The Reporting System of a Car Inspection Center

by

Mr. Suvinit Suwannasingh

A Final Report of the Three-Credit Course
CE 6998 Project

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Computer and Engineering Management
Assumption University

November 2003
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The Graduate School of Assumption University has approved this final report of the three-credit course, CE 6998 PROJECT, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer and Engineering Management.

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ABSTRACT

This project is a reporting system for an existing company, Suvic Car Pro Co.Ltd. Every month the employees spend a lot of overtime to generate the monthly report to the Department of Land Transport. Sometimes the employees can not finish the report before the dead line.

Reporting system is designed to be a web application program with the database for a computer based system. The application program will generate the report from the database to the Department of Land transport instead of the employee. This project will reduce operation costs of the company and time consumption of the employees.
ACKNOWLEDGEMENTS

I would like to thank several people who encouraged me in this project. If I do not have their motivations, this project might not be possible to finish.

First, I would like to thank my family. They always encourages me in education, this project cannot be finished without them.

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1. INTRODUCTION

1.1 Background of the Project

Car inspection is the rule and regulation of the Department of Land Transport of Thailand. The customers, who used car, must bring the cars to inspect before they go to continue registration at the Department of Land Transport. Suvic Car Pro is one of the authorized inspection centers of the Department of Land Transport.

Car inspection center inspects used cars every day. At the end of each month, car inspection center has to report about the information of the cars to the Department of Land Transport. The information of the cars is about the number of the cars that have been inspected in that month.

In the past, Suvic Car Pro made the reports to the Department of Land Transport manually. Suvic Car Pro always has problems with reports because of human errors. So the company needs to develop the application program of the computer based system to implement the report.

Now, Suvic Car Pro sees the opportunity of information technology that can help the company to make reports. With the report system, the company will save costs time consuming, and human errors.

1.2 Objective of the Project

The major goal of this project is creating and developing application program of reporting system for an existing business. To accomplish this goal, the following objectives have been established:

(1) To reduce the operation costs and time consumption.
(2) To improve the performance and efficiency of the report.
(3) To reduce human error of the employee.
(4) To reduce duplicate tasks.
(5) To enhance company satisfaction.

1.3 Scope of the Project

(1) This project will create a web application program a back office for the existing company.

(2) The web application program will be designed only to process reporting to the Department of Land Transport.

(3) There is no issue on another process for this project.

(4) The accuracy of the report depends on the accuracy of data that employees put to the system.

1.4 Deliverables

The completion of Reporting System of Car Inspection Center will deliver in 2 formats.

(1) The project report.

(2) The prototype of the web application program.
II. LITERATURE REVIEW

2.1 What is Reporting of car inspection?

The car inspection center licensed company must send the monthly report to the Department of Land Transport as the following:

(a) Car inspection center must send monthly reports by using report forms of car inspection from Department of Land Transport or use the report form that Department of Land Transport issues.

(b) The company must stamp logo of licensed company in which the logo consists of the name of company, address, telephone number the number of licensed and the expired date of licenses.

(c) The licensed company or authorized check correction of the report before signing the signature and keep the copy in the car inspection company for at least 3 years.

(d) The company must send the monthly report of car inspection to the Department of Land Transport within 10th days of the next month. The car inspection center that is located sends the report to the Engineering and safety bureau, Department of Land Transport. Another inspection center that is located outside Bangkok must send the report to Provinced Land Transport office.

2.2 What is the system?

Definition of "System"

A system is a set of related elements arranged in an orderly form so as to show a logical plan of a complex whole.

Systems can be provided in several definitions:
(a) A regularly interacting or interdependent group of items forming a unified whole.

(b) An organized set of doctrines, ideas, or principles, usually intended to explain the arrangements or working of a systematic whole.

(c) An organized or established procedure.

(d) Harmonious arrangement or pattern: order.

(e) An organized society or social situation regarded as stultifying establishment.

(A) Common types of systems

There are many different types of systems, but indeed, virtually everything that we come into contact with during our day-to-day life is either a system or a component of a system (both).

It is useful to organize the many different kinds of systems into useful categories, because our ultimate focus is on computer systems, we will divide all systems into two categories: natural systems and man-made systems.

(B) Natural systems

There are a lot of systems that are not made by people: they exist in nature and, by and large, serve their own purpose. It is convenient to divide natural systems into two basic subcategories: physical systems and living systems.

Physical systems include such diverse examples as:

1. Stellar systems: galaxies, solar systems, and so on.
2. Geological systems: rivers, mountain ranges, and so on.

Physical systems are interesting to study because we sometimes want to modify them. We also develop a variety of man-made systems, including computer systems,
which must interact harmoniously with physical systems; so it is often important to be able to model those systems to ensure that we understand them as fully as possible.

Living systems encompass all the myriad animals and plants around us, as well as our own human race. The properties and characteristics of familiar living systems can be used to help illustrate and better understand man-made systems.

Keep in mind that many man-made systems (and automated systems) interact with living systems. In some cases, automated systems are being designed to replace living systems. And in other case, researchers are considering living systems as components of automated systems.

(C) Man-made systems

Man-made systems include such things as:

1. Social systems: organizations of laws, doctrines, customs, and so on.
2. An organized, disciplined collection of ideas.
3. Transportation systems: networks of highways, canals, airlines and so on.
4. Communication systems: telephone, telex, and so on.
5. Manufacturing systems: factories, assembly lines, and so on.
6. Financial systems: accounting, inventory, general ledger and so on.

Most of these systems include computers today. As a systems analyst, you will naturally assume that every system that you come in contact with should be computerized. And the customer or user, with whom you interact will generally assume that you have such a bias. A systems analyst will analyze, or study, the system to determine its essence: and understand the system's required behavior, independent of the technology used to implement the system. In most case, we will be in a position to determine whether it makes sense to use a computer to carry out the functions of the system only after modeling its essential behavior.
Some information processing systems may not be automated because of these common reasons: Cost; Convenience; Security; Maintainability; Politics.

(D) Automated systems

Automated systems are the man-made systems that interact with or are controlled by one or more computers. We can distinguish many different kinds of automated systems, but they all tend to have common components:

(1) Computer hardware (CPUs, disks, terminals, and so on).

(2) Computer software: system programs such as operating systems, database systems, and so on.

(3) People: those who operate the system, those who provide its inputs and consume its outputs, and those who provide manual processing activities in a system.

(4) Data: the information that the system remembers over a period of time.

(5) Procedures: formal policies and instructions for operating the system.

One way of categorizing automated systems is by application. However, this turns out not to be terribly useful, for the techniques that we will discuss for analyzing, modeling, designing, and implementing automated systems are generally the same regardless of the application. A more useful categorization of automated systems is as follows:

(1) Batch system: A batch system is one in which, the information is usually retrieved on a sequential basis, which means that the computer system reads through all the records in its database, processing and updating those records for which there is some activity.
(2) On-line systems: An on-line system is one which accepts input directly from the area where it is created. It is also a system in which the outputs, or results of computation, are returned directly to where they are required.

