Car Reservation System

by

Ms. Sineenart Sila

Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science In Information Technology Assumption University

September, 2002
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The Faculty of Science and Technology

Master Project Approval

Project Title: Car Reservation System
By: Ms. Sineenart Sila
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Academic Year: 1/2002

The Department of Information Technology, Faculty of Science and Technology of Assumption University has approved this final report of the three credits course IT6900 Master Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Information Technology.

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September/ 2002
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Most of all, I would like to recognize and acknowledge the contribution of my father, my mother, my brother, and my dear friends who have given me plenty of encouragement, love, and understanding.
ABSTRACT

In Car Reservation System, which develops the system for new change process from the manual system to the electronic system of Petroleum Company. The objective of the system is developing car reservation system so that all employees of the case company can login for requesting car by themselves. The system uses web technology available to use at any time and any place it provides comfortable as well as tracking request feature for more satisfaction.

Employee Self Service is a strategy of the case company that encourages the company and employees to adjust business process concept, different thinking, and more business culture to align with the new e-Business environment. All of the employees understand and are willing to learn about the change. So, car reservation system is one of the case company that supports daily working life because employees must have personal request such as overtime request, leave request, and medical claim etc.

The project develops from problem statement, objective, and scope of work to create system analysis and design also implementation plan. The new system has more effectiveness and efficiency of company resources such as faster response by car administrators. It also helps car administrators to prepare managerial report faster, more accurately and more effectively.
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CHAPTER 1
INTRODUCTION

Car Reservation System is one of Employee Self Services (ESS) system for the case company. Since 1999 until now the company has 10 ESS systems such as Leave Request System, Overtime Request System, Personal Information System, Medical Claim System and so on. ESS is a concept of Information & Communication Technology Services Center (ICT) strategy, which continuously change a company to the Computerize Company. ICT strategies stated by CIO and Top Management announced by year 2000 to lead the company to a full computerization, are meant to encourage the company to reduce paper and use more computer system. So, systems that are developed must respond to business strategy and use the highest benefit of ICT resources. Therefore, the company will gradually change the employee’s working behavior from Paper-Based to Electronic-Based. Furthermore, employees must make a personal claim & requests by themselves (self-services). The main purpose for these strategies are to increase productivity, reduce processes, reduce cost of operation; moreover the company will adjust the employee readiness to E-business environment to be familiar with computer systems, security awareness and authority to decisions. E-business activity makes the company’s business activities faster than competitors to gain sustainable competitive advantage with security conscious. So, ESS system is the foundation of e-Business of the case company by which employees will be intimately acquainted with self-service system with security awareness.

Car Reservation System is developed by using web application for car reserve management that provide the opportunity for all employees to reserve car by
using system via Intranet and they can know the status of reservation request by themselves. On the other hand Car's Administrators can manages vehicles and drivers more effectively.

1.1 Statement of Problems

To deal with competitive advantage and company survival, the company realizes it has to improve the business process. One of the business processes that needs to be improved is Employee Self Services system which consists of systems that affect employees routine request and clearing expense such as overtime request, leave request and medical claim request. These requests require paper forms that every department will store for future use (may not use). Next, the paper forms will be sent by couriers to another department for processing and keeping for government regulation of 10-15 years etc. It causes the limitation of repository for each department and time consuming for verify correction.

The case company is a large company that has more hierarchy of management and a lot of employees so, everyday there are more paper works and duplication of works. Employees are so busy with paper works that they have less time to analyze and think about business properly.

ESS system is support system that is developed for company’s employees to assist them to request and claim by using web technology and Intranet. The main purpose is to response personal activities that employees are doing by themselves such as Leave Request System, Overtime Request System, Personnel Information System, Medical Claim System and so on. In globalization, every company brings computer to work faster, with old business culture, employees fill in paper forms and send them to the approver (depend on level of management) and next send it to other related department. From these reason, every department especially finance
Department must fill a huge information again for adding information to processing. Sometime have human error during processing such as request forms lose, and incorrect information.

Therefore, instead employees fill information into paper forms then we changing employees culture that filling information on computer screen and automatically send information to manager for approval. By using e-mail feature for automatic sending e-mail alert to manager for warning waiting request approve record. After request approved, it will send to related department for proceed work such as financing department will check for corrective and prepare payment to employee’s account faster than old procedure and increasing productivity too.

Employees, who accountability fills are information and update information by themselves. ESS systems have benefit both of employee and company. Finally, company will have paper less and less paper office.

Car Reservation System, although it is small system that not have business impact for company but also related with a routine works of employees. Because of the Case Company has car pool for service employee who gets out the office to contract business. For the existing system, employees use paper forms for car reservation request then filling form and send to manager for approval and send it to car pool administrator. Waiting for result and user will call to car administrator for checking car license or driver again. Sometime request's paper lose on the way, so car reservation request will did not take response or inappropriate manage. The problems of car reservation system can summary as show following:

1. Division/Department will reserve car reservation form for use within department. This causes the company order forms to be stocked though sometime they may not be used.
2. It wastes time and labor of car reservation request sent by couriers between departments.

3. Car administrators cannot verify time of the car used and the driver instantly because it is paper-based form. Car administrators will check working sheet of each car.

4. Employees will follow up car reservation request by themselves via phone call and wait for the result of consideration.

5. There is no car database for tracking car used.

1.2 Objective of Project

The objective of this project is to develop ESS system, which is car reservation system developed by web application.

1.3 Scope of works

The project scope is developing car reservation system which includes: Project Planning, System Analysis, System Design. The system will use web technology and users can use this system via Intranet. The system will be related with 3 portions, which are Employee, Manager, and Car pool Administrator by automatic link and update.

