Delete	From Date	From Time	To Date	To Time	Leave Type	Remark	Approved
<input type="checkbox"/>	<input type="checkbox"/>	05/08/2003	08:00 AM	05/08/2003	10:00 AM	Sick		
<input type="checkbox"/>	<input type="checkbox"/>	06/08/2003	08:00 AM	06/08/2003	02:00 PM	Sick		
<input type="checkbox"/>	<input type="checkbox"/>	18/08/2003	11:00 AM	18/08/2003	05:00 PM	Affair		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	27/08/2003	08:00 AM	27/08/2003	05:00 PM	Vacation	Cancel	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	28/08/2003	08:00 AM	29/08/2003	05:00 PM	Vacation		<input type="checkbox"/>

Approve All

Save

Local intranet

Start From... real... app... http... New... Fro... 10:23 AM

Figure G.30. Leave Approving.



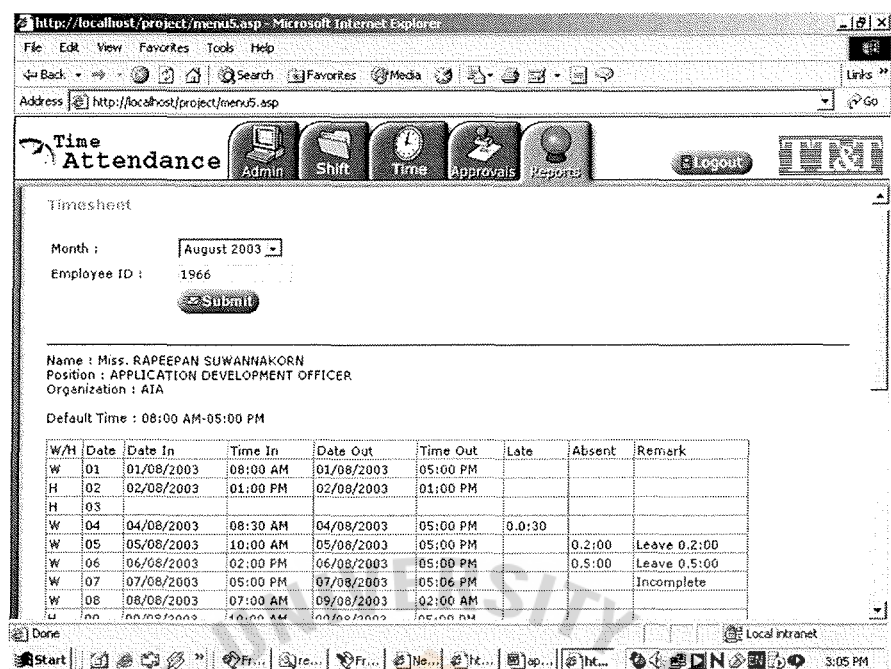


Figure H.1. Timesheet for Normal Working Schedule.

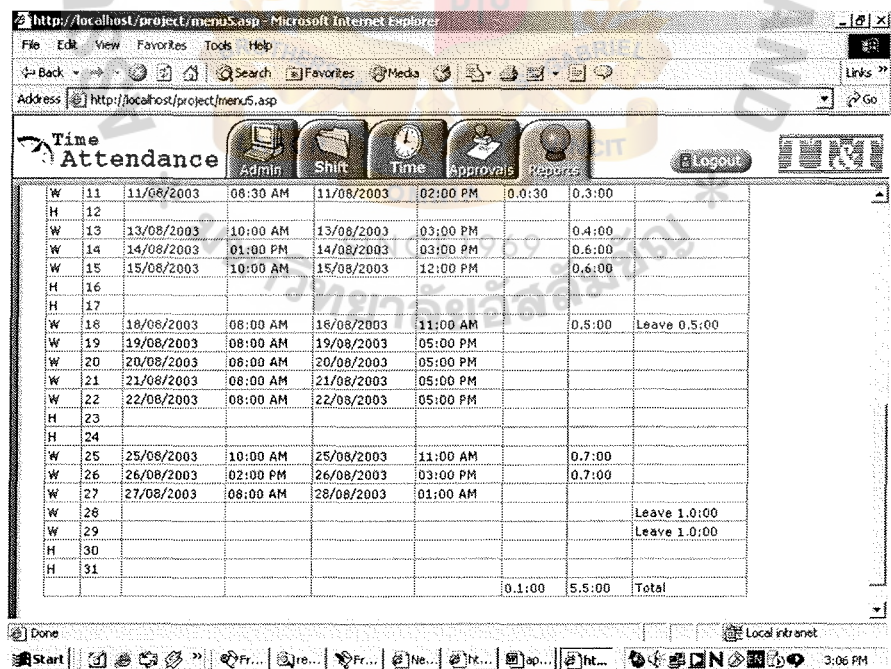


Figure H.2. Timesheet for Normal Working Schedule (Continued).

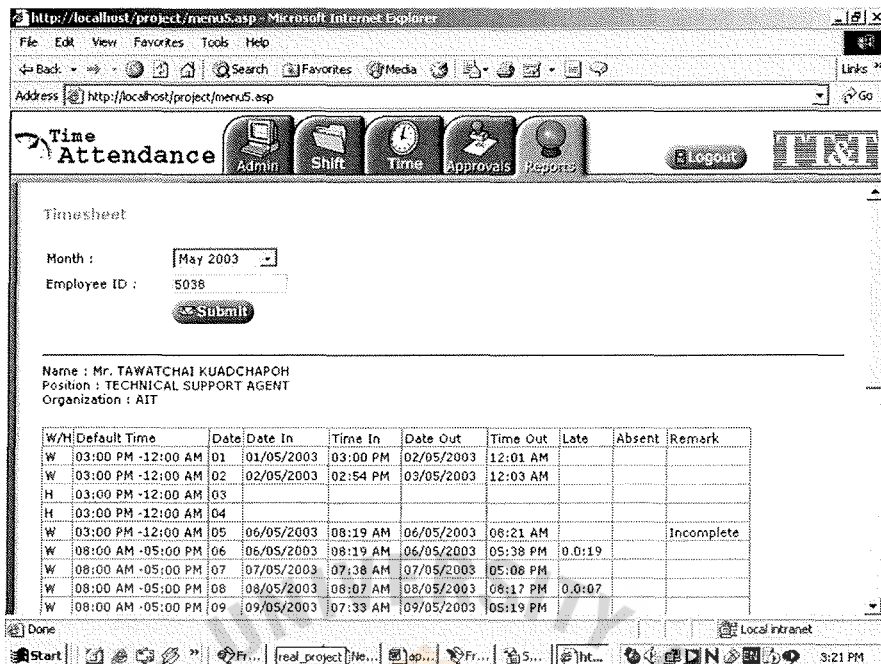


Figure H.3. Timesheet for Shift Working Schedule.