(3) Real-time systems: A real-time system may be defined as one which controls an environment by receiving data, processing them, and returning the results sufficiently quickly to affect the environment at that time.

(4) Decision-support systems: These computer systems do not make decisions on their own, but instead help managers and other professional “knowledge workers” in an organization that makes intelligent, informed decisions about various aspects of the operation. Typically, the decision-support systems are passive in the sense that they do not operate on a regular basis: instead, they are used on an ad hoc basis, whenever needed.

(5) Knowledge-based systems: The goal of computer scientists working in the field of artificial intelligence is to produce programs that imitate human performance in a wide variety of “intelligent” tasks. For some expert systems, that goal is close to being attained. For others, although we do not yet know how to construct programs that perform well on their own, we can begin to build programs that modify from others.

(E) General systems principles

There are a few general principles that are of particular interest to people building automated information systems. They include the following:

(1) The more specialized a system is, the less able it is to adapt to different circumstances.
(2) The more general-purpose a system is, the less optimized it is for any particular situation. But the more the system is optimized for a particular situation, the less adaptable it will be to new circumstances.

(3) The larger a system is, the more of its resources that must be devoted to its everyday maintenance.

(4) Systems are always part of larger systems, and they can always be partitioned into smaller systems.

(5) Systems grow. This principle could not be true for all systems, but many of the systems with which we are familiar do grow, because we often fail to take it into account when we begin developing the system.

2.3 Participants to system development

In the role of a systems analyst, you will work on systems development projects with a variety of other people. The cast of characters will change from project to project, the personalities will differ dramatically, and the number of people that you interact with will range from as few as one to as many as several dozen. However, the roles are fairly consistent, and you will see them over and over again.

(A) Users

The user, the most important player in the systems game, is the person (or group of people) for whom the system is being built. He or she is the person who will be interviewed, often in great detail, to learn what features the new system must have to be successful. The user is the “owner” in the sense that he or she receives, or inherits—and thus owns—the system when it is finally built. And the user is the “customer” in at least two important respects:

(1) As in so many other professions, “the customer is always right”, regardless of how demanding, unpleasant, or irrational he or she may seem.
(2) The customer is ultimately the person paying for the system and usually has the right and/or the ability to refuse to pay if he or she is unhappy with the product received.

In most cases, it is fairly easy to identify the user: the user is typically the person who makes a formal request for a system. In a small organization, this is usually a very informal process. In a large organization, the initiation of a systems development project is usually much more formalized.

Whenever possible, the systems analyst should try to establish direct contact with the user. Even if other people are involved as intermediaries, it is important to have regular, face-to-face meeting with the person who will ultimately inherit the system.

If it is not possible to communicate directly with the user, then the documentation produced by the systems analyst becomes even more crucial.

The heterogeneity of Users

One mistake often made by computer programmers, and sometimes by systems analysts is to assume that all users are the same. “User” implies that the systems analyst will only have to interact with one person, even when it is obvious that more than one user is involved, there is a tendency to think of them as a formless, shapeless, homogeneous group of humans. Here are two ways of categorizing users:

(1) Job category or level of supervision.

(2) Level of experience with data processing.

Categorizing Users by Job category

On a typical systems analysis project, we can usually count on interacting with three main job categories:
(a) Operational users: are the clerical, operational, and administrative people most likely to have the most day-to-day contact with the new system. There are three things that should be kept in mind when working with operational-level users:

1. Operational users are very much concerned with the functions that the system will perform, but they are likely to be even more concerned with the human interface issues.

2. Operational users tend to have a “local” view of the system, they tend to be knowledgeable about the specific job that they do and the people with whom they have immediate contact. But they often are unfamiliar with the “big picture”, that is, they may have trouble describing how their activity fits into the overall organization or what the overall organization’s charter really is.

3. Operational users tend to think of systems in very physical terms, that is, in terms of the implementation technology currently used to implement the system or in terms of technology that they imagine could be used.

(b) Supervisory users: are employed in a supervisory capacity: they usually manage a group of operational users and are responsible for their performance. The significant things to remember about supervisory users are these:

1. Many of them are former operational users who have been promoted to their current position.

2. One reason that the supervisory user may be perceived as out of touch with the operational user is that he or she is often measured and motivated by performance against a budget.
(3) It is usually the supervisory user who thinks of a new system as a way of reducing the number of operational users or avoiding further increases in their numbers as the volume of work increases.

(4) The supervisory user will often act as a middleman between the systems analyst and the operational user.

(5) The supervisory user often thinks in the same physical terms as the operational user, and this perspective is often just as local as that of the operational user.

(6) Finally, the supervisory user will be contacted day-to-day. He or she is the one who will typically define the requirements and detailed business policy that the system must implement. He or she may be a passive member of the team, a full-time member of the team, or even the project manager.

(c) Executive-level users: are generally not directly involved in a systems development project, unless the project is so large and so important that it has a major impact on the organization.

To summarize, there are three different types, or levels, of users. Keep in mind that they have different perspectives, different interests and priorities, and different backgrounds. These three types of users can be characterized as shown below:

(1) Operational: Usually has local view. Carries out the function of the system.
   Has a physical view of the system.

(2) Supervisory user: May or may not have local view. Generally familiar with operation. Driven by budget considerations. Often acts as a middleman between users and higher levels of management.

(3) Executive user: Has a global view. Provides initiative for the project. No direct operating experience. Has a strategic concern.
Categorizing Users by Level of Experience

Different users will have different levels of experience. Today, we can distinguish between rank amateurs, cocky novices, and a small (but rapidly growing) number of true computer experts.

(1) The amateur is the one who has never seen a computer and who exclaims loudly and frequently that he or she doesn’t understand all this computer stuff. The real problem with the amateur user is somewhat more subtle: he or she may find it difficult to understand the “language” that the systems analyst uses to describe the features, functions and characteristics of the system to be built, even though that language avoids obvious computer-related terminology.

(2) The second type of user is the “cocky novice”, the person who has been involved in one or two systems development projects, or the user who has a personal computer and who has written one or two basic programs. This user often claims to know exactly what he or she wants the system to do and is prone to point out all the mistakes that the systems analyst made on the last project.

Of course, there are some users who really understand systems analysis, as well as the underlying technology of computers. It is a pleasure working with these people. The only problem may be that the user and the systems analyst derive so much pleasure talking about the tools and techniques of systems analysis that they forget that their true objective is to build a functioning system.

(B) Management

Management is a rather loose term. The systems analyst is likely to come into contact with several different kinds of managers:
(1) User managers: managers in charge of several people in the operational area
where the new system will be used. These are usually middle-level
managers who want systems that will produce a variety of internal reports
and short-term trend analyses.

(2) Executive development project (EDP)/MIS managers: the person in charge
of the systems development project itself, and the higher-level managers
who are concerned with the overall management and allocation of resources
of all the technical staff in the systems development organization.

