VEHICLE PURCHASE DECISION SUPPORT SYSTEM (DSS)

By

Endang Harnani Mohd Tahir

Dissertation submitted in partial fulfillment of

the requirement for the

Bachelor of Technology (Hons)

(Business Information System)

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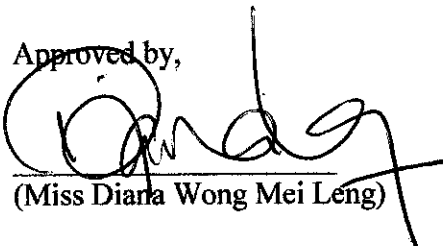Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

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A project dissertation submitted to the

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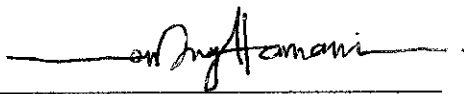
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(Miss Diana Wong Mei Leng)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

July 2009

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

ENDANG HARNANI MOHD TAHIR

ABSTRACT

Vehicle purchasing is one of the most important decision that made by people not almost every day because of the real time cost and the future value that the vehicle have. Some customers get carried away in choosing the vehicle of their dream. They suppose consider real cost and risk over the desire of having their dream car. Using the decision support system, vehicle purchasing might not be a problem as the system will provide a solution that can help the customer to matched their salary, the customer criteria with the vehicle that really suite the customer. The used of the system is expected to decrease the problem regarding the loan rejection by the bank, and increase the knowledge of vehicle among the automotive customer. Several version of the system will be develop where the system will take input from the user that are the criteria they needed for a vehicle and the same time the main function of the system that is the salary of the customer to do the matching with the price of the vehicle and then the system will produce a solution where the list of vehicle that suite the criteria that the customer given before.

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PROJECT BACKGROUND

1.1 Background Study

Knowledge is the process of translating information such as data and past experience into a meaningful set of relationship which are understood and applied by an individual. Knowledge management is the process of identifying, capturing, organizing and disseminating intellectual assets that are critical to the organization's long term performance. In knowledge management people use technology to process the knowledge, by transferring the tacit knowledge to explicit knowledge. To transfer the information effectively using the technologies, one of the element that used by knowledge management is decision support system. The information given will help people to make decision that needs more than simple information. Decision support system can help the decision making much easier as it is technology base. In this project, decision support system is predicted to be a system that can help in vehicle purchases/trading in the automotive industries. With this system the automotive industries move further in the technologies.

1.2 Problem Statement

When it's come to purchasing, people tend to make a good and even bad decision about the product they about to purchase. In purchasing the right vehicle, some customer take a long time to made the right decision in which car that they will purchase. Every customer that come to see the car dealer have their own dream car, but not every dream car suitable for them. Some customer bought car that doesn't suitable with the salary income that they have. This lead to unpaid monthly payment, vehicle are not being service because of the high maintenance and so much more. "Car owner are

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considering the real cost and risks in buying a new model, emphasizing needs over wants," (Jeff Barlett).

Most customers are attracted to the outside look of a car more than what really going on inside the car itself. Little knowledge about the car might leads to many problems this is because of poor information that given by the car salesman. This is because the salesman only given information that is good about the car.

The customer or even car owners are uncertain of the market price of the vehicle that they about to purchase or even to trade in for a new car. They are also uncertain about the market prediction that can help them to trade in their old car by getting the best deal in trading in and buying a new car.

1.3 Objectives

- Advisory system that help the customer to decide a suitable car by matching their salary or capability to the desired car but at the same time its suit with the customer requirement.

- The system provide an information hub for available new car for more reference and widest their choices of cars.

- This system will help the customer to do planning and budgeting before really purchase the car. With the information given, the customer can know how much they have to earn before actually purchase the car.

- The system also provide the report view about cars such as most preferred cars, most economical cars, most newest car and much more. With this kind of report it also helps both customer and dealer. It help the customer smaller the scoop of choices and help the dealer to suggest and promote the car listed in the report.