Employees can fill in by using a computer screen and can check the status of car reservation request by themselves, then the system will generate e-mail to the manager to remind him to approve car request and finally, the car administrator will assign the car and driver and update the information on screen. The system will provide easy and comfortable way to fill in and check information because the system will update automatically. The car administrator can follow up the car use, the driver and can control car’s maintenance.
1.4 Project Procedure

1. Study standardization of developing software tools for developing system of the case company
2. Study and understand car reservation process from existing procedure
3. Gather information from Travel & Vehicles Services Section, Administrator and System Analyst of System Software Development Department. This includes the survey of user requirement, company’s regulations, and consulting with system analysts for analysis and design suggesting
4. Develop Car Reservation System, use web technology so that employee can log on this system by Intranet. The system provides automatic updated information which users can track status of request. Also car administrator can track car & driver working and make a report
5. Evaluate the existing and the new system (benefits statement)
6. Make a system implementation plan
7. Give conclusions and recommendations
8. Prepare the project paper
9. Conduct project examination

1.5 Expected Benefits of the Project

Employee Point of View:

1. Employees can request car reservation by themselves via Intranet more easily and more comfortably.
2. Employees can verify, follow up the car requested by themselves and check the history of the car requested by tracking status of request record
3. It increase employee satisfaction

**Company Point of View:**

✓ 1. Reduce cost from eliminating papers and couriers for sending papers

✓ 2. Reduce cost and time for preparing documentation, communication, paper forms, and filing cabinet

✓ 3. Reduce time for filling and verifying information of Travel & Vehicle Service Section

✓ 4. Efficient car management to arranging car pool and driver's work

5. Enable the company to analyze cost of car request by selecting from organization structure and period of time effectively

1.6 **Limitation of works**

1. The project has limitations that are the standard tools to develop the system, Cold Fusion Enterprise V 4.0 which encourages me to study how to use these tools to develop.

2. Limitation of learning to understand because ICT staff are too busy to teach me.

3. Another limitation is about collecting the requirement and information from car administrators because they were not good at in business process work and did not clear their request.
CHAPTER 2
THE EXISTING SYSTEMS

2.1 Company Background

The case company is engaged in integrated gas and petroleum business, other support activities including a dominant position in oil and investment in related business while having a leading position in the marketing and trading of various crude oil, refined petroleum products over 25 years. In addition, through interests in associated companies, the company has invested in Thailand’s petrochemicals and refining industries. Primary business activities include:

- exploration, development and production of natural gas, condensate and crude oil through a subsidiary
- procurement, transmission, processing, marketing and distribution of natural gas and gas products
- marketing of refined products through various distribution channels including commercial, retail, reseller and international markets as well as international trading i.e. import and export of crude oil, condensate, petroleum feedstock and petrochemical products

Number of Employees As of August, 31 2002 the employees of the company, its Subsidiaries and Joint Ventures numbered 3,325
2.2 Organization Chart

Figure 2-1 Organization Chart of Case Company

Note: EVP - Executive Vice President
SEVP - Senior Executive Vice President
Organization Structure of the case company is divided into 6 lines of management. As shown as figure 2-1, which has details as follows;

1. Corporate Strategy & Development:

   Responsible for setting corporate strategies and long term plan which alignment with vision and can create the highest value to the company.

2. Corporate Finance & Accounting:

   Responsible for accounting and financing management that includes the company's subsidiary management to highest value for business.

3. Corporate Support:

   Responsible for developing core competency and employee skill to competitive strategy including legal, QSHE policy.

4. Gas Business Group:

   The company conducts a fully integrated gas business including exploration and production, procurement, transmission and distribution.

   The company solely operates an integrated transmission and distribution pipeline system in Thailand. It procures natural gas from both indigenous and overseas sources to serve national demand and is also Thailand's largest gas separator.

5. Oil Business Group: carries out 2 main activities

   - Marketing: marketing of petroleum products, a lubricant, petrochemical product through various markets both at home and overseas. Retaining the top position in the market, the company has a highly developed retail distribution network. It possesses the largest number of service stations (1,451 stations as of June 30, 2001) located throughout the country. Various markets served
by the company include governmental sector, state enterprise, power producers, oil and LPG resellers.

- **International trading**: importing and exporting of crude oil and condensate from indigenous and overseas sources, trading and exporting of petroleum, petrochemical products and byproducts from associated companies to neighboring countries and the countries in Southeast Asia.

6. Petrochemical & Refining Business Group:

The company has invested in refining and petrochemical businesses through associated refineries and petrochemical companies i.e. investment in 4 refineries (ThaiOil, Rayong, Star Petroleum and Bangchak) The company’s refining capacity reaches 240,000 barrels/day, representing 24% of national refining capacity. With respect to petrochemical business, the company has invested in both olefins and aromatics projects as well as chemical fertilizer in 5 companies; namely, Thai Olefins Company., Limited., The Aromatics (Thailand) Public Company Limited., National Petrochemical Public Company Limited., Thai Paraxylene Company., Limited and National Fertilizer Public Company Limited.

### 2.2 Functional structure related with the project

2.2.1 **Information & Communication Technology Services Center (ICT)**

Responsible for ICT management which provides efficiency and effectiveness of services consisting of 3

2.2.2 Travel & Vehicle Service Section report to Facilities Administration Department, which has duty to proceed about travels to every section and provide car to employees and management with efficiency and effectiveness, and provide the managerial car report for evaluation, tax, maintenance and the history of the car.

2.3 Existing system of Car Reservation

The case company has Travel & Vehicles Services Section for giving service employees to who require vehicles for outside company business. The business work flow of existing car reservation is shown in figure 2-2.

The process is related with 3 entities are employee, approver, Travel & vehicles Services Section

2.3.1 The employee fills the car reservation form that consist of
2.3.1.1 Date/Time
2.3.1.2 Objectives
2.3.1.3 Requester
2.3.1.4 Approver

2.3.2 The employee sends forms to the approver for approval request. If the request is rejected by the approver, the process finished.

2.3.3 The car administrator receives the request by couriers
2.3.4 The car administrator verifies the request, the car and the driver available from the book.