(3) General management: top-level managers who are not directly involved in
the EDP organization or in the user organization. This might include the
president and/or chairman of the organization.

(4) The primary interaction between the systems analyst and all these managers
has to do with the resources that will be assigned to the project. It is the
systems analyst’s job to identify and document the user’s requirements and
the constraints within which the system must be built.

(C) Auditors

Depending on the size of the project and the nature of the organization you work
in, you may or may not have auditors.

(D) Systems analysts

The system analyst is a key member of any system development project. In a
broader sense, the systems analyst plays several roles:

(1) Archaeologist and scribe: As a systems analyst, one of the main jobs is to
uncover detail and to document business policy that may exist only as
“tribal folklore”, passed down from generation to generation of users.
(2) Innovator: The systems analyst must separate the symptoms of the user's problem from the true causes. With his or her knowledge of computer technology, the analyst must help the user explore useful, new applications of computers.

(3) Mediator: The systems analyst who often finds himself in the middle of users, managers, programmers, auditors, and various other players, all of whom frequently disagree with one another.

(4) Project leader: Because the systems analyst is usually more experienced than the programmers on the project, and since he is assigned to the project before the programmers begin working, there is a natural tendency to assign project management responsibilities to the analyst.

(E) Systems designers

The systems designer is the person (or group of people) who will receive the output of the systems analysis work. His or her job is to transform a technology-free statement of user requirements into a high-level architectural design that will provide the framework within which the programmer can work. In many cases, the systems analyst and the systems designer are the same person, or member of the same unified group of people. It is important for the systems analyst and systems designer to stay in close touch throughout the project.

(F) Programmers

Particularly on large systems development projects, the systems designers are likely to be a "buffer" between the systems analysts and the programmers. The systems analysts deliver their product to the system designers, and the system designers deliver their product to the programmer. There is another reason why the systems analyst and the programmer may have little or no contact with each other: work is often performed
in a strictly serial sequence in many systems development projects. Thus, the work of systems analysis takes place first and is completely finished before the work of programming begins.

(G) Operations personnel

The operational personnel officers who are responsible for the computer center, telecommunications network, security of the computer hardware and data, as well as the actual running of computer programs, mounting of disk packs, and handling of output from computer printers. All this happens, after a new system has not only been analyzed and designed, but has also been programmed and tested.

2.4 System development Life-cycle

The six phases in the system development life cycle can be identified by different names. Also, there are no definite rules regarding what must be included in each of the six phases.

(A) Initial investigation

This phase introduces the objectives of the initial investigation, the steps required to initiate an investigation; the tasks involved in the initial investigation, and the data gathering and interviewing techniques. It also includes information and exhibits that should be in the initial investigation report, with regard to "How the standards manual might be used?" and "why to do this after reading this section."

(B) Feasibility Study

This phase determines the objectives of the feasibility study and who this task belongs to -- analysts or the project team? It lists out the steps required to complete a feasibility study, identifies the scope of the current system, problems and unexploited opportunities in the current system, which may be either manual or automated. It then discusses the major objectives for the new system, and the various methods to gather
data and determine how to use the methods. It also helps to estimate the costs of each possible solution, and develops estimates of the benefits and shortcomings of each solution. It presents users and the management views on the above issues and their decision of whether to commit to the analysis part of the project. This phase may include some related subphases:

1. **Current physical model**: The description of the system as it is now, including the mechanisms used to accomplish tasks (e.g., people, devices).

2. **Current logical model**: The system description in terms of functions, processes, and data with the mechanisms removed.

3. **New Logical Model**: The Current Logical Model with new features added.

4. **New Physical Model**: The Current Logical Model with the various processes allocated to automation, manual procedures, and other mechanisms.

**C) General Design**

Show the users the view of the application. In this phase, as well as the previous two, users must be directly involved. In this phase, the analysts’ imagination, creativity... and initiative are used to their fullest. It also issues the System Flowcharts to develop. In addition, broad specifications that describe how the data is to be processed by the computer will be developed.

**D) Detailed Design**

The Analysts have to transform from general design specifications to detailed requirements that can be used in implementing the many tasks that make up the system. The final report should include the Procedural Flowchart, record and report layout, and a realistic plan for implementing the design. No major changes should be made until the design is implemented and the system is operational, Then the programs for both transaction processing and batch jobs are executed. If there are the problems, the
professional data processing staff is responsible for determining the cause and implementing a solution.

(E) Implementation

Detailed logic plans must be developed for all programs before they can be written, tested, and documented. After each procedure and program is tested, the system is tested. The conversion to the new system is made according to a plan developed in the detailed design phase. Many companies encourage their customers documenting their own systems.

(F) System Audit

When the implementation report is submitted, an evaluation should be made to determine whether the system meets the objectives stated in the general design report. In this phase, users may be able to suggest the easy-to-implement improvements. As in the six phase development life cycle, the project can be dropped at any point prior to implementation. A project may be dropped if the benefits derived from the proposed system do not justify commitment of the needed resources. Or if the costs is higher, than expected.

2.5 What is system design?

The system design is the real-world solution to the business problem domain, and represented by a class diagram. It is built by reiteratively adding the real-world constraints to the idealized object model. A high level system design is the first arbitrarily few passes before the full, or detailed, system design is refined.

System Design Document is a document that describes and defines the system (or high level) design of the product. There are five main portions of this document: architecture of the project, high level design of the product, including the class diagram and class specifications, validating the design, how the product will interface with other
systems and the Build Plan. This plan shows how the project will be incrementally implemented in phases. Each phase will deploy one or more use-cases that QA and Testing will verify. Software developers typically develop this document.

2.6 Data Flow Diagram

A data flow diagram (DFD) shows how data moves through a business, automated or manual system, or program.

A DFD can show a high-level or low-level view of a system.

On a data flow diagram, all the processes are at approximately the same level. There should be no more than about ten processes shown on a data flow diagram to avoid showing too much detail on a single page.

Data Flow Diagram Objects

There are different sets of symbols available for data flow diagrams, depending on accepted conventions. The following shows Gane & Sarson's methodology.

Process

A process is a unit of work that operates on the data. The process may be automated or manual, on-line, batch, or real-time. The symbol for a process is a rounded rectangle.
Data flow

A data flow is a named flow of data through a system of processes. A data flow is shown as a directed line on the diagram.

Data store

A data store is a logical repository of data. It may be an automated file, a paper file, etc. A data store is shown as an open-ended rectangle.

External agent

An external agent is a source or destination of data. The external agent occurs outside of the system of processes. An external agent is depicted by an overlapping rectangle.
III. BUSINESS CONCEPT

3.1 Company background

Suvic Car Pro Co.Ltd. has been established for 15 years, with the introduction of the latest advanced equipment from Germany which was ahead of any competitors in the market. The company is located near the residential area, which is located at Rama IX road Soi 22 Huaykwang, Bangkok 10240. The location is in the heavy traffic area and easily seen by Rama IX residents.

The company aims to target on general car owners, firms, other automobile service providers and government agencies. The company provides the services of wheel balance, wheel alignment, under carriage, and all engine repairs.