1.4 Scope of Study

This system concentrates on implementing the decision making activities within the automotive industries for used and also new car purchases. It intends to improve the knowledge sharing or transfer in DSS when decision making activity is taking place. The proposed system is considered as an effective system in knowledge sharing that implement into DSS and beneficial to the automotive industries. As the automotive industries become bigger, they produce at least more than 2 to 3 new model per year. The industries need this kind of system to make sure the car that their producing is meeting the requirement made by the customer by considering them as the main source of idea.

CHAPTER 2

LITERATURE REVIEW

2.1 Decision Support System

Decision support system is one of the elements in Knowledge Management in sharing the right knowledge. Decision support system is a computer based problem solving system that assists choice between alternatives in complex and controversial domains[2].

"Sparague and Carlson (1982) and others define Decision Support System broadly as interactive computer based systems that help decision-makers use data and models to solve ill-structured, unstructured or semi-structured problems. Bonczek, Holsapple and Whinston (1981) argued the system must possess interactive query facilities, with a query language that is easy to learn and use (p.19)."

Various types of DSS help decision-makers use and manipulate very large database; some help managers apply checklists and rules; others make extensive use of mathematical models (cf., Power, 1997)

2.1.1 Data-Driven DSS

The first generation type of DSS. These systems include file drawer and management reporting systems, data warehousing and analysis systems. Data-driven DSS emphasize access to and manipulation of large database of structured data and especially a time-series of internal company data and sometimes external data.

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2.1.2 Model-Driven DSS

Model-driven DSS emphasize access to and manipulation of a model. Simple statistical and analytical tools provide the most elementary level of functionality. Model-driven DSS use data and parameters provided by decision-makers to aid them in analyzing a situation, but they are not usually data intensive. Very large database are usually not needed for this type.

2.1.3 Knowledge-Driven DSS

Knowledge-driven DSS can suggest or recommend actions to managers. These DSS are person-computer systems with specialized problem-solving expertise. The "expertise" consists of knowledge about a particular domain, understanding of problems within that domain, and skills at solving some of these problems. A related concept is Data Mining. It refers to class of analytical applications that search for hidden patterns in a database. Data mining tools can be used to create hybrid DSS that have major data and knowledge components.

2.1.4 Web-Based DSS

Web-Based DSS is a computerized system that delivers decision support information or decision support tools to a manager analyst using a "thin-client". A web-based DSS is synonymous with an intranet or enterprise-wide DSS. Also, web technologies are the primary tools used to create inter-organizational DSS that support the decision-making of customer and suppliers.
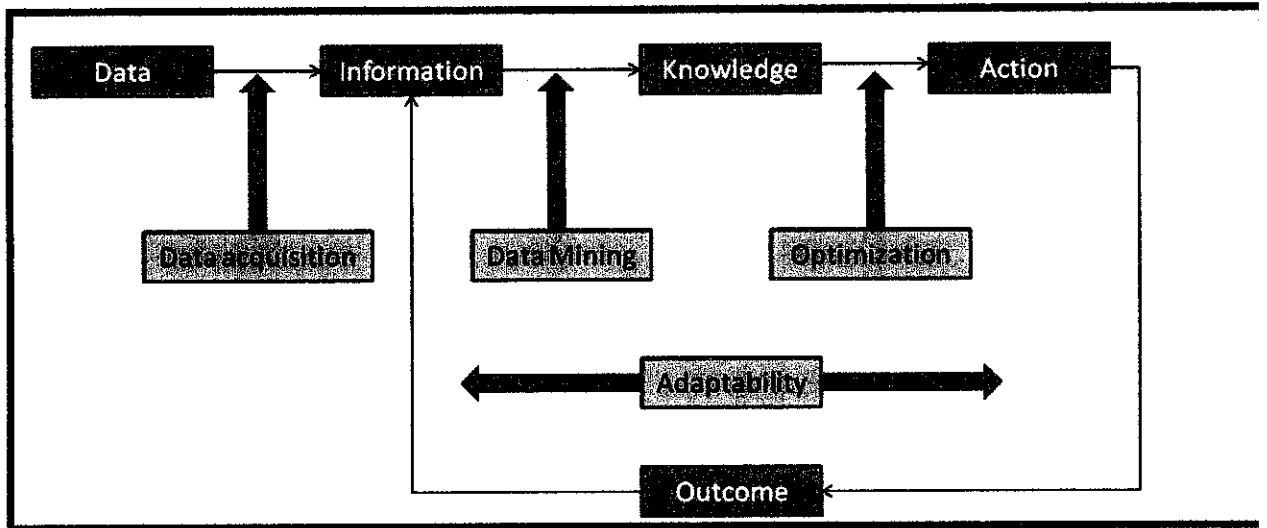
Figure 2.1: Web Based DSS