2.3.5 The requester is informed of the car license and the driver's name.

2.3.6 The requester contacts the car administrator to request car license.

2.3.7 Receive vehicle

In addition, Travel & Vehicle Service Sector has 67 units of vehicles and 25 drivers for giving service to employees outside central building which includes cars, mini buses, pickups and it also has outsourcing cars when the car request peaks.
Figure 2-2 Existing car reservation work flow
CHAPTER 3

THE PROPOSED SYSTEMS

Regarding the problem of the existing system stated in Chapters 1,2 a new car reservation system has been created. This chapter provides user requirements and conceptual analysis and design for the new system and implementation plan.

Car Reservation System is developed for employees who request vehicles (car, mini bus, pickup) for outside company business. Employee can request via the company Intranet and the input information into electronic form before submitting it to the approver and have automatic update status. Employees can track request status and know the car license and the driver’s name by themselves.

3.1 User Requirements

From the problem statements in Chapter 1, next phase is to gather user requirement. The collection of requirements from Travel & Vehicle Service teams consists of 1 section manager, 4 car administrators (HO, OIL, GAS, PETROCHEMICAL & REFINERY) and Corporate & Support Application Software Development teams which consist of 1 division manager, 2 system analyst and me. Meeting and the user’s interview can summarize requirement as follows

1. The user can use Car Reservation System by ESS categories, Intranet

2. The employee can input request by selecting car type and date/time of car request including objectives for car reservation request by themselves.

3. The system can automatically send the request to the approver and has alert function to the approver.

4. The system can automatically the request to the car administrator for considerable car and driver assigns.
5. The system can calculate and estimate the cost of car reserve request for showing the cost to charge back from functional unit request.

6. The system can make reports for the car administrator and functional management to analyze car information using and cost.

7. The system can show the status of car reservation request and the result of consideration by themselves such as car license and the name of the driver without call for asking.

8. The system can show the history of the car operation such as date/time, mile-in, mile-out, the requester, and the cost for each request.

9. The system provides car management function such as adding and editing car information.

10. The system provides driver management function such as adding and editing driver information.

11. The system provides search function for the car administrator to search faster.

3.2 Scope of developing the system

3.2.1 Study and analyse system requirement and make an Overview Conceptual Project which is consistent with the business requirement. Gathering in to Context Diagram and Data Flow Diagram level - 0 and Data Flow Diagram level - 1 and Entity Relationship Diagram.

3.2.2 Study process and procedure of the new car reservation system.

3.2.3 System functional design to fit user requirement.
3.2.4 Develop prototype system prepared for user review and acceptance

3.2.5 Design the system which consists of

3.2.5.1 Input design including which is easy to maintain master files

3.2.5.2 Output design including the report which easy to understand

3.2.5.3 Interface design which can easily use

3.2.6 System development which supports web application

3.3 The software development schedule

<table>
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<th>Activity</th>
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<th>End Date</th>
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<td>3</td>
<td>July 29, 2002</td>
<td>July 31, 2002</td>
</tr>
<tr>
<td>2. System analysis &amp; Design</td>
<td>10</td>
<td>August 1, 2002</td>
<td>August 10, 2002</td>
</tr>
<tr>
<td>4. Software Testing</td>
<td>1</td>
<td>August 26, 2002</td>
<td>August 27, 2002</td>
</tr>
<tr>
<td>5. Implementation and installation plan</td>
<td>11</td>
<td>August 28, 2002</td>
<td>August 5, 2002</td>
</tr>
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Table 3-1 The software development schedule

3.4 Software / Hardware / Resource Requirement

3.4.1 Application Software

- Microsoft Internet Explorer V.5
- Window 95/98
- Web Application Tools –ColdFusion Studio 4.5

3.4.2 System Software

- Windows 95/98
- Web Application Server – ColdFusion Server 4.5
- Personal Web Server

3.4.3 Database Management Software
- Microsoft Access 98

3.4.4 Processing
- Processing at server by Web Application Server

3.4.5 Communications
- LAN
- IP Address

3.4.6 Other Equipment
- Notebook for developing software
- PC for printing report
3.5 Feasibility Study

3.5.1 Tangible Benefits

<table>
<thead>
<tr>
<th>Description</th>
<th>Benefit/Year</th>
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<tr>
<td>Reduce time for verifying information and inputing data</td>
<td>19,170.0</td>
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<tr>
<td>Reduce time to make reports</td>
<td>19,936.8</td>
</tr>
<tr>
<td>Eliminate paper forms</td>
<td>7,000.0</td>
</tr>
<tr>
<td>Reduce labor cost for couriers</td>
<td>38,340.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>84,446.8</strong></td>
</tr>
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</table>

Table 3-2 Tangible Benefit Summary

Assumption

1. Employee is average salary per month = 37,465. - (Average salary of employee level 3-12 as of 1 August, 2002. Information from Human Resource Department)

2. 1 month is working day = 22 days

3. Employee’s average salary per day = 37,465 / 22 = 1,703 Baht

4. 1 working day (8 hr.) = 480 minutes

5. Employee’s average salary per minute = 1,703 / 480 = 3.55 Baht
### Table 3-3 Tangible Benefit Calculation

#### 3.5.2 Intangible Benefits
- Employees gain more satisfaction with easy way to use and tracking
- Use car reservation information for analysis and management
- Reduce human error for inputting data
- Employees change culture to daily work with self service
- Car administrators can manage cars and drivers efficiently and effectively

#### 3.5.3 Cost

One time Cost

<table>
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<tr>
<td>Others</td>
<td>5,000.0</td>
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<tr>
<td>Total</td>
<td>209,480.0</td>
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*Table 3-4 One time Cost Summary*
Recurring cost

<table>
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<th>Description</th>
<th>Baht</th>
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<td>Maintenance cost</td>
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<tr>
<td>Total</td>
<td>10,000.0</td>
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Table 3-5 Recurring Cost Summary

Assumption

Skills Requirement

<table>
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<tr>
<th>Role</th>
<th>Number</th>
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<tbody>
<tr>
<td>User Leader</td>
<td>1</td>
</tr>
<tr>
<td>System Analyst</td>
<td>2</td>
</tr>
<tr>
<td>Web Application Developer</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
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</tbody>
</table>