In 1996, Suvic Car Pro Co.Ltd. was the authorized inspection center of the Department of Land Transport of Thailand to inspect used cars in Bangkok and the suburban areas. There are many inspection centers all over Thailand and there are 70 inspection centers in Bangkok, but there are only 30 inspection centers which can inspect both cars and motorcycles. Suvic Car Pro is one of them.

Since the number of cars that has to inspect is increasing every year but the number of the inspection center is fixed or decreased each year, by the rule and regulation of the Department of Land Transportation, many inspection centers were closed because of the standardized of performance and the corruption. It causes that each inspection can gain more customers in each year.
3.2 How to generate revenue?

The main revenue of Suvic Car Pro Co.Ltd. comes from two ways.

(1) Car inspection package. The package is about 160 baht/package. There are about 1000 customers who come to use the service in each month.

(2) Car repairing. Suvic Car Pro has many services, such as wheel alignment, wheel balancing, changing tyre and oil, and engine repairing. Some of the customers who use these car repairing services come from the customers who took the car inspection package and they want to repair their cars.

Suvic Car Pro website is established as a free service for the customers. It might not get the revenue directly. But it might motivate the customer to come to use the service of the company. Suvic Car Pro might get the impression from the customers as the benefit of the company.
IV THE EXISTING SITUATION

4.1 Current Situation Analysis

(a) Rule and regulation of the Department of Land Transport

Car inspection center must send monthly reports by using a report form of car inspection from Department of Land Transport with in 10th days of each month. The Department of Land Transport wants to know the number of cars that had been inspected monthly on each inspection center. If the inspection centers send reports to the department of land transport late many times, the inspection center will be closed by the rules and regulations. If any inspection center is closed, there is no chance for them to reopen the company for this service again.

(b) Situation of Suvic Car Pro

The image of Suvic Car Pro is not quite good in the Department of Land Transport. Suvic Car Pro always sends reports to the Department of Land Transport late because there is a lot of paperwork of daily reports that the employees have to collect. If Suvic Car Pro has been such notice from the Department of Land Transport in writing, the company has lot of chances to be closed by the Department of Land Transport.

The employees spend lot of time to make the report. When the employees gather the information and make the reports, there are a lot of mistakes on the report such as the total number of the cars. Sometimes the employees have to rewrite the report because the Department of Land Transport can not read the hand writing and they send the report back to be corrected. If Suvic Car Pro could send the final report to the Department of Land Transport before the 10th day, it is not impossible to do that. The employees have to recheck the whole paperwork for the whole month again and they will send the report late.
4.1 Current System Analysis

(a) Data entry to the daily report

The employees have to record each car that has been inspected at the inspection center. The record will be on paper that is such proscribed the department of Land Transport. The data is about the parts and sections of the car that has been inspected. The employees will enter the data manually on paper. The hand-writing of each employee is not the same and it is difficult for the supervisor to make the decision for each car. Sometimes the employees edit the data on the report for which they have no right to do. But by doing it manually, the employees can do that.

(b) Transforming data from daily report to month report

There is a monthly report form from the Department of Land Transport in which the employees have to enter the data. When the time comes, the employees will write the monthly report by looking through total number of daily reports. The data might not be corrected because the employees do it manually. The employees have to calculate the number of cars that had been inspected each month. They have to count the number of cars which is registered at Bangkok or another province. The employees also have to categorize the type of the car. All these are done manually.

(c) Summary report with detail

Many times, the employees don’t care about the details of the information. They might make up the data. It will be easy for them to do the summary report. Though the department of Land Transport does not know the exact number of the cars, they can examine and investigate the number.

(d) Writing report on the form

There is no computerized system for the reports. The employees will entry to the report manually. If they write something wrong, they can not use the eraser to erase the
hand-writing. The employees have to write the whole new report again because the reports must be clear. No one can erase or edit the content of the reports.

(e) Car Inspection record

There is no record for the cars that use the services at the inspection center. If the customers want to know how long they had the inspection, the employees will ask for the receipt from the company. If the customers have no receipt, the employees cannot do anything to find the result for the customers.

4.2 Existing System Problems

(a) Operation cost and time consuming

Suvic Car Pro has to pay extra for the overtime cost. The employees always work overtime to make the monthly report. Normally they will spend at least 7 days to finish the monthly report. If they can finish early and send the report to the Department of Land Transport without the rejection, the process is fine. In fact, many times the report is rejected and the employees have to do the whole process again. After finishing, the employees send the report to the Department of Transport late.

(b) Paper work

The employees have to record each car that has been inspected at the inspection center. The record will be on paper form the department of Land Transport. If there are 1,000 cars that have been inspected each month, the paper work of the car inspection will be at least 1,000 pieces. The inspection center has to keep these papers at least more than 3 years before the company can destroy them.

(c) No history record of car inspection

There is no record for the cars that use the services at the inspection center. If the customers want to know how long they had the inspection, the employees will ask for
the receipt from the company. If the customers have no receipt, the employees can not
do anything to find the result for the customers.

(d) human error of employee

With manual work the employees always have problems about the calculation. It
might be the accidents or intentions of the employees. But it causes disaster to the
company. Though the supervisor will check the correctness of the report, it takes time to
redo the whole report again.

4.3 User Requirement

Computerize system for reporting

Currently all data management is done manually. It is time consuming in order to
deal with paper work such as daily reports, lost, unreadable hand writing and etc. These
affect on the data accuracy.

The main function, which needs a computerized system, is reporting system. For
example, instead of writing the data on the report, the employees want to type the data
into the computerized system. The employees want the computer to do the calculation
and do the summary of the report. Finally, the employees want the computer print out
the result on the report form.
V. FINANCIAL STATEMENT

5.1 Project Benefit

This project is designed to reduced cost and time consumption. The benefits of the project might not come in the revenue of the company, because the benefit of this project is reducing cost of the operation. The company will save money for wages over time and for the employees who do not need to work until night. So the employees can have time to rest after work. The others benefits are the cost of paper work, this project will do the report instead of the employees, so the employees just enter the data and the program will calculate the rest and generate the report. The employees do not rewrite the paper again.

The performance of the report will be increased by the program. The human error will be wiped out from the report. The company will send the reports to the Department of Land Transport on time. The image of the company will be better.