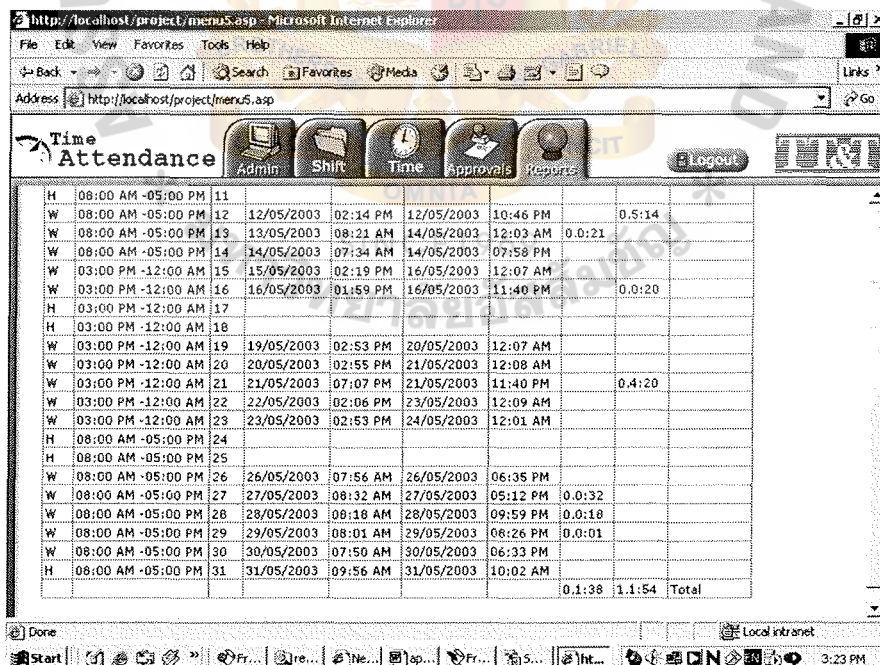


Figure H.4. Timesheet for Shift Working Schedule (Continued).

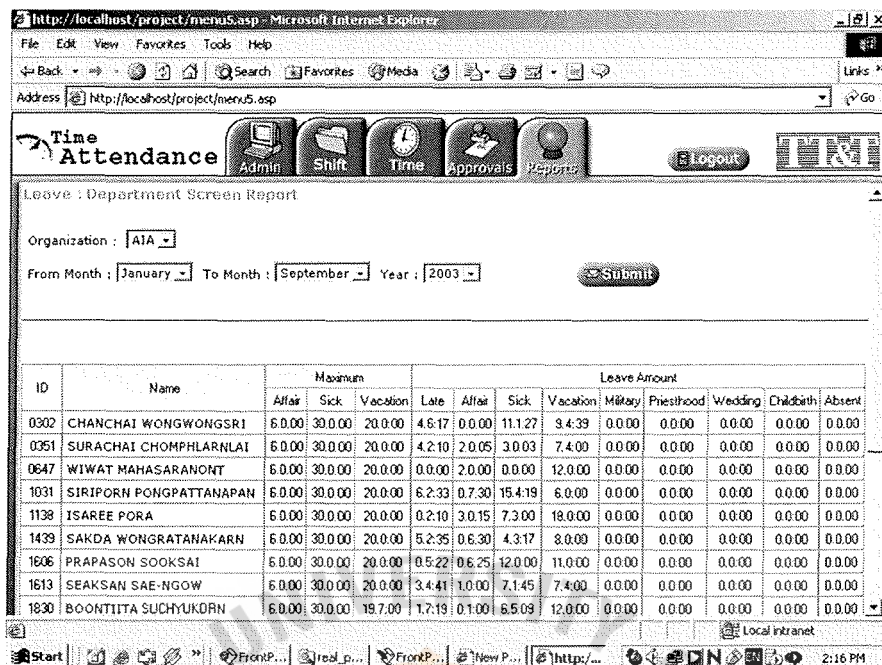


Figure H.5. Leave : Department Screen Report.



Figure H.6. Leave : Individual Screen Report.

http://localhost/project/menu5.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Mail News RSS Links

Address http://localhost/project/menu5.asp Go

Time Attendance Admin Shift Time Approvals Reports Logout

Leave Type	From Date	From Time	To Date	To Time	Leave Amount	Remark
Affair	18/08/2003	11:00 AM	18/08/2003	05:00 PM	0.5:00	
Late	07/02/2003	08:00 AM	07/02/2003	08:40 AM	0.0:40	
Late	11/04/2003	08:00 AM	11/04/2003	08:15 AM	0.0:15	
Late	02/06/2003	08:00 AM	02/06/2003	08:55 AM	0.0:55	
Late	10/06/2003	08:00 AM	10/06/2003	08:23 AM	0.0:23	
Late	04/07/2003	08:00 AM	04/07/2003	08:14 AM	0.0:14	
Late	04/08/2003	08:00 AM	04/08/2003	08:30 AM	0.0:30	
Late	11/08/2003	08:00 AM	11/08/2003	08:30 AM	0.0:30	
Sick	05/04/2003	08:00 AM	05/04/2003	05:00 PM	1.0:00	
Sick	09/05/2003	08:00 AM	09/05/2003	05:00 PM	1.0:00	
Sick	05/06/2003	08:00 AM	05/06/2003	10:00 AM	0.2:00	
Sick	06/06/2003	08:00 AM	06/06/2003	02:00 PM	0.5:00	
Vacation	10/01/2003	08:00 AM	10/01/2003	05:00 PM	1.0:00	
Vacation	28/08/2003	08:00 AM	29/08/2003	05:00 PM	2.0:00	

Local intranet

Start SQL 5... inline FrontP... http://... appen... 11:35 AM

Figure H.7. Leave : Individual Screen Report (Continued).

http://localhost/project/menu5.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Mail News RSS Links

Address http://localhost/project/menu5.asp Go

Time Attendance Admin Shift Time Approvals Reports Logout

Shift Schedule

Organization : AIT Default Time Group: C

Month: May Year: 2003 Submit

C1 07:30 AM - 04:30 PM / C2 03:30 PM - 12:30 AM / C3 11:30 PM - 08:30 AM

ID	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14
5036	WEERAWIT SAKSITTIPITAK	C1	C1	C1	C1	C1	C3	C3	C3	C3	C3	C2	C2	C2	C
5067	SONGKRAM SIRICHREONWAT	C1	C1	C1	C1	C1	C3	C3	C3	C3	C3	C2	C2	C2	C
5068	SOMPOB NOPPACHAI	C2	C2	C2	C2	C2	C1	C1	C1	C1	C1	C3	C3	C3	C
5116	WALAILAK LACHAROJNE	C2	C2	C2	C2	C2	C1	C1	C1	C1	C1	C3	C3	C3	C
5119	PATTARAWADEE AEIMVIT	C3	C3	C3	C3	C3	C2	C2	C2	C2	C2	C1	C1	C1	C
5180	APAKORN HETKATE	C3	C3	C3	C3	C3	C2	C2	C2	C2	C2	C1	C1	C1	C

Done

Start Pro... real... app... ACD... Fro... http... 6:42 PM

Figure H.8. Shift Schedule: Department Screen Report.

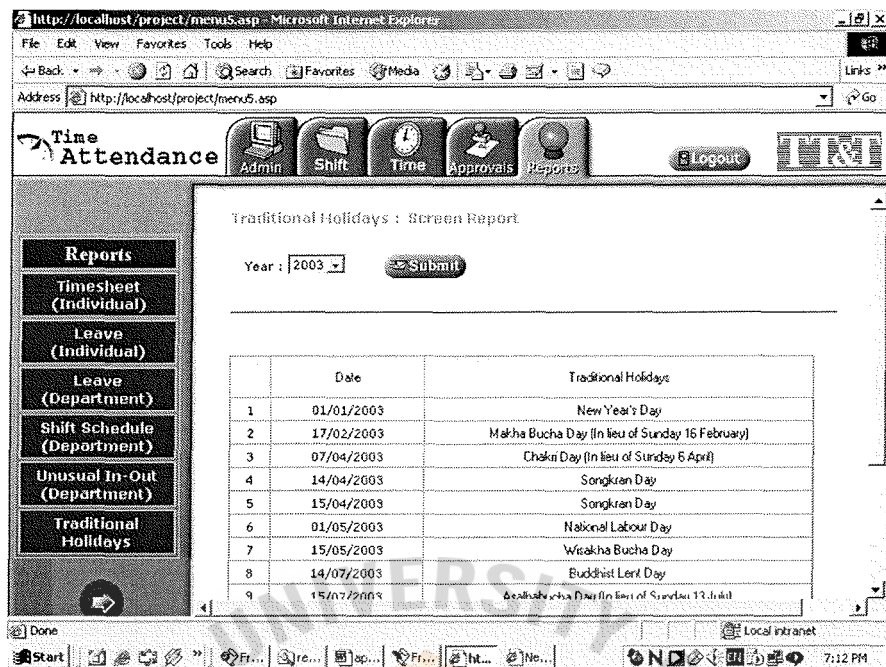


Figure H.9. Traditional Holidays: Screen Report.