The diagram above shows how the decision support system should work. The diagram also shows the flow from data acquisition to recommended action, including an adaptive feedback loop.

All the data that being collected by the developer will be turn into useful information for the system. Using the data acquisition all the data will be easily transform into information. For this system, developer collects data from various car dealers. The vehicle data will be kept as information to help the developer to develop the database that the system needed.

The developer using the data mining to classified the information that will be stored in the database. The information that has been classified will be transform into knowledge. Data mining helps the developer to transfer all the data about the vehicle into useful knowledge that can be deliver to the user by classifying the information into different categorize. Using data mining as the classification method, it can help the developer to develop the algorithm to produce the result and the action. The algorithm will read the database and produce the result which is the vehicle that suite the requirement of the classification and also the input from the user.

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To develop the algorithm, the developer use rule-based reasoning to adapt the algorithm and produce the result.

Rule-based reasoning (RBR) is a bit more complex but also a bit more formalized. Rule-based uses the knowledge in the knowledge base to solve problems or answer questions. The objective of reasoning process of rule-based systems is to derive a value for a conclusion. There are two means of deriving conclusions; [1]

1. Start with all the known data and progress naturally to the conclusion

   a. Data driven

   b. Forward chaining

   c. Forward reasoning

2. Select a possible conclusion and try to prove its validity by looking for supporting evidence

   a. Goal driven

   b. Backward chaining

   c. Backward reasoning

For this system, the developer uses the first mean, where the developer use data to in the vehicle database to derive the solution for the customer in choosing the suitable vehicle for them. Data in the database are group into three different groups where the group is the conclusions for the situation given for each condition. The system use the data in the database to matched with the data or information given by the user. Using the data and information given by the user, the system will read the data that stored in the database to produce the desire result. It will read the data forward by reading data by data.

2.2 Automotive Industries and its Customer

Every year in the automotive industries, they produce more than 73 million vehicle worlds wide and the problems that face by the industries is how to distribute and promote the vehicle to the customer either new model or even used cars [7]. As the time goes by, the vehicles have become more and more expensive that leads to customer delaying to buy new car for themselves.

Some customer delaying their purchases of vehicle because of the vehicle itself. A survey asked which brands consumers thought were leader in automotive industries, the customer listed down seven categories that is design, performance, quality, safety, innovation and value. From these categories the customers decide which car that leads the industries. This survey shows that the costumer need to know more than just the design of the car as the survey show the most categories that being voted was safety then the quality.

Every vehicle that being produce has they own specialties. From the design of the car, the performance, quality, safety, innovation to the value of the car should be considered while producing. This is because customer usually value a car that they about to purchase using this criteria. The competition between the vehicle manufacturing has become more and more compete table. Some cars have the same criteria and almost the same design but produce by two different manufacturer. They produce similar car to compete each other in the market. They even produce the special edition of the same car to make sure that they are in front of the other competition.

The normal way of purchasing a car is the customer will find their own information about the car first through internet, magazine, papers and any other media before actually coming to the car dealer. Usually the dealer only gives small amount of information about the car as they only talk about how the payment can be made.

2.3   Knowledge Based System

Knowledge based system a system that uses artificial intelligence or expert system techniques in problem solving processes. It incorporates a store (database) of export knowledge with couplings and linkage designed to facilities its retrieval in response to specific queries or to transfer expertise from one domain of knowledge to another.