<table>
<thead>
<tr>
<th>Benefit Description</th>
<th>Quantity</th>
<th>Unit Type</th>
<th>Unit Price</th>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
<th>5th Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wage for Overtime</td>
<td>1</td>
<td>Month/Year</td>
<td>2,000</td>
<td>24,000</td>
<td>27,580</td>
<td>30,485</td>
<td>32,944</td>
<td>35,138</td>
</tr>
<tr>
<td>Paper Work</td>
<td>20</td>
<td>Month/Year</td>
<td>55.00</td>
<td>1,100</td>
<td>1,210</td>
<td>1,331</td>
<td>1,464</td>
<td>1,611</td>
</tr>
<tr>
<td>Yearly Net Benefit</td>
<td></td>
<td></td>
<td></td>
<td>25,100</td>
<td>28,790</td>
<td>31,816</td>
<td>34,408</td>
<td>36,749</td>
</tr>
<tr>
<td>Overall Net Benefit</td>
<td></td>
<td></td>
<td></td>
<td>25,100</td>
<td>53,890</td>
<td>85,706</td>
<td>120,114</td>
<td>156,863</td>
</tr>
</tbody>
</table>

Table 5.1 Project Benefit Table
5.2 Project Cost

The company does not need to invest on the hardware because the company already have a computer (PC) Set, such as desktop computer, printer, scanner. The cost for Suvic Car Pro is to invest on the software such as application program for the project. The company hires the programmers to write the application program for this project. The training for the employees is important too. The turn over of the employees is not so high, the company can have the training from time to time.

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Quantity</th>
<th>Unit Type</th>
<th>Unit Price</th>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
<th>5th Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Research and Development Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Preliminary Investigation</td>
<td>1</td>
<td>Time</td>
<td>5,000</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Investment Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Software Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Application Program</td>
<td>1</td>
<td>Package</td>
<td>25,000</td>
<td>25,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Office Tools</td>
<td>1</td>
<td>Unit</td>
<td>5,000</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Operating Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Office Supply</td>
<td>1</td>
<td>Year</td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
</tr>
<tr>
<td>3.2 Utilities</td>
<td>1</td>
<td>month</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td>3.3 Repair and maintenance</td>
<td>1</td>
<td>Year</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Yearly Net Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Net Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.2 Project Cost Table
5.3 Break Even Analysis

Suvic Car pro will not get a break even from this project in a short period because the company does not get benefits in the form of the income. The company does not invest much on the hardware system. So the company will get a break even in a few years from the implementation of the project.

This project helps the company about the image of the company. The company will not be closed by the Department of Land Transport because of sending reports late. This is an intangible benefit that can not come in the type of the revenue.

<table>
<thead>
<tr>
<th>Analysis</th>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
<th>5th Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Benefit</td>
<td>24,000.00</td>
<td>27,580.00</td>
<td>30,485.00</td>
<td>32,944.00</td>
<td>35,138.40</td>
</tr>
<tr>
<td>Discount Rate (10%)</td>
<td>0.9091</td>
<td>0.8264</td>
<td>0.7513</td>
<td>0.6830</td>
<td>0.6209</td>
</tr>
<tr>
<td>Present Value of Net Benefit</td>
<td>21,184.40</td>
<td>22,792.11</td>
<td>22,903.38</td>
<td>22,500.75</td>
<td>21,817.43</td>
</tr>
<tr>
<td>NPV of all Benefit</td>
<td>21,184.40</td>
<td>44,610.51</td>
<td>67,513.89</td>
<td>90,014.64</td>
<td>111,832.08</td>
</tr>
<tr>
<td>Net Cost</td>
<td>42,500.00</td>
<td>7,500.00</td>
<td>7,500.00</td>
<td>7,500.00</td>
<td>7,500.00</td>
</tr>
<tr>
<td>Discount Rate (10%)</td>
<td>0.9091</td>
<td>0.8264</td>
<td>0.7513</td>
<td>0.6830</td>
<td>0.6209</td>
</tr>
<tr>
<td>Present Value of Cost</td>
<td>38,636.75</td>
<td>6,198.00</td>
<td>5,634.75</td>
<td>5,122.50</td>
<td>4,656.75</td>
</tr>
<tr>
<td>NPV of all Cost</td>
<td>38,636.75</td>
<td>44,834.75</td>
<td>50,469.50</td>
<td>55,592.00</td>
<td>60,248.75</td>
</tr>
</tbody>
</table>

Yearly NPV Cash Flow | 17,044.39 | 34,422.64 | 51,583.33 |
Overall NPV Cash Flow | 1.80 | 34,424.45 | 86,007.78 |

Overall Return on Investment | 1.43 |
Use first year of positive cash flow to calculate break-even fraction | 1.000 |
Breakeven Point is 2.0 year

Table 5.3 Break Even Analysis Table
5.4 Break-Even Analysis Graph

![Break-Even Analysis Graph](image-url)
VI. SYSTEM DESIGN AND DEVELOPMENT

6.1 Definition of System’s Goal

(1) To design and develop (Reporting System) for an existing business.

(2) To generate the monthly report for the car inspection center.

(3) To prevent time consumption from manual report.

(4) To cut the operation costs.

(5) To provide the information about records of the car inspection.

(6) To prevent the human errors.

(7) To protect the corruption from the employees.

6.2 Question and Answer

(A) What does the reporting system do?

The reporting system will generate the monthly report of the car inspection center for the company. Instead of manual report, the report system will calculate the number of cars and other information and print out the reports.

(B) What do the employees do for the system?

When the employees inspect the cars, the employees have to enter the data that is inspected into the system. The reports system will store the data and calculate the information and print out the report.

(C) What happens with the human errors?

The human errors such as wrong calculation or the unreadable hand-writing will be wiped out from the reports, because the reporting system will do the calculation instead of the employees. Printing out from the printer can make the readers easy to understand the content of the reports.

6.3 The proposed system

(A) System’s design and development
The reporting system is designed to do the task instead of the employees. The prototype of the web application program will be developed by the programmers.

(a) Identify problem

The company identifies the problems of the current system by the investigation and observation. The employees have less efficient performance to develop the skills. Most monthly reports have lots of errors. The employees finish the report late. Therefore the company needs a system that helps the employees.

(b) Develop prototype

The web application program which designed the interface similar to the existing car inspection card. When the employees enter the data of car information, they will feel familiar with the web application program.

The company wants to develop a web application program because it can run from anywhere with the internet browser. Though the reporting system is not connected to the internet, users can develop web application program to serve in the future.

The web application program is divided into 2 parts. The first one is for the car information. When the employees received the car registration book from the customers at the first station, the employees will enter the car information into the web application program. The second one is for the car inspection result. The employees who inspect the car will enter the result of the inspection into the system.

The information from 2 parts will combine to generate the inspection card. The employees bring the inspection card to the supervisor to sign. The criteria of the inspection are set, so the system will decide the result of the inspection for the supervisor.

(c) Implement and use prototype
After developing the prototype for the reporting system, the users will implement and use the prototype together with the existing system to compare the result. While the employees still work on the same tasks, the developers will enter the data and information into the system with the same result which the employees write on paper.

(d) Convert to operational system

If the prototype of web application program is insufficient for the company, the company will decide to convert back to the existing system. Insufficient in this case means many things. If the employees spend a lot of time on the new system more than the existing system, the company could not accept this prototype, because the employees can not spend much time to enter the information. If the system slows down the speed of work, it is not acceptable. If the system can not generate the monthly report in the form of the Department of Land Transport, it is not acceptable.

(e) Revise and enhance prototype

The users of the web application program will identify the problems of the new system. The programmer will revise the program like the problem that users require. If the prototype is acceptable, this web application program will be installed into the computer system of the company. If there is further new requirement, the programmers will develop the web application program for next version.