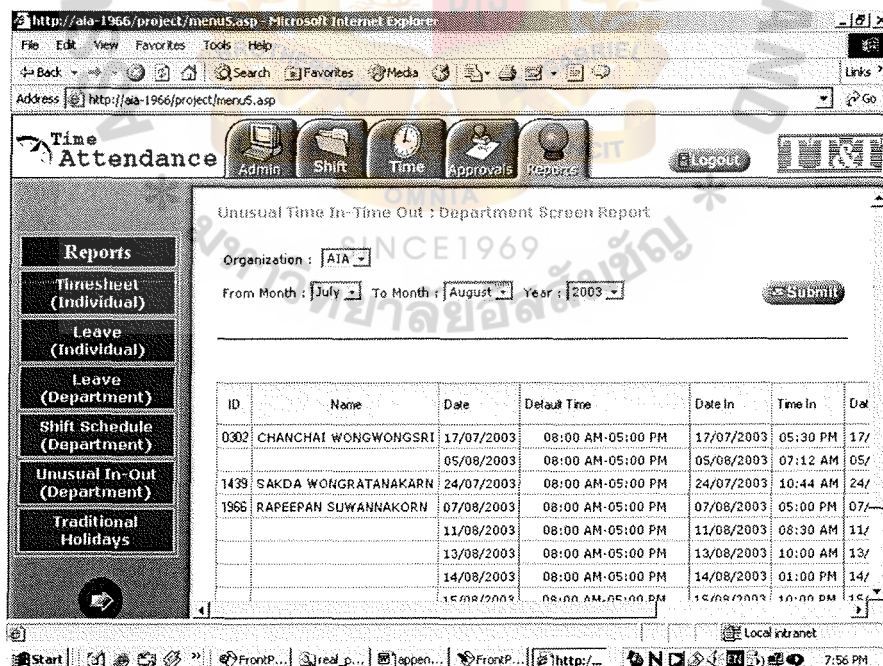


Figure H.10. Unusual Time In – Time Out: Department Screen Report.

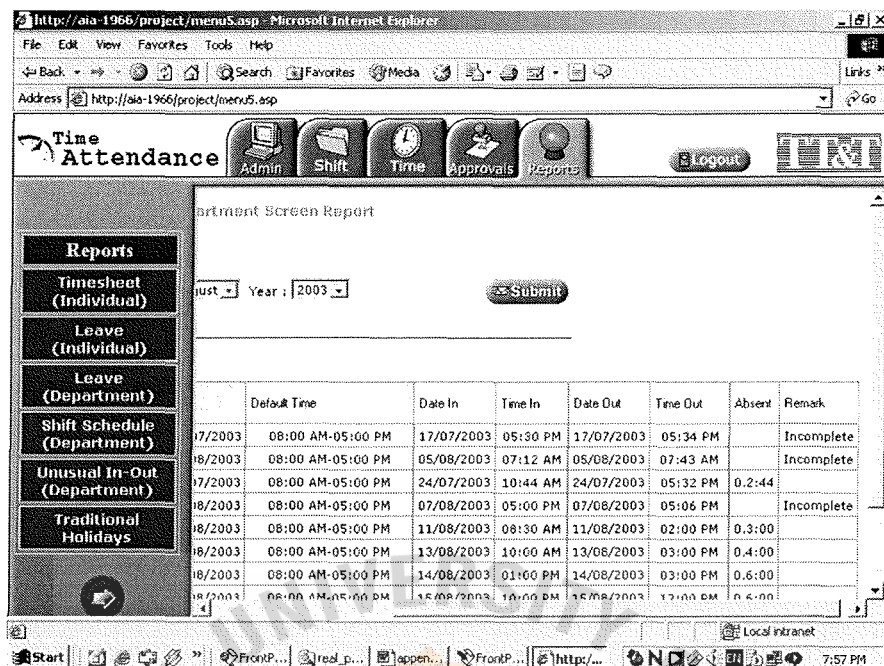


Figure H.11. Unusual Time In – Time Out: Department Screen Report (Continued).



Cost Comparison of Existing and Candidate Solutions

Table I.1. Existing System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
Operating Cost					
People-Ware Cost:					
HR Manager 1 Person @ 35,000	35,000.00	38,500.00	42,350.00	46,585.00	51,243.50
HR Supervisor 1 Person @ 25,000	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
HR Officers 10 Persons @ 10,000	100,000.00	110,000.00	121,000.00	133,100.00	146,410.00
Total Monthly Salary Cost	160,000.00	176,000.00	193,600.00	212,960.00	234,256.00
Total Annual Salary Cost	1,920,000.00	2,112,000.00	2,323,200.00	2,555,520.00	2,811,072.00
Office Supplies & Miscellaneous Cost:					
Stationary 6,500 per month	78,000.00	85,800.00	94,380.00	103,818.00	114,199.80
Paper 12,000 per month	144,000.00	158,400.00	174,240.00	191,664.00	210,830.40
Utility 6,000 per month	72,000.00	79,200.00	87,120.00	95,832.00	105,415.20
Miscellaneous 5,000 per month	60,000.00	66,000.00	72,600.00	79,860.00	87,846.00
Total Annual Office Supplies & Miscellaneous Cost	354,000.00	389,400.00	428,340.00	471,174.00	518,291.40
Total Operating Cost	2,274,000.00	2,501,400.00	2,751,540.00	3,026,694.00	3,329,363.40
Total Existing System Cost	2,274,000.00	2,501,400.00	2,751,540.00	3,026,694.00	3,329,363.40

Table I.2. Candidate 1 Cost Analysis, Baht.