Time to develop 34 days

- Employee’s average salary per month = 37,465.- (Average salary of employee level 3-12 as of 1 August, 2002. Information from Human Resource Department)

- 1 month’s working day = 22 days

- Employee’s average salary per day = 37,465 / 22 = 1,703 Baht

- 1 working day has 8 hr. = 480 minutes

- Employee’s average salary per minute = 1,703 / 480 = 3.55 Baht

Development Cost = 4 * (30 * 8 * 60) * 3.55 = 204,480 Baht
## Car Reservation System

### Economic Feasibility Analysis

<table>
<thead>
<tr>
<th></th>
<th>Year 0</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Net economic benefit</strong></td>
<td>0.00</td>
<td>84,446.80</td>
<td>84,446.80</td>
<td>84,446.80</td>
<td>84,446.80</td>
<td>84,446.80</td>
<td>84,446.80</td>
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<td><strong>Discount Rate (5 %)</strong></td>
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<td>0.95</td>
<td>0.9100</td>
<td>0.8600</td>
<td>0.7800</td>
<td>0.7500</td>
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<tr>
<td><strong>PV. of benefits</strong></td>
<td>0.00</td>
<td>80,224.46</td>
<td>75,846.59</td>
<td>72,624.25</td>
<td>65,866.50</td>
<td>63,335.10</td>
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</tr>
<tr>
<td><strong>NPV. Of all benefits</strong></td>
<td>0.00</td>
<td>80,224.46</td>
<td>157,071.05</td>
<td>229,695.30</td>
<td>295,563.80</td>
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<td>358,898.90</td>
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|                  |        |            |            |            |            |            |            |
| **one time costs**     | 209,480.00 |            |            |            |            |            |            |
| **Recurring cost**     | 0.00   | 10,000.00  | 10,000.00  | 10,000.00  | 10,000.00  | 10,000.00  |            |
| **Discount Rate (5 %)** | 1.00   | 0.95       | 0.9100     | 0.8600     | 0.7800     | 0.7500     |            |
| **PV. Of recurring cost** | 0.00   | 9,500.00   | 9,100.00   | 8,600.00   | 7,800.00   | 7,500.00   |            |
| **NPV. Of all costs**  | 103,700.00 | 113,200.00 | 122,300.00 | 130,900.00 | 138,700.00 | 146,200.00 | 146,200.00 |
| **Overall NPV**        |        |            |            |            |            |            | 212,698.90 |
| **Overall ROI**        |        |            |            |            |            |            | 1.45       |

### Break-even Analysis

<table>
<thead>
<tr>
<th></th>
<th>Yearly NPV Cash Flow</th>
<th>Overall NPV Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yearly NPV Cash Flow</strong></td>
<td>103,700.00</td>
<td>-32,975.54</td>
</tr>
<tr>
<td><strong>Overall NPV Cash Flow</strong></td>
<td>-32,975.54</td>
<td>156,863.80</td>
</tr>
</tbody>
</table>

**Project break-even occurs between year 1 and 2.**

*Use the second year of positive cash flow to calculate break-even fraction \((157,071.05-122,300.00/157071.05) = 0.22\)*

**Actual break-even occurred at 1.22 year.**

---

1. From Tangible Benefit
2. Discount rate means interest rate \((i)\) : formula = \(1/(1+i)^n\)
3. One time cost = cost of development
4. Overall NPV = Total NPV of all benefit - Total NPV of all costs
5. ROI = Overall NPV / Total NPV of all costs
6. Yearly NPV cash flow = Yearly PV of benefit - Yearly PV of recurring costs
7. Overall NPV Cash Flow = NPV of all benefit - NPV of all costs
### Table 3-6 Economic Feasibility Study

<table>
<thead>
<tr>
<th>Year</th>
<th>Break-even Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>20,000</td>
</tr>
<tr>
<td>2</td>
<td>40,000</td>
</tr>
<tr>
<td>3</td>
<td>60,000</td>
</tr>
<tr>
<td>4</td>
<td>80,000</td>
</tr>
<tr>
<td>5</td>
<td>100,000</td>
</tr>
<tr>
<td>6</td>
<td>120,000</td>
</tr>
<tr>
<td>7</td>
<td>140,000</td>
</tr>
<tr>
<td>8</td>
<td>160,000</td>
</tr>
<tr>
<td>9</td>
<td>180,000</td>
</tr>
<tr>
<td>10</td>
<td>200,000</td>
</tr>
</tbody>
</table>

![Figure 3-1 Break-Even Point](image-url)
3.6 Conceptual Design

3.6.1 Process Modeling

3.6.1.1 Data flow diagram: one of several notations that are called structured analysis techniques, a picture of the movement of data between external entities and the processes and data stores within a system.

There are two different standard sets of data flows, data stores, processes, and sources/sinks (or external entities). The set of symbols that used for this project is Gane & Sarson symbols.

3.6.1.1 A data flow can be best understood as data in motion, moving from one place in a system to another.

3.6.1.2 A data store: Data at rest, which may take the form of many different physical representations.

3.6.1.3 Process: The work or actions performed on data so that they are transformed, stored, or distributed.

3.6.1.4 Source/Sink: The origin and/or destination of data, sometimes referred to as external entities.

3.6.1.2 Level-0 diagram: A data flow diagram that represents a system's major processes, data flows, and data stores at a high level of detail.
3.6.1.3 Entity-relationship data model (E-R model): a detailed, logical representation of the entities, associations, and data element for an organization or business area

3.6.1.3.1 Entity type: A collection of entities that share common properties or characteristics.

3.6.1.3.2 Entity instance (instance): A single occurrence of an entity type

3.6.1.3.3 Attribute: A named property or characteristic of an entity that is of interest to the organization

3.6.1.3.4 Candidate key: An attribute (or combination of attribute) that uniquely identifies each instance of an entity type.