(B) System cost

The cost of system will be the cost of the application program. The company has to hire the programmers to write the application program for the reporting system. There is no additional hardware for the reporting system because the company will use the existing computer set for the new reporting system. The cost of training the employees is also included. The rate of turn over of the employees of the company is not too high.
The company has to train the employees from time to time. The new employees has to be trained how to use the reporting system.

(C) System integrates into existing systems

The new reporting system will work to generate the report instead of manual reports from the employees.

The existing system: The customers bring the car to the inspection center. The employees will receive the car registration book from the customers and write down the car information on the car inspection card. Another employee will bring the card to the car for the inspection. The employees will inspect the car and write the result of the inspection on the card. After finishing the inspection, the employees will make the decision to pass the inspection or not. If the car passes the inspection, the company will issue the certificate for the car. At the end of the day, the employees will accumulate the inspection cards and pile them up. The employees will count the number of the cars which passes the inspection and the cars which do not pass the inspection. Also the employees will categorize the type of the car. At the end of the month, the employees will gather information from the pile of inspection card and write the monthly report to the Department of Land Transport.

The new system: The customers bring the car to the inspection center. The employees will receive the car registration book from the customers and enter the car information into the system. Instead of writing down the result of the car inspection on the inspection card, the car inspector will enter the result into the system directly. The new system will map the information and from both parts put it together to generate the inspection card. The system also helps the supervisor to decide which car passed the inspection. At the end of the day, the system will generate the daily report from the
information in the system and at the end of the month, the reporting system will generate the monthly report for the Department of Land Transport.

(D) People in the process

The employees who have to be involved in the process of system are the inspection section of the company. There are a few employees who can access the reporting system. The first is the data entry employees, who enter the data of car information to the reporting system. The second is the employee who enters the result of car inspection into the reporting system. The third is the supervisor who can set the criteria of reporting system to generate the report. The data entry has to be involved every time when the customers bring the car to the company but the supervisor can generate the report from the reporting system once a month.

(E) Training

The employees need training for the new reporting system. Normally the employees are familiar with the manual method to generate the report. The employees never use the computer before. Training of using computer is concerned for the first priority. The second training is how to use the program. The employees have to enter the data to the reporting system instead of the writing on the report card. If there is no training on the data entry activities, the employees could not serve the customers. When the customers brings cars to the inspection center, they expect that they can leave the center within 20 minutes. Training of the reporting system will help the employees enter the data to the system fast enough.

(F) Forming team

The existing team of car inspection has to work together to inspect the car. But the new system can separate the team of the car inspection into two teams.
The first one is a reception for the customers. This team will contact the customers. After receiving the car registration book, the team will issue the receipt to the customer while the second team brings the car to inspect. This can save time for the customer because the employees do not need to wait for the order.

The second team will inspect the car when the customers bring the car to the inspection center. The second team will inspect and enter the result of the inspection into the system.

(G) Organizational changes to take advantage of the system

Establish the procedure to inspect the car. Before using the new system, the employees will inspect the car by following the procedures of the company. The car will be inspected after the customer paid the fee, it can avoid misunderstanding between customers and employees. But with the new system, the employees can inspect car before the customer paid the fee. Though the car is inspected before the customers paid, the inspection card will not be generated. The information of inspection result can not map the car information. The customers have to pay for the fee, the inspection card will be generated for the supervisor to sign.

Establish the decision to pass the car inspection. The employees make the decision to pass the car inspection by their own decision. Sometimes they omit the rule and regulation of the Department of Land Transport. The new system will decide the decision to pass the car instead of the employees. The system will make the decision more accurately than the employees. The system will protect the corruption of the employees because the employees can not access the system to change the data as they could do in the paper cards.
6.4 Database Design

<table>
<thead>
<tr>
<th>Customer Member</th>
<th>Many</th>
<th>Car registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer identification</td>
<td></td>
<td>Vehicle ID</td>
</tr>
<tr>
<td>Customer Name</td>
<td></td>
<td>Customer number</td>
</tr>
<tr>
<td>Customer Address</td>
<td></td>
<td>The owner Name</td>
</tr>
<tr>
<td>Customer Mobile Phone</td>
<td></td>
<td>The owner identification number</td>
</tr>
<tr>
<td>Customer e-mail</td>
<td></td>
<td>The owner address</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The owner Telephone number</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The owner nationality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The driver name</td>
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**Figure 6.0** Entity Relationship
This following below are the table description for the above four tables.

(A) Customer

(a) Customer Name

(i) Name: Customer name

(ii) Meaning: First name and Last name of the customer who register to the system.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Must be unique.

(b) Customer Address

(i) Name: Customer Address

(ii) Meaning: Address of the customer who register to the system.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Non-unique.

(c) Customer Mobile Phone

(i) Name: Customer Mobile Phone

(ii) Meaning: Telephone number of mobile phone of the customer who register to the system.

(iii) Data type: Numeric

(iv) Format: n-nnn-nnn

(v) Uniqueness: Non-unique.

(d) Customer e-mail

(i) Name: Customer e-mail

(ii) Meaning: E-mail of the customer who register to the system.
(e) The customer identification number.

(i) Name: The customer identification number

(ii) Meaning: The identification number of the customer who registered on the system such as 3100601377064.

(iii) Data type: Numeric

(iv) Format: nnnnnnnnnnnnn

(v) Uniqueness: Must be unique

(B) Car information

(a) Date of Registration

(i) Name: Date of Registration

(ii) Meaning: The date when the owner registered the car at the Department of Land Transport.

(iii) Data type: Numeric

(iv) Format: dd/mm/yyyy

(v) Uniqueness: Non-unique.

(b) Province

(i) Name: Province

(ii) Meaning: The province of the car that the owner registered at the Department of Land Transport.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Non-unique.
(c) Type of Vehicle

(i) Name: Type of Vehicle

(ii) Meaning: Type of the car such as personal vehicle with at most 7 seats.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Non-unique.

(d) Remark

(i) Name: Remark

(ii) Meaning: Remark or the car.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Non-unique.

(e) Brand of Vehicle

(i) Name: Brand of vehicle

(ii) Meaning: Brand of the car such as Honda.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Non-unique.

(f) Model

(i) Name: Model

(ii) Meaning: Model of the car such as Accord.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Non-unique.
(g) **Year**

(i) Name: Year

(ii) Meaning: Year of the car such as 1994.

(iii) Data type: Numeric

(iv) Format: XXXX

(v) Uniqueness: Non-unique.

(h) **Color**

(i) Name: Color

(ii) Meaning: Color of the car such as Gold.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Non-unique.

(i) **Body serial Number**

(i) Name: Body serial Number

(ii) Meaning: Serial number at the body of vehicle.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Must be unique.

(j) **Position of Body serial number.**

(i) Name: Position of Body serial number.