Cost items		Years				
		1	2	3	4	5
Fixed Cost						
Hardware Cost:						
Computer Server	2 Units @ 125,000	250,000.00	0.00	0.00	0.00	0.00
Workstation Cost	7 Units @ 32,000	224,000.00	0.00	0.00	0.00	0.00
Laserjet Printer	5 Units @ 30,000	150,000.00	0.00	0.00	0.00	0.00
Scanner	1 Unit @ 25,000	25,000.00	0.00	0.00	0.00	0.00
UPS	1 Unit @ 32,000	32,000.00	0.00	0.00	0.00	0.00
Total Hardware Cost		681,000.00	0.00	0.00	0.00	0.00
Software Cost:						
Windows 2000 Server	2 Units @ 30,500	61,000.00	0.00	0.00	0.00	0.00
Norton AntiVirus Ent	1 Unit @ 101,500	101,500.00	0.00	0.00	0.00	0.00
Windows 2000 Pro	7 Units @ 13,500	94,500.00	0.00	0.00	0.00	0.00
MS Office 2000	7 Units @ 10,500	73,500.00	0.00	0.00	0.00	0.00
ORACLE 8i Server	1 Unit @ 300,000	300,000.00	0.00	0.00	0.00	0.00
Developer 2000	1 Unit @ 50,000	50,000.00	0.00	0.00	0.00	0.00
Total Software Cost		680,500.00	0.00	0.00	0.00	0.00
Implementation Cost:						
Hardware Installation Cost		200,000.00	0.00	0.00	0.00	0.00
Training & Manual Cost		20,000.00	0.00	0.00	0.00	0.00
Total Implementation Cost		220,000.00	0.00	0.00	0.00	0.00
Total Fixed Cost		1,581,500.00	0.00	0.00	0.00	0.00
Operating Cost						
People-Ware Cost:						
HR Manager	1 Person @ 35,000	35,000.00	38,500.00	42,350.00	46,585.00	51,243.50
HR Head of Unit	1 Person @ 25,000	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
HR Officers	5 Persons @ 10,000	50,000.00	55,000.00	60,500.00	66,550.00	73,205.00
Total Monthly Salary Cost		110,000.00	121,000.00	133,100.00	146,410.00	161,051.00
Total Annual Salary Cost		1,320,000.00	1,452,000.00	1,597,200.00	1,756,920.00	1,932,612.00
Maintenance Cost:						
Maintenance Cost		0.00	40,000.00	44,000.00	48,400.00	53,240.00
Total Maintenance Cost		0.00	40,000.00	44,000.00	48,400.00	53,240.00
Office Supplies & Miscellaneous Cost:						
Stationary	1,500 per month	54,000.00	59,400.00	65,340.00	71,874.00	79,061.40
Paper	1,000 per month	36,000.00	39,600.00	43,560.00	47,916.00	52,707.60
Utility	1,700 per month	60,000.00	66,000.00	72,600.00	79,860.00	87,846.00
Miscellaneous	2,000 per month	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Total Annual Office Supplies & Miscellaneous Cost		198,000.00	217,800.00	239,580.00	263,538.00	289,891.80
Total Operating Cost		1,518,000.00	1,709,800.00	1,880,780.00	2,068,858.00	2,275,743.80
Total Existing System Cost		3,099,500.00	1,709,800.00	1,880,780.00	2,068,858.00	2,275,743.80

Table I.3. Candidate 2 Cost Analysis, Baht.

Cost items		Years				
		1	2	3	4	5
Fixed Cost						
Hardware Cost:						
Computer Server	3 Units @ 125,000	375,000.00	0.00	0.00	0.00	0.00
Workstation Cost	7 Units @ 32,000	224,000.00	0.00	0.00	0.00	0.00
Laserjet Printer	5 Units @ 30,000	150,000.00	0.00	0.00	0.00	0.00
Scanner	1 Unit @ 25,000	25,000.00	0.00	0.00	0.00	0.00
UPS	1 Unit @ 32,000	32,000.00	0.00	0.00	0.00	0.00
Total Hardware Cost		806,000.00	0.00	0.00	0.00	0.00
Software Cost:						
Windows 2000 Server	3 Units @ 30,500	91,500.00	0.00	0.00	0.00	0.00
MS SQL Server	1 Units @ 55,500	55,500.00	0.00	0.00	0.00	0.00
MS Exchange 2000	1 Units @ 60,500	60,500.00	0.00	0.00	0.00	0.00
Norton AntiVirus Ent	1 Unit @ 101,500	101,500.00	0.00	0.00	0.00	0.00
Windows 2000 Pro	7 Units @ 13,500	94,500.00	0.00	0.00	0.00	0.00
MS Office 2000	7 Units @ 10,500	73,500.00	0.00	0.00	0.00	0.00
MS Frontpage 2000	1 Unit @ 6,000	6,000.00	0.00	0.00	0.00	0.00
Total Software Cost		483,000.00	0.00	0.00	0.00	0.00
Implementation Cost:						
Hardware Installation Cost		300,000.00	0.00	0.00	0.00	0.00
Training & Manual Cost		20,000.00	0.00	0.00	0.00	0.00
Total Implementation Cost		320,000.00	0.00	0.00	0.00	0.00
Total Fixed Cost		1,609,000.00	0.00	0.00	0.00	0.00
Operating Cost						
People-Ware Cost:						
HR Manager	1 Person @ 35,000	35,000.00	38,500.00	42,350.00	46,585.00	51,243.50
HR Supervisor	1 Person @ 25,000	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
HR Officers	5 Persons @ 10,000	50,000.00	55,000.00	60,500.00	66,550.00	73,205.00
Total Monthly Salary Cost		110,000.00	121,000.00	133,100.00	146,410.00	161,051.00
Total Annual Salary Cost		1,320,000.00	1,452,000.00	1,597,200.00	1,756,920.00	1,932,612.00
Maintenance Cost:						
Maintenance Cost		0.00	30,000.00	33,000.00	36,300.00	39,930.00
Total Maintenance Cost		0.00	30,000.00	33,000.00	36,300.00	39,930.00
Office Supplies & Miscellaneous Cost:						
Stationary	1,500 per month	18,000.00	19,800.00	21,780.00	23,958.00	26,353.80
Paper	1,000 per month	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
Utility	2,000 per month	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Miscellaneous	2,000 per month	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Total Annual Office Supplies & Miscellaneous Cost		78,000.00	85,800.00	94,380.00	103,818.00	114,199.80
Total Operating Cost		1,398,000.00	1,567,800.00	1,724,580.00	1,897,038.00	2,086,741.80
Total Existing System Cost		3,007,000.00	1,567,800.00	1,724,580.00	1,897,038.00	2,086,741.80

Table I.4. Candidate 3 Cost Analysis, Baht.

Cost items		Years				
		1	2	3	4	5
Fixed Cost						
Hardware Cost:						
Computer Server	2 Units @ 125,000	250,000.00	0.00	0.00	0.00	0.00
Workstation Cost	7 Units @ 32,000	224,000.00	0.00	0.00	0.00	0.00
Laserjet Printer	5 Units @ 30,000	150,000.00	0.00	0.00	0.00	0.00
Scanner	1 Unit @ 25,000	25,000.00	0.00	0.00	0.00	0.00
UPS	1 Unit @ 32,000	32,000.00	0.00	0.00	0.00	0.00
Total Hardware Cost		681,000.00	0.00	0.00	0.00	0.00
Software Cost:						
Windows 2000 Server	2 Units @ 30,500	61,000.00	0.00	0.00	0.00	0.00
MS Exchange 2000	1 Units @ 60,500	60,500.00	0.00	0.00	0.00	0.00
Norton AntiVirus Ent	1 Unit @ 101,500	101,500.00	0.00	0.00	0.00	0.00
Windows 2000 Pro	7 Units @ 13,500	94,500.00	0.00	0.00	0.00	0.00
MS Office 2000	7 Units @ 10,500	73,500.00	0.00	0.00	0.00	0.00
MS Frontpage 2000	1 Unit @ 6,000	6,000.00	0.00	0.00	0.00	0.00
Total Software Cost		397,000.00	0.00	0.00	0.00	0.00
Implementation Cost:						
Hardware Installation Cost		200,000.00	0.00	0.00	0.00	0.00
Training & Manual Cost		20,000.00	0.00	0.00	0.00	0.00
Total Implementation Cost		220,000.00	0.00	0.00	0.00	0.00
Total Fixed Cost		1,298,000.00	0.00	0.00	0.00	0.00
Operating Cost						
People-Ware Cost:						
HR Manager	1 Person @ 35,000	35,000.00	38,500.00	42,350.00	46,585.00	51,243.50
HR Supervisor	1 Person @ 25,000	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
HR Officers	5 Persons @ 10,000	50,000.00	55,000.00	60,500.00	66,550.00	73,205.00
Total Monthly Salary Cost		110,000.00	121,000.00	133,100.00	146,410.00	161,051.00
Total Annual Salary Cost		1,320,000.00	1,452,000.00	1,597,200.00	1,756,920.00	1,932,612.00
Maintenance Cost:						
Maintenance Cost		0.00	20,000.00	22,000.00	24,200.00	26,620.00
Total Maintenance Cost		0.00	20,000.00	22,000.00	24,200.00	26,620.00
Office Supplies & Miscellaneous Cost:						
Stationary	1,500 per month	18,000.00	19,800.00	21,780.00	23,958.00	26,353.80
Paper	1,000 per month	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
Utility	2,000 per month	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Miscellaneous	2,000 per month	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Total Annual Office Supplies & Miscellaneous Cost		78,000.00	85,800.00	94,380.00	103,818.00	114,199.80
Total Operating Cost		1,398,000.00	1,557,800.00	1,713,580.00	1,884,938.00	2,073,431.80
Total Existing System Cost		2,696,000.00	1,557,800.00	1,713,580.00	1,884,938.00	2,073,431.80

The promotion rate for staff rises approximately 10% per year and the inflation rate and annual operation cost will increase around 10% per year.