2.3.1   Knowledge-based System – User's View

2.3.1.1   Intelligent program

Intelligent program target is the end user. The end user can't open the source of the system. The intelligent program encapsulates most of the knowledge, including possible knowledge representations of rules, frame, and defaults information. This program typically rarely necessary for end users to access, and often dangerous from a security standpoint. The user interface may enable the intelligence program to pose questions to the user about the problem about at hand. It may provide explanation about why intelligent program is asking particular questions.

2.3.1.2   User interface

User interface may allow the user to query the intelligent program as to why or how a particular decision was made. The user interface display result to the problem asks by the intelligent program. It also may the user to save and print result. The result may provide graphic representation of the result.

2.3.1.3   Problem-specific database ('workspace').

The database is representing as logical known facts. The working space where the systems read any inputs and write its outputs. The inputs consist of all information provided automatically or by the user. The output includes all the conclusions of the intelligent program are able to derive, including both the final solution required by the user, as well as the intermediate conclusions.

2.3.2 Knowledge-based system – Developer's view

For this view, there are 2 kinds of developers that are developer of the score platforms or language that develop interface engines, user interface and etc. For this developers is not necessary, this is because the interface can be used one or more of the many existing development environments. The other developers are the knowledge engineer (KE). They use the development to program a KB system. In a traditionally way, the KE personally interview domain experts to elicit knowledge. Knowledge base system has two main components that is intelligent program and development environment in the developer's view. For the developers view is the most important as it will act as the main domain for the system development. The black box can be open by the developers to create and edit the program.

2.4   Knowledge Decision Support System in Automotive Industries

Knowledge decision support system can be implemented to the automotive industries as the industries keep on producing a large amount of vehicle every year. The system will not only help the customer to decide which car to purchase but also to help the industries to be more sufficient in their database and the information about the car itself by not mixing it with other information.
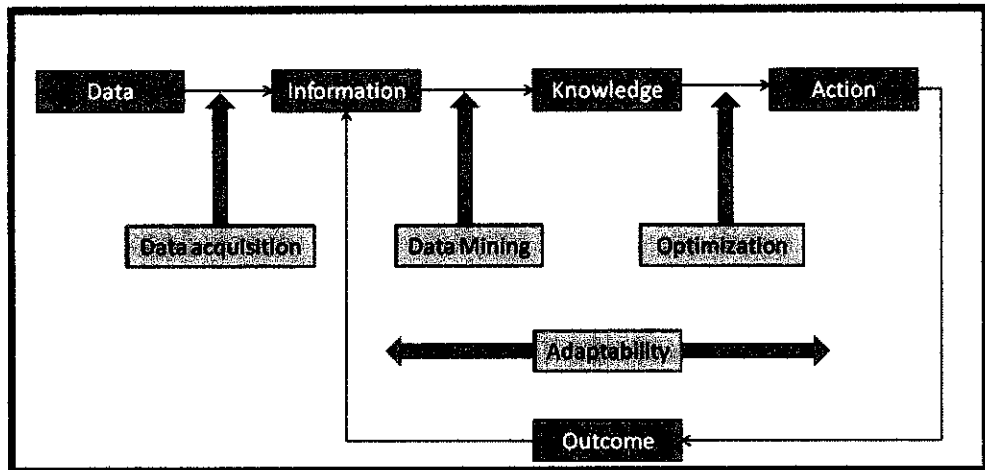
Figure 2.2: Web Based DSS

Using the same diagram as the reference, the decision support system using the same diagram in implementing the decision support system to the automotive industries in purchasing process for customer.

The collection of data will be transform into information using the data acquisition. Using data mining, information is transform into useful knowledge that can be used to increase revenue and cuts cost. It allows the users to analyze data from different dimensions, categorize it, and summarize the relationship identified. Technically this process is the process of finding correlations or patterns among dozens of field in large relational database. Implementing this process in the automotive industries, data mining helps to transfer all the data about the vehicle into useful knowledge that can be delivering to the customer by categorize the information into different categories such as design/style, performance, quality, safety, technology innovation and value. The information also being delivered to the customer using the report view. The knowledge

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are being fully utilize for further action that lead to outcome by matching the customer requirement to the vehicle that hit the requirement. The outcome is the car that matches the requirement.