3.6.1.3.5 Identifier: A candidate key that has been selected as the unique, identifying characteristic for an entity type

3.6.2 Applied Process Modeling with Case Study

3.6.2.1 Context Diagram shows system boundaries that relate to car reservation system. This system concerns of 3 entities consisting of user, approver, car administrator. The user fill car reservation into system and then car information is alert the approver for approving the request. When the request is approved, the car administrator will arrange the cars and the driver’s atomically update information. Context Diagram provides conceptual view for easy understanding. (figure 3-2)
Figure 3-2 Context Diagram of Car Reservation System
3.6.2.2 New Data flow diagram level-0 has 4 processes as follows (figure 3-3)

3.6.2.2.1 Process 1: Verify Password is the process to generate authentication person who can log on this system with security.

3.6.2.2.2 Process 2: Fill car reservation request is the process that the user can input data/select data and submit the form for approval.

3.6.2.2.3 Process 3: View and Adjust request is the process that the approver can view and adjust date/time also reason and then determine the request for approve/reject car reservation request.

3.6.2.2.4 Process 4: Approve Request is the process which the car administrator assigns the car and the driver and approves the request.
User log on

User

Varify Password

Checking Valid Password

Generate user information

Fill car reservation request

Car Information Request

Car Information RequestData

View and Adjust request

Confirmation request

Car Information RequestData

Approve request

Waiting for approval

Car Reservation Request

Car Reservation Request Approved

Car Administrator

Close Request

Car and Driver Management

Approver

Car Book

Car Information

Figure 3-3 New Data Flow Diagram Level 0
3.6.2.3. Data flow diagram level – 1 of process 1 (figure 3-3) of process number 1 which consists of 2 processes as follows;

3.6.2.3.1 Register for the new user is the process employee must identify themselves first

3.6.2.3.2 Verify user’s name and password is the process which check if the authorized person and password are correct, then the system will retrieve necessary personal information data from R/3 system.
Generate user information

Propose object and details

Input data

Select car type, unit, driver

car and driver request

Propose date/time

Estimate cost
generate

Select approver

Generating complete request

Submit form

Car Reservation Information

Car Book

Figure 3-5 Data Flow Diagram level – 1 of process # 2
3.6.2.4 Data flow diagram level-1 of process 2 (figure3-4) consist of has 5 processes as follows:

3.6.2.4.1 Process 1: Propose objective and details the user inputs objective and detail of traveling

3.6.2.4.2 Process 2: Select the car type process unit and the driver’s need process. The user selects the car type and select the unit of car and need for the driver or the need of the car only

3.6.2.4.3 Process 3: Propose date/time process. The user select date/time

3.6.2.4.4 Process 4: Select the approver process. The user can select the approver and change the approver

3.6.2.4.5 Process 5: Submit form process. The user submits, resents and cancels the form
Figure 3-6 Data Flow Diagram level – 1 of process # 3

3.6.2.5 Data flow diagram level-1 of process 3 (figure 3 -6) consists of 2 processes as follows

3.6.2.5.1 Process 1 : View car reservation request process which shows information update from master file

3.6.2.5.2 Process 2 : Adjust date and time
3.6.2.6 Data flow diagram level -1 of process 4 (figure 3-7) consists of 4 processes as follows

3.6.2.6.1 Process 1: View car request information process is the process for the car administrator to review the request

3.6.2.6.2 Process 2: Select car and driver process is the process for the car administrator to assign the car and the driver for each request
3.6.2.6.3 Process 3: Confirm date/time process is the process for the car administrator to confirm the date/time for the driver and the user.

3.6.2.6.4 Process 4: Consider approval process is the process for the car administrator to approve the request.

3.6.3 Entity Relationship Diagram (E-R Diagram) of car reservation system (figure 3-8)

![Entity Relationship Diagram](image)

Figure 3-8 Entity Relationship Diagram
3.7 Input Design

3.7.1 Password table consist of 2 records as follows (figure 3-9)

3.7.1.1 User Name : Users input data and keep in password

3.7.1.2 Password : Users input data and verify by password table

Figure 3-9 Password table
3.7.2 Personal Information file will be directly retrieve from R/3 system which provides flexible records for input/update/delete (figure 3-10)

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Address</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>04010</td>
<td>Mr. Pramote Nisangsook</td>
<td>1122044</td>
<td>242-1224</td>
</tr>
<tr>
<td>04015</td>
<td>Mr. Sonol Tonhong</td>
<td>6102046</td>
<td>282228</td>
</tr>
<tr>
<td>04019</td>
<td>Miss Jaree Songsersrin</td>
<td>2642042</td>
<td>232211</td>
</tr>
<tr>
<td>04020</td>
<td>Mr. Wanidote Sanochotha</td>
<td>9102433</td>
<td>392-6993</td>
</tr>
<tr>
<td>04026</td>
<td>Mrs. Wattrat Chawachana</td>
<td>2482041</td>
<td>311-1492</td>
</tr>
<tr>
<td>04029</td>
<td>Mr. Taneesil Pavapatana</td>
<td>1602042</td>
<td>2130</td>
</tr>
<tr>
<td>04032</td>
<td>Mr. Phason Sunthornsrin</td>
<td>2002043</td>
<td>12322</td>
</tr>
<tr>
<td>04034</td>
<td>Miss Tipak Nakeshitrun</td>
<td>2501204</td>
<td>21785</td>
</tr>
<tr>
<td>10032</td>
<td>Mr. Choichart Naengsapan</td>
<td>2484044</td>
<td>492-279</td>
</tr>
<tr>
<td>10034</td>
<td>Mr. Supin Janvin</td>
<td>1390204</td>
<td>102-2323</td>
</tr>
<tr>
<td>10035</td>
<td>Mr. Vional Tulatong</td>
<td>1610242</td>
<td>803-7621</td>
</tr>
<tr>
<td>10036</td>
<td>Mr. Boonanae Chooslong</td>
<td>1802043</td>
<td>7022</td>
</tr>
<tr>
<td>10037</td>
<td>Mr. Arnach Chetapatkula</td>
<td>1502043</td>
<td>57-62</td>
</tr>
<tr>
<td>10038</td>
<td>Mr. Kluan Charnongnae</td>
<td>6302045</td>
<td>280123</td>
</tr>
<tr>
<td>10039</td>
<td>Mr. Pann Wongla</td>
<td>3102040</td>
<td>246-4197</td>
</tr>
<tr>
<td>10040</td>
<td>Mr. Simwong Sangaroow</td>
<td>1380244</td>
<td>30-11</td>
</tr>
<tr>
<td>10041</td>
<td>Mr. Niti Thongtong</td>
<td>1962041</td>
<td>1975-224</td>
</tr>
<tr>
<td>10044</td>
<td>Mr. Teeaphon Buadee</td>
<td>2162044</td>
<td>8226-8323</td>
</tr>
<tr>
<td>10046</td>
<td>Mr. Visothi Ouvayen</td>
<td>2380204</td>
<td>53-6</td>
</tr>
<tr>
<td>10047</td>
<td>Mr. Tarn Phraewkai</td>
<td>4780204</td>
<td>101114</td>
</tr>
<tr>
<td>10050</td>
<td>Mr. Somtham Nattayoy</td>
<td>1101041</td>
<td>100333-47</td>
</tr>
<tr>
<td>10051</td>
<td>Mr. Somtham Nattayoy</td>
<td>1101041</td>
<td>100333-47</td>
</tr>
</tbody>
</table>