Table I.5. Five Years Accumulated Existing System Cost, Baht.

Year	Total Existing System Cost	Accumulated Cost
1	2,274,000.00	2,274,000.00
2	2,501,400.00	4,775,400.00
3	2,751,540.00	7,526,940.00
4	3,026,694.00	10,553,634.00
5	3,329,363.40	13,882,997.40
Total	13,882,997.40	-

Table I.6. Five Years Accumulated Candidate 1 Cost, Baht.

Year	Total Candidate 1 Cost	Accumulated Cost
1	3,099,500.00	3,099,500.00
2	1,709,800.00	4,809,300.00
3	1,880,780.00	6,690,080.00
4	2,068,858.00	8,758,938.00
5	2,275,743.80	11,034,681.80
Total	11,034,681.80	-

Table I.7. Five Years Accumulated Candidate 2 Cost, Baht.

Year	Total Candidate 2 Cost	Accumulate Cost
1	3,007,000.00	3,007,000.00
2	1,567,800.00	4,574,800.00
3	1,724,580.00	6,299,380.00
4	1,897,038.00	8,196,418.00
5	2,086,741.80	10,283,159.80
Total	10,283,159.80	-

Table I.8. Five Years Accumulated Candidate 3 Cost, Baht.

Year	Total Candidate 3 Cost	Accumulate Cost
1	2,696,000.00	2,696,000.00
2	1,557,800.00	4,253,800.00
3	1,713,580.00	5,967,380.00
4	1,884,938.00	7,852,318.00
5	2,073,431.80	9,925,749.80
Total	9,925,749.80	-

Table I.9. The Comparison between Existing and Candidate 1 Costs, Baht.

Year	Accumulated Existing System Cost	Accumulated Candidate 1 Cost
1	2,274,000.00	3,099,500.00
2	4,775,400.00	4,809,300.00
3	7,526,940.00	6,690,080.00
4	10,553,634.00	8,758,938.00
5	13,882,997.40	11,034,681.80

Table I.10. The Comparison between Existing and Candidate 2 Costs, Baht.

Year	Accumulated Existing System Cost	Accumulated Candidate 2 Cost
1	2,274,000.00	3,007,000.00
2	4,775,400.00	4,574,800.00
3	7,526,940.00	6,299,380.00
4	10,553,634.00	8,196,418.00
5	13,882,997.40	10,283,159.80

Table I.11. The Comparison between Existing and Candidate 3 Costs, Baht.

Year	Accumulated Existing System Cost	Accumulated Candidate 3 Cost
1	2,274,000.00	2,696,000.00
2	4,775,400.00	4,253,800.00
3	7,526,940.00	5,967,380.00
4	10,553,634.00	7,852,318.00
5	13,882,997.40	9,925,749.80

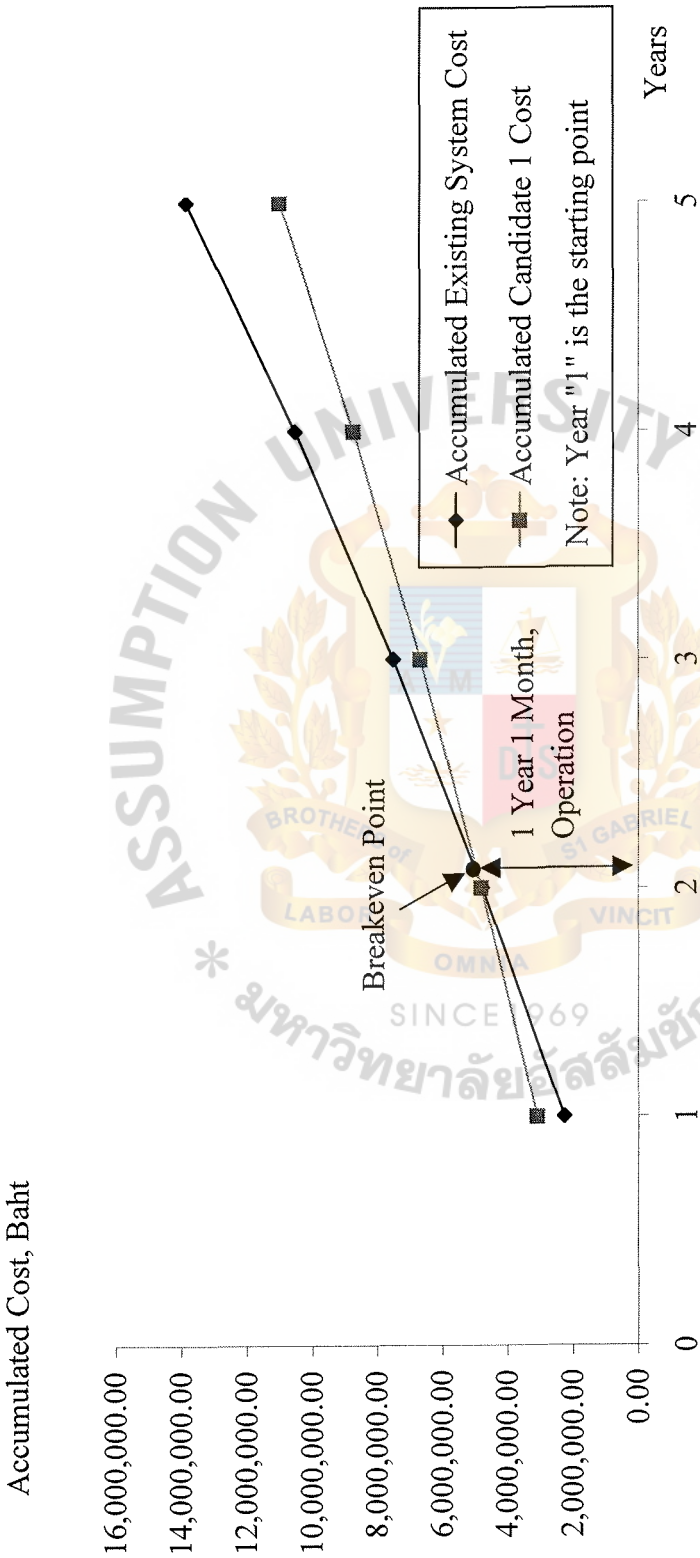


Figure I.1. Cost Comparison between Existing System and Candidate 1.