(ii) Meaning: Position of Body serial number such as at the back of the vehicle.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Non-unique.
(k) Model of Engine

(i) Name: Model of Engine.

(ii) Meaning: Model of Engine of the car such as Honda.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Non-unique.

(l) Engine Serial number.

(i) Name: Engine Serial number

(ii) Meaning: Serial number of the engine which is installed in the car.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Must be unique.

(m) Position of Engine Serial number.

(i) Name: Position of Engine Serial number.

(ii) Meaning: Position of the Serial number on the engine in the car.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Must be unique.

(n) Fuel

(i) Name: Fuel

(ii) Meaning: Fuel type of the engine such as gasoline or diesel.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Must be unique.
(o) Cylinder

(i) Name: Cylinder

(ii) Meaning: The number of cylinder of the engine of the car.

(iii) Data type: Numeric

(iv) Format: General

(v) Uniqueness: Non-unique.

(p) Horse Power

(i) Name: Horse Power

(ii) Meaning: The horse power of the engine of the car such as 180 horse power.

(iii) Data type: Numeric

(iv) Format: XXX

(v) Uniqueness: Non-unique.

(q) Weight

(i) Name: Weight

(ii) Meaning: weight of the car such as 1,500 Kg.

(iii) Data type: Numeric

(iv) Format: XXXX Kg.

(v) Uniqueness: Non-unique.

(r) Seat

(i) Name: Seat

(ii) Meaning: The number of seat of the car such as 7 seats.

(iii) Data type: Numeric

(iv) Format: nn seats

(v) Uniqueness: Non-unique.
(C) Car registration

(a) Vehicle ID

(i) Name: Vehicle ID

(ii) Meaning: The ID of vehicle such as TT-3645.

(iii) Data type: Character

(iv) Format: XXX-nnnn

(v) Uniqueness: Must be unique.

(b) Customer number.

(i) Name: Customer number.

(ii) Meaning: The number of the customer who owns the vehicle.

(iii) Data type: Numeric

(iv) Format: General

(v) Uniqueness: Non-unique.

(e) The owner name

(i) Name: The owner name

(ii) Meaning: First name and Last name of the owner of the vehicle.

(iii) Data type: Character

(iv) Format: General

(v) Uniqueness: Non-unique.

(d) The owner identification number.

(i) Name: The owner identification number

(ii) Meaning: The identification number of the owner of the vehicle.

(iii) Data type: Numeric

(iv) Format: nnnnnnnnnnnnnn

(v) Uniqueness: Non-unique.
(i) The driver identification number

   (i) Name: The driver identification
   (ii) Meaning: The identification number of the driver of the vehicle such as 3100601377064.
   (iii) Data type: Numeric
   (iv) Format: nnnnnnnnnnnnn
   (v) Uniqueness: Non-unique.

(j) The driver address

   (i) Name: The driver address
   (ii) Meaning: The address of the driver of the vehicle.
   (iii) Data type: Character
   (iv) Format: General
   (v) Uniqueness: Non-unique.

(k) The driver Telephone number

   (i) Name: The driver telephone number
   (ii) Meaning: The telephone number of the driver number of the vehicle.
   (iii) Data type: Numeric
   (iv) Format: n-nnn-nnnn
   (v) Uniqueness: Non-unique.

(l) The driver Nationality

   (i) Name: The driver Nationality
   (ii) Meaning: Nationality of the driver of the vehicle such as Thai.
   (iii) Data type: Character
   (iv) Format: General
   (v) Uniqueness: Non-unique.
(D) Car inspection result

(a) Vehicle ID
   (i) Name: Vehicle ID
   (ii) Meaning: The ID of vehicle such as TT-3645.
   (iii) Data type: Character
   (iv) Format: XXX-nnnn
   (v) Uniqueness: Must be unique.

(b) Body serial Number
   (i) Name: Body serial Number
   (ii) Meaning: Serial number at the body of vehicle.
   (iii) Data type: Character
   (iv) Format: General
   (v) Uniqueness: Must be unique.

(c) Position of Body serial number.
   (i) Name: Position of Body serial number.
   (ii) Meaning: Position of Body serial number such as at the back of the vehicle.
   (iii) Data type: Character
   (iv) Format: General
   (v) Uniqueness: Non-unique.

(d) Model of Engine
   (i) Name: Model of Engine.
   (ii) Meaning: Model of Engine of the car such as Honda.
   (iii) Data type: Character
   (iv) Format: General
(v) Uniqueness: Non-unique.

(e) Engine Serial number.
   (i) Name: Engine Serial number
   (ii) Meaning: Serial number of the engine which is installed in the car.
   (iii) Data type: Character
   (iv) Format: General
   (v) Uniqueness: Must be unique.

(f) Position of Engine Serial number.
   (i) Name: Position of Engine Serial number.
   (ii) Meaning: Position of the Serial number on the engine in the car.
   (iii) Data type: Character
   (iv) Format: General
   (v) Uniqueness: Must be unique.

(g) Fuel
   (i) Name: Fuel
   (ii) Meaning: Fuel type of the engine such as gasoline or diesel.
   (iii) Data type: Character
   (iv) Format: General
   (v) Uniqueness: Must be unique.

(h) Cylinder
   (i) Name: Cylinder
   (ii) Meaning: The number of cylinder of the engine of the car.
   (iii) Data type: Numeric
Balancing, Controlling and Steering, Wheel and Tyre, Fuel tank, Color Body, Doors and floor, Seat Belt.

(ii) Meaning: The result of inspected car which is yes or no.

(iii) Data type: Numeric

(iv) Format: General

(v) Uniqueness: Non-unique.
6.5 Data flow Diagram

Context diagram of the reporting system.

(a) The customers bring the car to the company.
(b) The customers gives and order to the employee.
(c) The reporting system issue the receipt to the customers.
(d) The reporting system sends the car inspection order to the supervisor.
(e) The supervisor sends the car inspection result to the reporting system.
(f) The reporting system sends the car inspection card to the supervisor.
(g) The reporting system sends the daily report to the supervisor.
(h) The reporting system sends the monthly report to the department of land transport.

Figure 6.1 Context diagram of Reporting System
Context diagram of reporting system level 0

(a) The customer sends the customer order to the receive car inspection order process.

(b) The car inspection order process sends car inspection order to the supervisor.

(c) The car inspection order process sends the car information data to the create customer data process.

(d) The create customer data order process sends receipt back to the customer.

(e) The create customer process sends the car information data to the check car inspection result process.

(f) The supervisor sends the car inspection result to the check car inspection result process.

(g) The check car inspection result process sends the car inspection card to the supervisor.

(h) The check car inspection result process sends the correct car information on data card to update car information file process.

(i) The check car inspection result process sends the correct car inspection result on data card to update car inspection file process.

(j) The update car information file process formatted car information data to car information file.

(k) The update car inspection file process formatted car inspection data to the car inspection file.

(l) The car information file sends daily information data to the generate daily report process.

(m) The car inspection file sends daily car inspection data to the generate daily report process.
(n) The generate daily report process sends the daily report to the supervisor.