Figure 3-10 Personal Information table
3.7.3 Position table consist of position code and position name (figure 3-11)

<table>
<thead>
<tr>
<th>Position Code</th>
<th>Position Name</th>
<th>Last Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>081004010</td>
<td>System Analyst</td>
<td>23/3/2002</td>
</tr>
<tr>
<td>160400000</td>
<td>Administrator</td>
<td>23/3/2002</td>
</tr>
<tr>
<td>160400000</td>
<td>Geologist</td>
<td>23/3/2002</td>
</tr>
<tr>
<td>160300001</td>
<td>Rhetorician</td>
<td>23/3/2002</td>
</tr>
<tr>
<td>210600005</td>
<td>Illustrator</td>
<td>23/3/2002</td>
</tr>
<tr>
<td>000000005</td>
<td>Transfer EDP</td>
<td>23/3/2002</td>
</tr>
</tbody>
</table>

Figure 3-11 Position table
3.7.4 Unit code table consist of unit code number and unit name (figure 3-12)

![Table of Unit Codes](image)

**Figure 3-12 Unit Code table**
3.7.5 Car Reservation table is the master table for car reservation that can update table which provide necessary information for request which consists of reservation number, car id, driver id, book code, date start /end etc. (figure 3-13)

Figure 3-13 Car Reservation table
3.7.6 Driver information table consists of DriverId, DriverName, DriverCode that can insert/update/delete (figure 3-14)

<table>
<thead>
<tr>
<th>DriverId</th>
<th>DriverName</th>
<th>DriverCode</th>
<th>BirthDate</th>
</tr>
</thead>
<tbody>
<tr>
<td>120032</td>
<td>Mr. Kan</td>
<td>DR-001</td>
<td>5-12-1962</td>
</tr>
<tr>
<td>220033</td>
<td>Mr. Sasi</td>
<td>DR-002</td>
<td>5-12-1963</td>
</tr>
<tr>
<td>320034</td>
<td>Mr. Nerai</td>
<td>DR-003</td>
<td>5-12-1964</td>
</tr>
<tr>
<td>420034</td>
<td>Mr. Kai</td>
<td>DR-004</td>
<td>5-12-1965</td>
</tr>
<tr>
<td>520035</td>
<td>Mr. Suchin</td>
<td>DR-005</td>
<td>5-12-1966</td>
</tr>
<tr>
<td>620036</td>
<td>Mr. Pratn</td>
<td>DR-006</td>
<td>5-12-1967</td>
</tr>
<tr>
<td>720037</td>
<td>Mr. Somchai</td>
<td>DR-007</td>
<td>5-12-1968</td>
</tr>
<tr>
<td>820038</td>
<td>Mr. Sine</td>
<td>DR-008</td>
<td>5-12-1969</td>
</tr>
</tbody>
</table>

Figure 3-14 Driver Information table
3.7.7 The Car Reservation form which retrieves data from the master table and the user input data which consists of

3.7.7.1 Objective to car reservation: User input data

3.7.7.2 The employee joining this travel: User input data

3.7.7.3 The car type request: Selects drop down list of car type such as car, pickup, mini bus

3.7.7.4 The car Amount: Selects data from drop down list

3.7.7.5 Employee contact No.: User input data

3.7.7.6 Car Request and Driver: Check box for choosing cars or cars with drivers

3.7.7.7 Remark: User input data (optional)

3.7.7.8 Date for car request: Select from dialogue box

3.7.7.9 Location for request car: User input data

3.7.7.10 Time to request: Select from dialogue box

3.7.7.11 Estimate Cost: Calculate from working driver's salary and OT including car rent rate

3.7.7.12 Approver: Select from approver table that is defined by organization code from PIS

3.7.7.13 Reason: User input data (Optional)

3.7.7.14 Service Rate: Input/Update/Cancel from master data one time record

3.7.7.15 Holiday Calendar: Input/Update/Cancel from company calendar that show official holiday

3.7.7.16 Change Password:
3.7.7.16.1 Old Password: Input information which link from password file

3.7.7.16.2 New Password: Input information and update in password file

3.7.7.16.3 Confirm Password: Input information and confirm password in password file

3.7.7.17 Approve Consideration:

3.7.7.18 Submit date/time of car reservation requests calculate cost of this request

3.7.7.19 Submit request link with car request status and update car information

3.7.7.20 Approved Report: Select month from drop down list box
3.8 **Output Design** Reports generated by system, which provide managerial information for follow up essential information such as driver's work, cost of car management and moreover system more flexible for users can select times to view printing information.