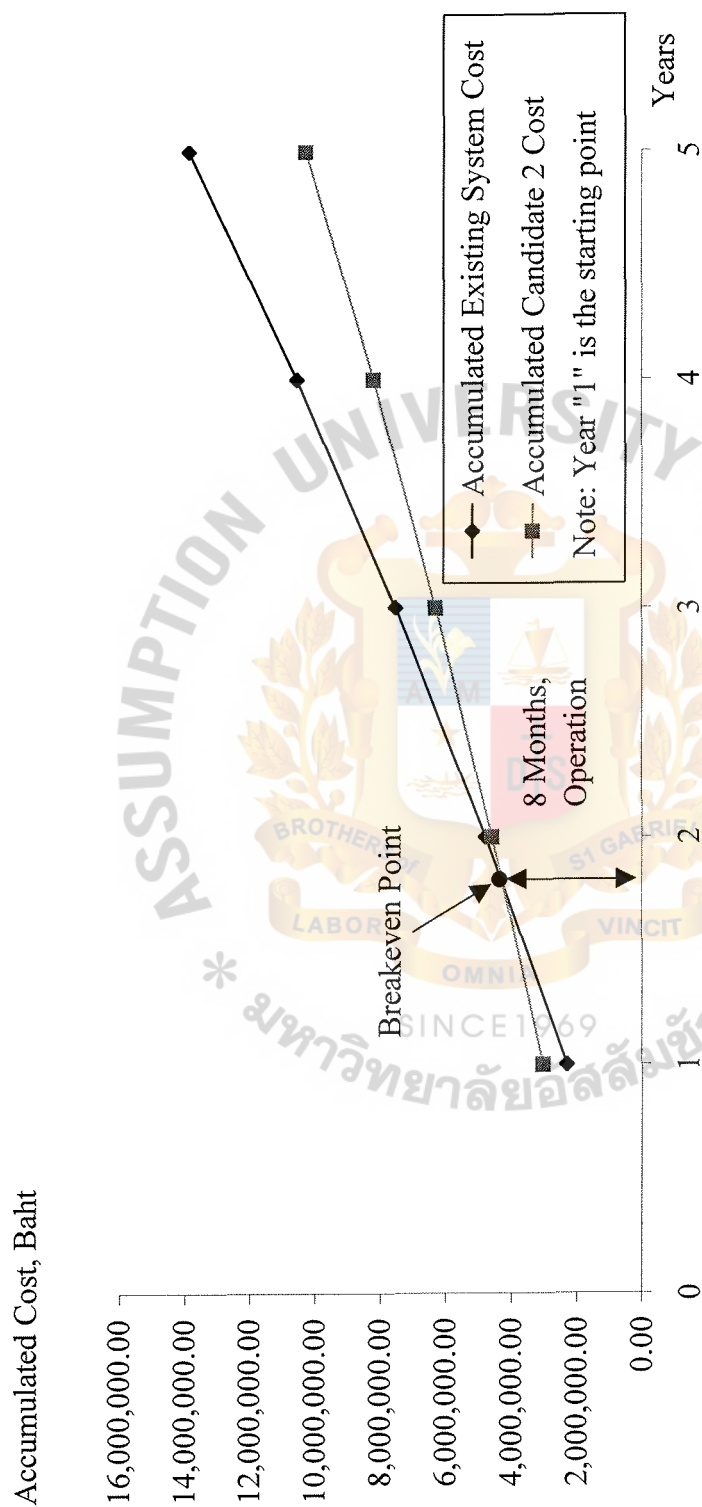


Figure I.2. Cost Comparison between Existing System and Candidate 2.

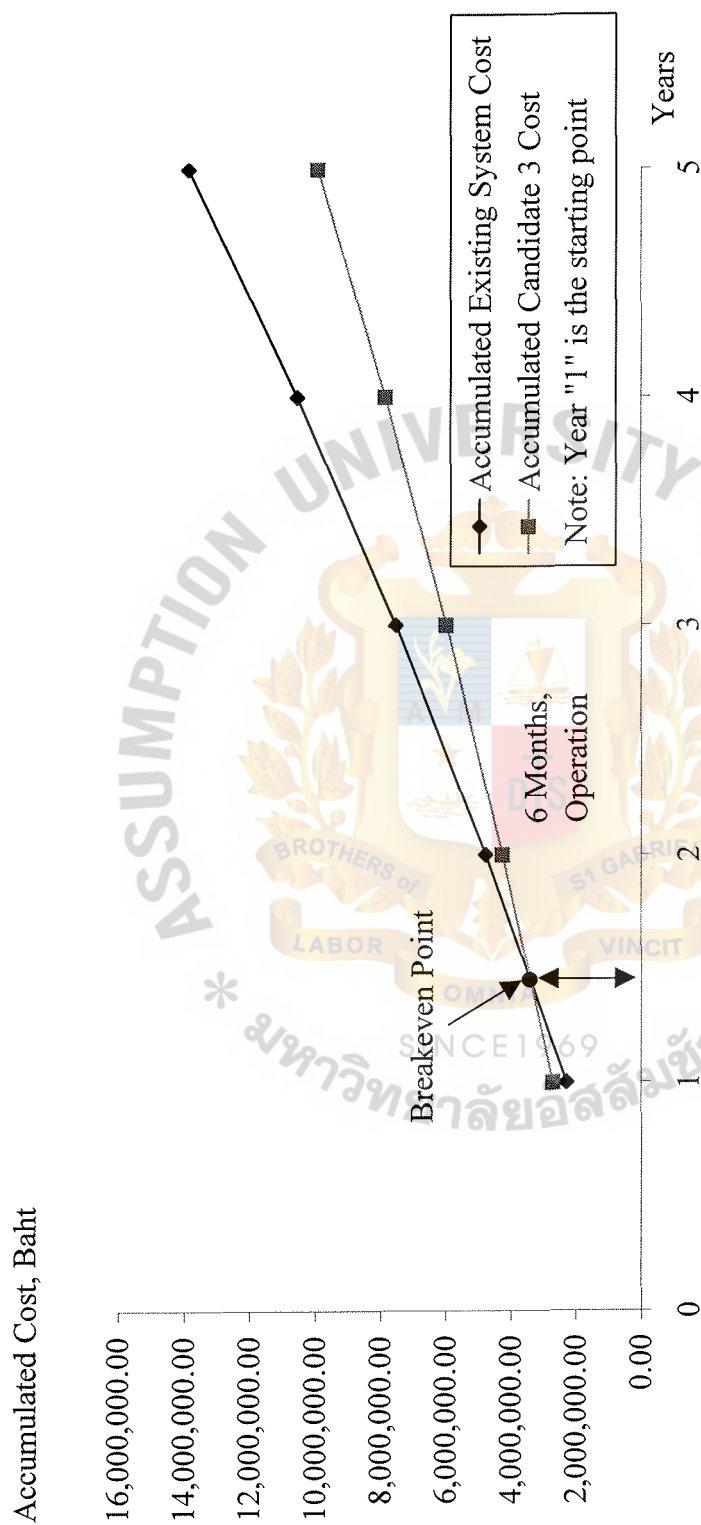


Figure I.3. Cost Comparison between Existing System and Candidate 3.

Table I.12. Tangible Benefits of Candidate 1, Baht.

Cost Items	Cost
Reduction of Human Resource staffs per annual 5 @10000	600,000
Reduction of stationary cost	24,000
Reduction of paper cost	108,000
Reduction of utility cost	12,000
Reduction of miscellaneous cost	12,000
Total	756,000

Table I.13. Tangible Benefits of Candidate 2, Baht.

Cost Items	Cost
Reduction of Human Resource staffs per annual 5 @10000	600,000
Reduction of stationary cost	60,000
Reduction of paper cost	132,000
Reduction of utility cost	48,000
Reduction of miscellaneous cost	36,000
Total	876,000

Table I.14. Tangible Benefits of Candidate 3, Baht.