The implementation of decision support system into the automotive industries means implementing knowledge management as DSS is part of KM. DSS support the knowledge collection, knowledge transfer and also knowledge sharing, by sharing the knowledge about the automotive industries especially the specific criteria of a vehicle. DSS not only can help customer in making decision but also help the customer to know more about the vehicle they about to purchase and helps the car dealer to understand more about their customer and also the car their selling.

2.5 Target User for Decision Support System

2.5.1 Automotive industries and its customer

The main target user for this system is the automotive industries and its customer. Customer comes to car dealer in dealing with purchases, the search for information of the vehicle. This gives the customer the advantages to ask more rather than reading pamphlet and information in the internet. Customer sometimes comes to the shop without any knowledge about what kind of vehicle they about to purchase. Sometimes, customers come with the chosen vehicle but without knowing that they don't afford the vehicle that leads to some problem. As a car dealer, they have the advantages to gives they personal view besides the main information about the vehicle. With the decision support system, it will help the car dealer to deliver and gives more fact that can convince the customer about the vehicle. Maybe some customer like to stick their own choice, as a car dealer with the system, they can convince the customer that the calculation that being done by the system will leads to a better solution by displaying the report of the vehicle requirements that match the information given.

2.5.2 Customer Behavior

The developer had done research on customer behavior on how they purchase the vehicle and what are the criteria that they looking in purchasing vehicle and also how the information gathering are perform by the customer.

2.5.2.1 Self-Satisfaction

Purchasing a vehicle doesn't always happen, there are factors that influencing the shopping behavior of a customer. Some customer might just too boring and need something new for them. For some customer the price is not the main issue of purchasing a new vehicle. Especially the youngsters, the type that doesn't really care about their savings. This kind of customer will spend no matter how much money to be unique and the dealer will point out the newest and most attractive vehicle features. Even thought this not happen all the time, but there is people that are willing to pay a premium for the car of their dream. [15]

2.5.2.2 Fuel Consumption

A recent study shows that the raise of gas price affecting the customer shopping behavior for vehicle. When it comes to purchasing a new vehicle, six out of ten customer say that the raise in gas price has either changed their mind about the vehicle they about to purchase or strongly considering the purchase of a vehicle they normally would not have considered. [7]

2.5.2.3 Replacing Car with Better Features

Another characteristic that influence the customer behavior in purchasing vehicle is the features of the vehicle. Some customer purchasing their next new vehicle is because of the old keep on broken down. With that, this type of customer will be finding the vehicle that will start in the morning easily and doesn't require endless money for continues repairs. These customers will be comparing and will be searching for a better in features in the vehicle. At the same time this type of customer will be having the car in a long term, so the customer will be comparing not only the features but also the reliability and the quality of the vehicle. [13]

2.5.2.4 Payment Concern

Another type of customer behavior in purchasing new vehicle is the customer that would buy the vehicle at the lowest price and don't really have the eager to buy the vehicle. Additional can payment isn't the favorite for them in the process of purchasing the vehicle. This type of customer usually comes in the show room with the budget they already have, the dealer should show them the vehicle that suite their budget, but if the customer started to feeling that the vehicle shown to them are out of their range of budget, they might just walk out of the dealership. [14]

2.5.3 The Purchasing Information

For the car dealer it is important for them to be more focus on improving customer satisfaction, they have become consumer-oriented in an effort to make the buying process more enjoyable and informative [21]. To purchase a vehicle it is important that the customer can understand what the basic key individuals at the dealerships are. The salesperson, as a customer the main interaction will be your salesperson. As the salesperson who is expert on the operation and features of the vehicle, they will accompany the customer from the moment the customer comes into the showroom to test drive, negotiate during the sale and assist them with the finance manager with the required paperwork. It is important to ask whenever the customers have some doubt in their mind.