3.8.1 The approval Report: Approver can check car reservation request requested by the employee in division/department. The report can select view and print for period of time. (figure 3-15)

![Approval Consideration Report in SEPTEMBER](image)

**Figure 3-15 Approval Report**
3.8.2 Car Reservation Request Summary Report:

The car administrator can select the car requested by the employee in division/department and the system can view and print for period of time. The information will generate the date, the requester, the objective to request, the car type, the period of time of request. (figure 3-16)

Figure 3-16 Car Reservation Request Summary Report
3.8.3 Car Reservation Service Cost Report

With the car reservation service cost reports for the car administrator can select by organization structure and select by period of time with drill down information. (figure 3-17)

![Car Reservation Service Cost Report]

**Figure 3-17 Car Reservation Service Cost Report**
3.8.4 Driver Working Time Sheet Summary Report

With the driver Working Time Sheet Summary Report, the car administrator selects the driver’s name and the period of time as the system can show a list of working time consisting of car reservation request number, time for working and locations to driving. (figure 3-18)

```
<table>
<thead>
<tr>
<th>Request No.</th>
<th>From</th>
<th>To</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>000000000000</td>
<td>2002-01-12</td>
<td>2002-01-12</td>
</tr>
<tr>
<td></td>
<td>000000000000</td>
<td>2002-01-12</td>
<td>2002-01-12</td>
</tr>
<tr>
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<td>000000000000</td>
<td>2002-01-12</td>
<td>2002-01-12</td>
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<tr>
<td></td>
<td>000000000000</td>
<td>2002-01-12</td>
<td>2002-01-12</td>
</tr>
<tr>
<td></td>
<td>000000000000</td>
<td>2002-01-12</td>
<td>2002-01-12</td>
</tr>
<tr>
<td></td>
<td>000000000000</td>
<td>2002-01-12</td>
<td>2002-01-12</td>
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<td>000000000000</td>
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<tr>
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<td>000000000000</td>
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<td>2002-01-12</td>
</tr>
<tr>
<td></td>
<td>000000000000</td>
<td>2002-01-12</td>
<td>2002-01-12</td>
</tr>
</tbody>
</table>
```

Figure 3-18 Driver Working Time Sheet Report
3.9 Output Screen

3.9.1 Log in Screen: the employee can log in to car reservation system by selecting ESS categories and select car reservation system. (figure 3-19)

3.9.1.1 User name: Input the employee’s ID

3.9.1.2 Password: Input same password for ESS system

Figure 3-19 Log In Screen
3.9.2 First page of car reservation system (figure 3-20) system will generate personal information of requester such as name, employee ID, title, Department etc.
3.9.2.1 Car reservation form consist of necessary information to request such as date/time, objective, vehicle type request etc. (figure 3-21)
3.9.2.2 When the user select date/time and click adjust time system will calculate estimate expense for car request (figure 3-22)
3.9.2.3 The system provides the automatic select approver, on the other hand the user can change an approver (figure 3-23)
3.9.2.4 Status form, when the user sends car reservation request. When the user submits the form, the system will generate the status of request page (figure 3-24) which consists of the request number, the status of request, and the estimate cost etc.

![Figure 3-24 Status of car reservation request](image-url)
3.9.3 Approve Consideration form consists of car reservation request that the requester inputs and submits. The approvers can view the request before approving/rejecting also adjusting date/time (figure 3-25)

![Approve Consideration Form](image)

Figure 3-25 Approve Consideration Form
3.9.4 Update Car Reservation Status. The status is update and it show the request is updated by whom (approver ID) (figure 3-26)

Figure 3-26 Update Car Reservation Request
3.9.5 Car Administrator status (figure 3-27), the car administrator see the list of request waiting for approval.
3.9.5 Car Administrator approve form

3.9.5.1 The car administrator can preview the request before approval consideration/reject (figure 3-28)
3.9.5.2 Select Car License. The car administrator selects car from car’s spec
table which consists of cars that the car pool service supervises
(figure 3-29)

Figure 3-29 Car Administrator Select Car
3.9.5.3 Car administrator Select Driver (figure 3-30) The car administrator can select from car’s driver table which consists of the name and the employee’s ID.

Figure 3-30 Car Administrator Select Driver
3.9.5.4 Approve / Reject Consideration (figure 3-31)

<table>
<thead>
<tr>
<th>NO</th>
<th>CAR</th>
<th>DRIVER</th>
<th>REMARK</th>
<th>CONSIDERATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1054</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 3-31 Approve /Reject Consideration**
3.9.5.5 Car administrator Pre Approval form (figure 3-32)
3.9.5.6 Updated Status Screen (figure 3-33) The status change when the car administrator approves that the requester can know by themselves.
### Company Official Holiday Calendar (figure 3-34)

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/2002</td>
<td>New Year</td>
</tr>
<tr>
<td>5/1/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>6/1/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>12/1/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>13/1/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>19/1/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>20/1/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>25/1/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>26/1/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>27/1/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>2/2/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>3/2/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>9/2/2002</td>
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</tr>
<tr>
<td>10/2/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>16/2/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>17/2/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>12/3/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>16/3/2002</td>
<td>Make-up Holiday</td>
</tr>
<tr>
<td>23/3/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>30/3/2002</td>
<td>Weekend</td>
</tr>
<tr>
<td>6/4/2002</td>
<td>Weekend</td>
</tr>
</tbody>
</table>

**Figure 3-34 Company Official Holiday Calendar**
3.9.5.7 Change Password Screen (figure 3-35)
3.9.5.8 Car Update (figure 3-36) The car administrator can add/update/delete car under their supervision more easily.
3.9.5.9 Driver Update (figure 3-37) The car administrator can add / update / delete driver information from car’s driver table.
3.9.5.9.1 Search Car Request (figure 3-38) The system provides multi way to search such as search by name, search by the employee's number, search by date etc.
3.9.5.12 Close request (figure 3-38) The car administrator updates information about car use from request such as mile-in, mile-out etc.
3.9.5.13 Car tracking update (figure 3-40)

Figure 3-40 Car Tracking Information
3.10 SYSTEM EVALUATION

Car Reservation System is developed for the case company employee who wishes to reserve a car for going out of the office. Regarding the new system, the employee can log in via the company Intranet that can log on at any time and any place with Internet and make transactions by themselves. The system automatically sends information to the approver and the car administrator instantly. The employees gain more satisfaction and it is easier to track requests. The company gains new employee’s behavior which continues to change for better.