Cost Items	Cost
Reduction of Human Resource staffs per annual 5 @10000	600,000
Reduction of stationary cost	60,000
Reduction of paper cost	132,000
Reduction of utility cost	48,000
Reduction of miscellaneous cost	36,000
Total	876,000

Table I.15. Payback Period of Candidate 1.

I	=	1,581,500
R	=	1,518,000 – 756,000
	=	762,000
T	=	0.1
P	=	1,581,500 / (1-0.1) 762,000
	=	2.3 years

Table I.16. Payback Period of Candidate 2.

I	=	1,609,000
R	=	1,398,000 – 876,000
	=	522,000
T	=	0.1
P	=	1,609,000 / (1-0.1) 522,000
	=	3.4 years

Table I.17. Payback Period of Candidate 3.

I	=	1,298,000
R	=	1,398,000 – 876,000
	=	522,000
T	=	0.1
P	=	1,298,000 / (1-0.1) 522,000
	=	2.8 years

Payback period (after tax) for candidate 1 is 2.5 years, candidate 2 is 3.4 years, and candidate 3 is 2.8 years so all candidates are good investment due to all investments must have payback period less than or equal to four years.



Table I.18. Payback Analysis for Candidate 1, Baht.

Cost Item	Years				
	0	1	2	3	4
Development Cost:	-1,581,500.00				
Operation & Maintenance Cost:		-1,518,000.00	-1,709,800.00	-1,880,780.00	-2,068,858.00
Discount Factor for 10%:	1.000	0.909	0.826	0.751	0.683
Time-adjusted costs (adjusted to present value):	-1,581,500.00	-1,379,862.00	-1,412,294.80	-1,412,465.78	-1,413,030.01
Cumulative time-adjusted costs over lifetime:	-1,581,500.00	-2,961,362.00	-4,373,656.80	-5,786,122.58	-7,199,152.59
Benefits derived from operation of new system:	0.00	2,267,500.00	2,556,700.00	2,787,800.00	3,050,200.00
Discount Factors for 10%:	1.000	0.909	0.826	0.751	0.683
Time-adjusted benefits (current of present value):	0.00	2,061,157.50	2,111,834.20	2,093,637.80	2,083,286.60
Cumulative time-adjusted benefits over lifetime:	0.00	2,061,157.50	4,172,991.70	6,266,629.50	8,349,916.10
Cumulative lifetime time-adjusted cost+benefits:	-1,581,500.00	-900,204.50	-200,665.10	480,506.92	1,150,763.51
					1,700,631.81

Table I.19. Payback Analysis for Candidate 2, Baht.

Cost Item	Years					
	0	1	2	3	4	5
Development Cost:	-1,609,000.00					
Operation & Maintenance Cost:		-1,398,000.00	-1,567,800.00	-1,724,580.00	-1,897,038.00	-2,086,741.80
Discount Factor for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted costs (adjusted to present value):	-1,609,000.00	-1,270,782.00	-1,295,002.80	-1,295,159.58	-1,295,676.95	-1,295,866.66
Cumulative time-adjusted costs over lifetime:	-1,609,000.00	-2,879,782.00	-4,174,784.80	-5,469,944.38	-6,765,621.33	-8,061,487.99
Benefits derived from operation of new system:	0.00	1,902,500.00	2,172,700.00	2,377,000.00	2,630,200.00	2,892,500.00
Discount Factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted benefits (current of present value):	0.00	1,729,372.50	1,794,650.20	1,785,127.00	1,796,426.60	1,796,242.50
Cumulative time-adjusted benefits over lifetime:	0.00	1,729,372.50	3,524,022.70	5,309,149.70	7,105,576.30	8,901,818.80
Cumulative lifetime time-adjusted cost+benefits:	-1,609,000.00	-1,150,409.50	-650,762.10	-160,794.68	339,954.97	840,330.81

Table I.20. Payback Analysis for Candidate 3, Baht.

Cost Item	Years					
	0	1	2	3	4	5
Development Cost:	-1,298,000.00					
Operation & Maintenance Cost:		-1,398,000.00	-1,557,800.00	-1,713,580.00	-1,884,938.00	-2,073,431.80
Discount Factor for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted costs (adjusted to present value):	-1,298,000.00	-1,270,782.00	-1,286,742.80	-1,286,898.58	-1,287,412.65	-1,287,601.15
Cumulative time-adjusted costs over lifetime:	-1,298,000.00	-2,568,782.00	-3,855,524.80	-5,142,423.38	-6,429,836.03	-7,717,437.18
Benefits derived from operation of new system:	0.00	1,890,500.00	2,162,500.00	2,326,500.00	2,604,200.00	2,878,500.00
Discount Factors for 10%:	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjusted benefits (current of present value):	0.00	1,718,464.50	1,786,225.00	1,747,201.50	1,778,668.60	1,787,548.50
Cumulative time-adjusted benefits over lifetime:	0.00	1,718,464.50	3,504,689.50	5,251,891.00	7,030,559.60	8,818,108.10
Cumulative lifetime time-adjusted cost+benefits:	-1,298,000.00	-850,317.50	-350,835.30	109,467.62	600,723.57	1,100,670.92

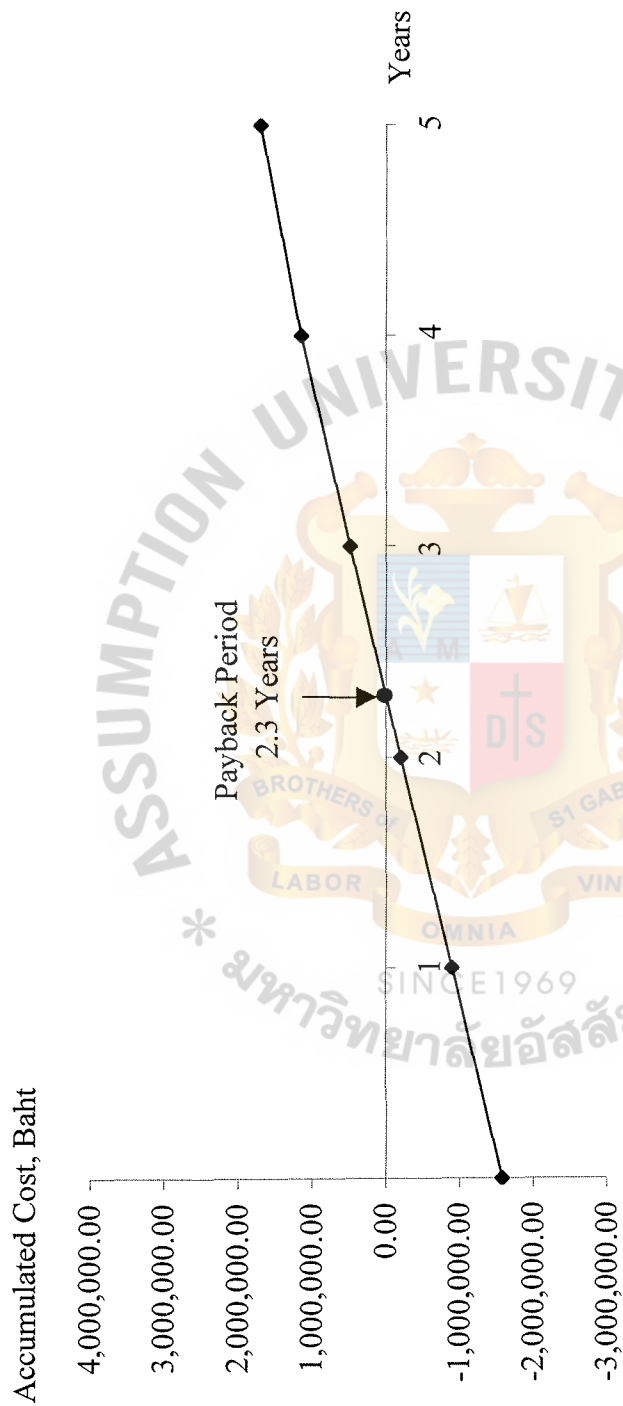


Figure I.4. Payback Analysis Graph for Candidate 1.