(o) The generate the daily report formatted the daily report data and send to generate monthly report process.

(p) The generate monthly report process sends the monthly report to the department of land transport.
Figure 6.2  Context diagram of Reporting System Level 0
Context diagram of reporting system level 1 (receipt car inspection order process)

(a) The receive customer order processes receive customer order.
(b) The receive customer processes sends the customer order to the receive car registration book process and generate car inspection order process.
(c) The receive car registration book processes sends the customer order to the enter car information data process.
(d) The enter car information process sends car information data to the create customer data process.
(e) The generate car information order process sends car information order to the supervisor.

Figure 6.3  Context diagram of Reporting System Level 1
Context diagram of reporting system level 1 (create customer data process)

(a) The receive car information process receive car information data from the enter car information data.

(b) The receive car information process sends the car information data to the display car information to write the receipt process.

(c) The display car information to write the receipt process sends the receipt to the customer and the car information data to the check car inspection result process.

Figure 6.4: Context diagram of Reporting System Level 1
Context diagram of reporting system level 1 (check car inspection result process)

(a) The receive data card process car information data from the create customer data process and the car inspection result from the supervisor.

(b) The receive data card process sends car information and car inspection result on data card to the compare car information with car inspection result process.

(c) The compare car information with car inspection result process sends the car inspection result and car information on data card to the identify problem of car process.

(d) The identify problem of car process sends no problem car data to the approved car process and sends problem car data to the reject car process.

(e) The approve car process sends the problem car data to the correct car information and car inspection result process.

(f) The reject car process sends the problem car data to the correct car information and car inspection result process.

(g) The correct car information and car inspection result process sends the car inspection card to the supervisor.

(h) The correct car information and car inspection result process sends the correct car information on data card to the update car information file process.

(i) The correct car information and car inspection result process sends the correct car inspection result on data card to the update car inspection file process.
Figure 6.5  Context diagram of Reporting System Level 1
Context diagram of Reporting System Level 1 (generate daily report process)

(a) The car information file sends the daily car information data to the access car information data and car inspection data process.

(b) The car inspection file sends the daily car inspection data to the access car information data and car inspection data process.

(c) The access car information data and car inspection data process sends the daily car inspection data and daily car information data to the aggregate car information and car inspection data process.

(d) The aggregate car information and car inspection data process sends the aggregate data to the prepare daily report process.

(e) The prepare daily report process sends formatted daily report data to the generate monthly report process and sends the daily report to the supervisor.
6.1 Access Car Information Data and Car Inspection Data

6.2 Aggregate Car Information and Car Inspection Data

6.3 Prepare Daily Report

Figure 6.6  Context diagram of Reporting System Level 1
Context diagram of Reporting System Level 2 (prepare daily report process)

(a) The formatted daily report process receives the aggregate data from the aggregate car information and car inspection data process.

(b) The formatted daily report process sends the formatted data to the print daily report process and sends the formatted daily report data to the generate monthly report process.

(c) The print daily report process sends the daily report to the supervisor.

Figure 6.7  Context diagram of Reporting System Level 2
Context diagram of Reporting System Level 1 (generate monthly report process)

(a) The calculate aggregate data process receives formatted daily report data from the generate daily report process.

(b) The calculate aggregate data process sends the final aggregate data to the format aggregate data process.

(c) The format aggregate data process sends formatted aggregate data to the prepare monthly report process.

(d) The prepare monthly report process sends monthly report to the department of land transport.

Figure 6.8  Context diagram of Reporting System Level 1
Context diagram of Reporting System Level 2 (prepare monthly report process)

(a) The identify reason of reject car process receives formatted aggregate data from format aggregate data process.

(b) The identify reason of reject car sends the summary of aggregated data to the finalize aggregated data process.

(c) The finalize aggregated data process sends the aggregated data to the print report process.

(d) The report process sends the monthly reports to the department of land transport.

Figure 6.9  Context diagram of Reporting System Level 2
VII. SYSTEM MANAGEMENT SUMMARY

7.1 System Management

Suvic Car Pro will store the data and information on the company server. The information is about car information and car inspection. There are two types of employees that can access the computer server. The first is the employee who has responsibility for data entering. The second is the supervisor that can maintain the system.

The supervisor will maintain the system at the end of the month through the beginning of the next month before the 10th days, so the error checking can be done before the date line of the report.

7.2 System securities control

Securities control is not the major issue for the reporting system because Suvic Car Pro decides that the information of the car inspection is regally open to anyone. But Suvic Car Pro concerns about the accuracy of data. If someone edits the data, the result of the report will be changed. Only the supervisor has the authority can access the system.

Suvic Car Pro also sets up the procedure, standard and regulations to control the employee. The system is designed to support all error handling so the system can reduce all errors.

The back-up system and UPS is reserved for the system. The system can print reports anytime even though power failure occur at that time. The system can use electric power from the UPS.

7.3 System Testing

There are 3 main strategies for testing systems

(1) Unit Testing
Each module will be tested separately, such as the module of printing. The print out must be formatted on the paper form. The module of calculating, the calculation of the number of car is correct or not.

(2) Integrating Testing

The testing will combine each module in a program to run together such as the module of printing and calculating. The printing out of the calculation is on the paper form.

(3) System Testing

The testing will combine every program in a system to run together, such as the new database and the reporting system, the system can look through the car inspection record and print it on the form, or the reporting system can print out the result of the previous month.
VIII. CONCLUSION AND RECOMMENDATION

8.1 Conclusion

After the implementation, the reporting system of Suvic Car Pro will improve in performance and the efficiency of the reports so that the company can send the report to the Department of Land Transport on time. The cost of operation will be reduced by the system.

The image of the company will increase from the past because the Department of Land Transport accepted the new reporting system. In the future, the Department of Land Transport may use this reporting system for the whole inspection center over Thailand as a standard application program.

The cost of operation will be reduced as follows:

1) Time consuming. The reporting system will generate the report to Department of Land Transport at the beginning of the month. The employees do not have to spend a lot of time to generate the report.

2) Wage of over time. The company does not need to pay for the over time anymore because the reporting system can do all the work for employees. The employees do not stay to work after working hours.

3) The amount of paper work. The employees will enter the data into the system in stead of writing on paper; the company does not need to keep the paper work anymore. All the data is stored in the computer system.

4) Human error. The reporting system does the work in stead of the employees so human error is reduced by the system. When human error is reduced, the employees do not need to regenerate the manual report again. So the company saves cost of paper and time consumption.
The company has a new database that can record the data and information of the customer and the car. The company can examine the work process by looking through the database system.

The benefit of this project will cover the cost of the project in the mid period because this project does not generate the revenue to the company. The main benefit of this project is to reduce cost.

8.2 Recommendation

This project is completely suitable for the reporting system. But there are some tasks that the employees have to do manually. If this project covers not only the reporting system but also generating receipt system, this project will reduce cost and time consumption for the company, because the employees still need to write the receipt for the customer manually.
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