The role of sales manager is to oversee all new and used vehicle sales at the dealership. The sales manager has the authority to adjust pricing and make all sales-related decisions. During the sales process, the salesperson will often consult with their sales manager as the terms of transaction are negotiated.

Finance manager is responsible for vehicle financing, warranty sales and sales aftermarket products. Finance manager often has business relationships with several bans and leasing companies, which gave them the ability to offer numerous financing options. After the vehicle negotiation is complete, the finance manager will draft the sales or leasing contract.

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The customer also needs to understand the common terms in the process of purchasing the vehicle. The common terms such as, down payment is the amount of money paid at the beginning of the sales transaction. The more you pay the down payment the less you will be paying the other payment. Other term such as monthly payment, the amount due each month on an installment loan. The annual percentage rate (APR) refers to the interest rate on the vehicle loan. Lower APR means the monthly payment will also be lower. There are more terms that need to be understood by the customer in the process of purchasing a new vehicle. [21]

CHAPTER 3

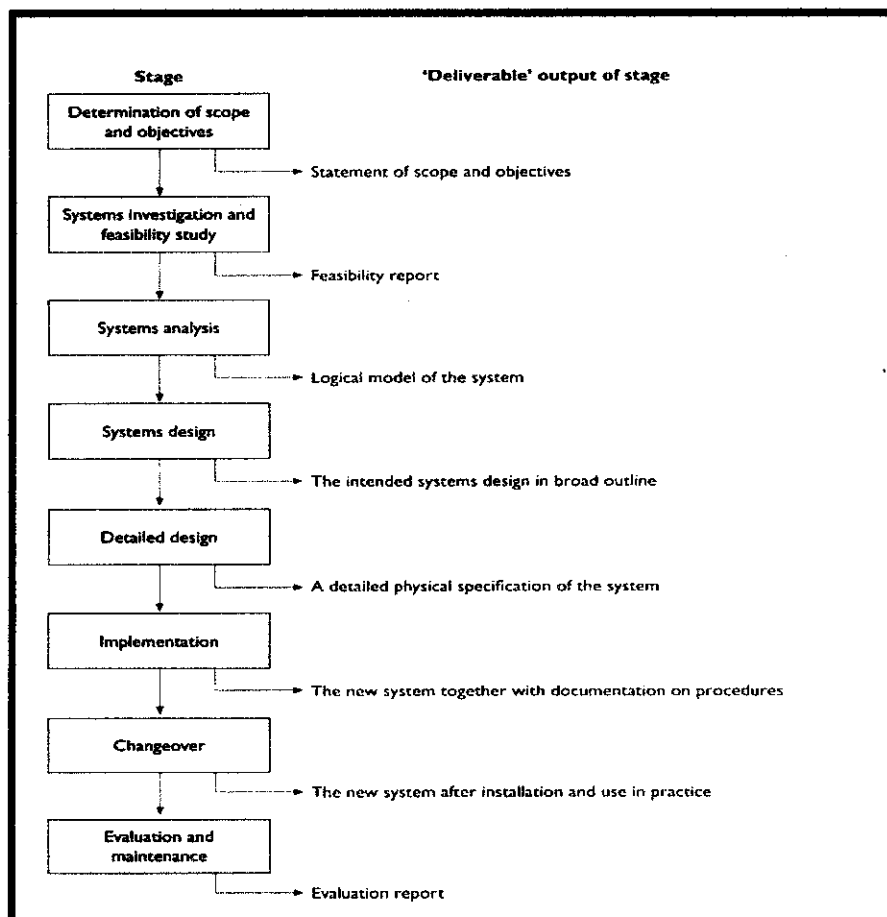# METHODOLOGY

3.1 System Development Life Cycle

Figure 3.1: System Development Life Cycle

System development life cycle (SDLC) is a conceptual used in project management that describes the stages involved in an information system development

project from an initial feasibility study through maintenance of the complete application. Stages in SDLC:

3.1.1 Determination of scope and objectives

The most important phase in SDLC as it will determine the main purpose of building the systems by clarifies the statement of scope and objectives of the systems. The main purpose of the systems is to help the buyer making the right decision using the decision support system web based.