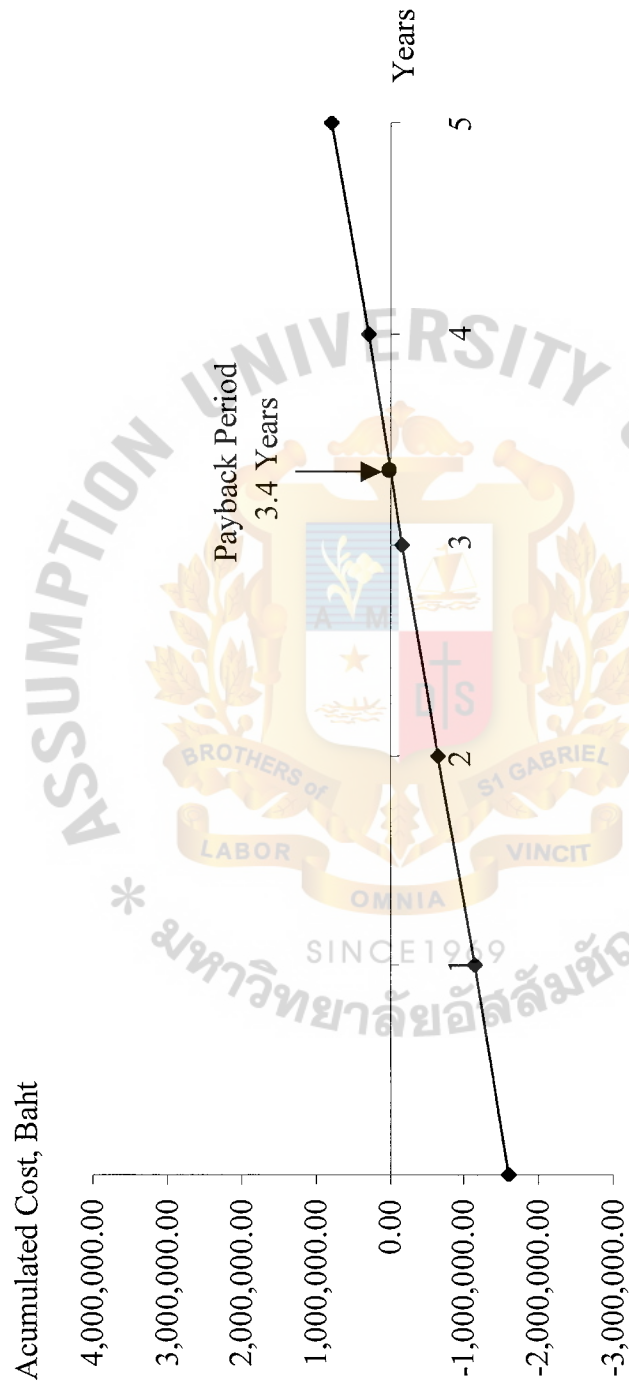


Figure I.5. Payback Analysis Graph for Candidate 2.

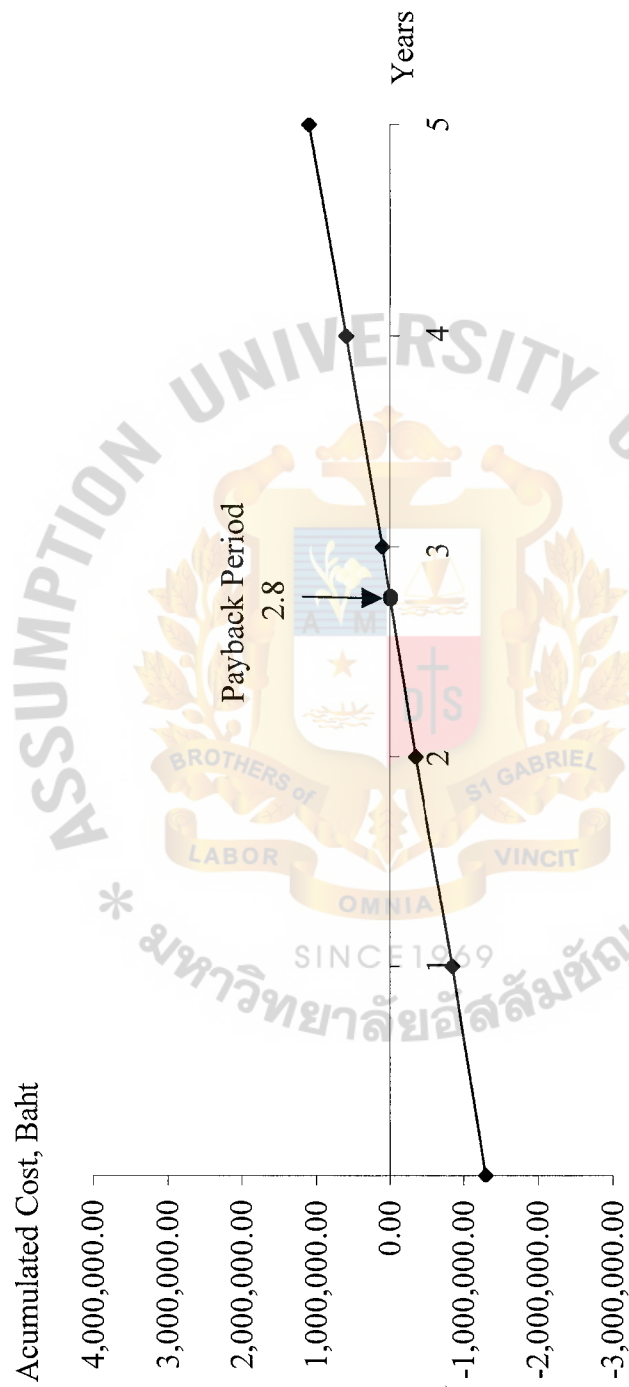


Figure I.6. Payback Analysis Graph for Candidate 3.

BIBLIOGRAPHY

1. Date, C. J. An Introduction to Database Systems. MA: Addison-Wesley, 1995.
2. Greer, Tyson. Understanding Intranets. Redmond, WA: Microsoft Press, 1998.
3. Grosshans, Daniel. File Systems Design & Implementation. NJ: Prentice-Hall, 1997.
4. Jeffrey L. Whitten, Lonnie D. Bentley, Kevin C. Dittman. System Analysis and Design Methods, fifth edition. McGraw-Hill, 2000.
5. Laudon, Kenneth C. and Jane Price Laudon. Management Information Systems: A Contemporary Perspective. NY: Macmillan, 1998.
6. Lewis, T. G. and M. Z. Smith. Applying Data Structures. Huston: Houghton Mifflin, 1976.
7. Loomis, Mary E. S. Data Management and File Structures, Second Edition. London: Prentice-Hall International, 1989.
8. Page-jones, Meilir. The Practical Guide to Structured Systems Design, Second Edition. NJ: Prentice-Hall, 1988.
9. Walker, A.J. Handbook of Human Resource Information Management. NY: McGraw Hill, Inc, 1993.