3.10.1 Benefits from new system consist of tangible benefit and intangible benefit which can calculate as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Benefit/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce time for verify information and input data</td>
<td>19,170.0</td>
</tr>
<tr>
<td>Reduce time to make report</td>
<td>19,936.8</td>
</tr>
<tr>
<td>Eliminate paper form</td>
<td>7,000.0</td>
</tr>
<tr>
<td>Reduce labor cost for courier</td>
<td>38,340.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>84,446.8</strong></td>
</tr>
</tbody>
</table>

Table 3-7 Tangible Benefit Summary

**Assumption**

1. Employee’s average salary per month = 37,465.- (Average salary of employee level 3-12 as of 1 August, 2002. Information from Human Resource Department)
2. 1 month’s working day = 22 days
3. Employee’s average salary per day = 37,465 / 22 = 1,703 Baht
4. 1 working day (8 hr). = 480 minutes
5. Employee’s average salary per minute = 1,703 / 480 = 3.55 Baht
### Table 3-8 Tangible Benefit Calculation

<table>
<thead>
<tr>
<th></th>
<th>Number of Transactions (X)</th>
<th>Existing (Minute) (Y)</th>
<th>New (Minute) (Z)</th>
<th>Per Month (X*(Y-Z) * 3.55)</th>
<th>Per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce time for verify information</td>
<td>90</td>
<td>5</td>
<td>0</td>
<td>1,597.5</td>
<td>19,170.0</td>
</tr>
<tr>
<td>and input data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduce time to make reports</td>
<td>4</td>
<td>120</td>
<td>3</td>
<td>1,661.4</td>
<td>19,936.8</td>
</tr>
<tr>
<td>Eliminate paper forms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7,000.0</td>
</tr>
<tr>
<td>Reduce cost for couriers</td>
<td>90</td>
<td>10</td>
<td>0</td>
<td>3,195.0</td>
<td>38,340.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>84,446.8</td>
</tr>
</tbody>
</table>

3.10.2 Intangible Benefits

- Employees gain more satisfaction with easy way to use and tracking
- Use car reservation information for analysis and management
- Reduce human error for input data
- Employees change culture of daily work to self service
- Car administrators can manage car and drivers efficiently and effectively
3.10.3 Evaluation benefit to percentage

<table>
<thead>
<tr>
<th></th>
<th>Number of Transactions (X)</th>
<th>Existing (Minute) (Y)</th>
<th>New (Minute) (Z)</th>
<th>% time reduce (z-y)/y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce time for verify information</td>
<td>90</td>
<td>5</td>
<td>0</td>
<td>-100%</td>
</tr>
<tr>
<td>and input data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduce time to make reports</td>
<td>4</td>
<td>120</td>
<td>3</td>
<td>-39%</td>
</tr>
<tr>
<td>Eliminate paper forms</td>
<td></td>
<td></td>
<td></td>
<td>-100%</td>
</tr>
<tr>
<td>Reduce cost for couriers</td>
<td>90</td>
<td>10</td>
<td>0</td>
<td>-100%</td>
</tr>
</tbody>
</table>

Table 3-9 Evaluation benefit to percentage

The new system consumes less time than existing system because the system will automatically send the request to related persons by itself. Table 3-9 show a percentage of time that is reduced by the new system. The result shows efficiency of the new system, which is better than the old style.
CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

Regarding ICT strategies stated by Executive Vice President, Information & Communication Technology Services Center since 1999, the company is a full computerized stage. Every system will continuously change from paper-based to electronic-based core business system. The support system is developed by ESS concept that employees must make transactions, take ownership and responsibility by themselves.

4.1 Summary

Car Reservation System objective is to develop the system so that employees can login via Intranet of company by using web application for support anytime & anyplace work and employees can make transaction via Internet using company networking. The system is supporting daily work of employees since the new system will reduce time, increase productivity of workers and moreover provide employee satisfaction. Methodology selected for this project starts by studying problems, studying for problem solving, defining objective, and scope of work for this project and gathering user requirement for system analysis and design and then developing car reservation system which provides functions and output design including output screen. The finally system is analyzing and evaluating on how the new system is better that the existing one.

The problem statement defined by the existing system is that using paper-based that limitations of time, restrict process, inconvenience to checking status via phone. It is hard for the car administrator to collect information for report.

The objective and scope of work is good for project planning. Next, the system analysis uses CASE tools for analyzing conceptual design with logical models such as
context diagram, data flow diagram level – 0 , data flow diagram level – 1, and Entity Relationship Diagram for analyzing the new car reservation system.

The development starts by creating the prototype for the user and teams acceptance which include the input/output design.

The result of this analysis shows that the new system can reduce time, reduce process, and eliminate paper forms and the employees gain more satisfaction. This system has Return On Investment (ROI) 1.45 %, the ratio that indicates system consideration investment. Break even point of the system is 1.22 years.

4.2 Recommendation

Further studies recommended are listed as follows:

4.2.1 Prepare questionnaires and interview employees that are affected by ESS system. Set target groups such as top management, middle management, lower management, central employees, and countryside employee for feedback of ESS concept and employees satisfaction for improving the system. Furthermore, the new systems will be developed by using the result of employee’s satisfaction to ESS system questionnaire for development.

4.2.2 Interview employees to see their satisfaction to Car Reservation System. The objective is improvement of systems to gain more employees, approvers, and car administrator satisfaction.

4.2.3 User Help functions that are added to Car Reservation System for users to learn and solve problems by themselves without calling to helpdesk, which is better and increases productivity upper level.
Bibliography and references


2. The Case Company’s annual report 2001