3.1.2 System investigation and feasibility study

In this phase developer had to do research based on the scope and the objective of that had been determine the before. In this step, feasibility studies are performing. The information that gather and present in the feasibility study will help the developer to list in detail all the things that needed to make the system work. The studies also identify logistical and other system-related problems and solution. Feasibility studies also serve as a solid foundation for developing the system plan as a business plan. For this system, the feasibility study had to be done to make sure the system goes with the requirement that needed by the car dealer and also meet the customer satisfaction by providing the full information about the car they about to purchase.

3.1.3 System analysis

For this phase, an analysis strategy is developed to guide the project team's efforts. For example studying the current system that been used by the current user. In this phase also, requirement gathering will be perform that will leads to the development of a concept for a new system. The analyses, system concept, and models are combined into document called the system proposal, which is presented to the user who requires the system

3.1.4 System design

The system design phase decides how the system will operate, in terms of hardware, software, and network infrastructure that is the user interface, forms and reports and the specific programs, database, and file that will be needed.

3.1.5 Detailed design

After gathering and determines what are the requirement and the how the system will operate, a detailed physical design in broad outline are design to see more clearly how the system will look like. In other words the system must be developing in this phase in terms of the user interface and other.

3.1.6 Implementation

In the implementation phase, usually gets the most attention. In implementation the system is built and tested to ensure it performs as designed. Installation is the process by which the new system is turned on.

3.1.7 Changeover

In this phase the developer follows the system on how the user fully utilized the system to make it easier in their business process and also help their customer in finding satisfaction in purchasing the vehicle.

3.1.8 Evaluation and Maintenance

In the final phase, the evaluation report are made after following how the system used by the user on how to improve the system and to maintain it so it will follows the current requirement that might changes through time. As this system changes might be needed as the automotive industries will be having new improvement from time to time in terms of the technologies of the vehicle itself.

3.1.9 Strength and Weakness

It helps the developer to plan in developing the system. Without the module, the developer might has the problem on differentiate which is important that need to be done first and which need to be done later. Its help the developer to keep in track what have they done and what should be done next. Even though it helps the developer to keep in track to the system, this system might face problem such as stuck in the middle of the development because of changes in user requirement or even the suddenly changes in the database system because of the market prediction. This might lead to late implementation or deliverable.

3.2 Gantt Chart

The Gantt chart shows the work flow that should the developer need to follow to make sure the system is done by the time its need to be implemented. Refer to appendix.

3.3 Flow Chart Diagram

Activity diagram represent manual or computerized behavior. It also shows the primary activities and the relationships among the activities in a process. For this system, the main activity is to match making the vehicle requirement and the customer information and at the same time meet customer satisfaction. Its start with information

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gathering from the customer by filling the form that provided by the system, if the information given complete than the system will process the information and do the match making and display the result which is vehicle that match the information and needed by the vehicle. If not then user need to complete the form.

For this system, there are 2 main activities, one for the main user and the other one is for the developer. For the main user that is the car dealer that filling in the information to the system. The main activities for this user are gather information from customer, if the information given and needed matched and complete, the system will do the matching and finally prompt the result by listing the list of vehicle that match the information and the customer will choose the right vehicle according to the listing and also consultation given by the dealer. In this activity, the system also prompts a warning if the information given not complete. The prompt warning will ask the user to complete the information if not the system will connect the user back to the main page. Refer to appendix.

3.4 Use Case Diagram

Use case diagram shows interaction between actor and the activity with the system. The frost actor of this system is the admin itself. The admin will easily access to the work-interface and update the interface, database and also the information in the system. This is because the system will be upgrading their interface according to the user requirement. The database and the information changes as the automotive industries change or producing new product or even there is new valuable information about automotive industries. The second actor is the user of the system. The user will open the system through web and will discover more information about the industries. The user will fill in the form to match the vehicle they need and want. Then, the user's information will be matched with the database then the result will be viewed by the user. Refer to appendix

CHAPTER 4

TOOLS/EQUIPMENT AND METHOD

4.1   Architecture/Framework
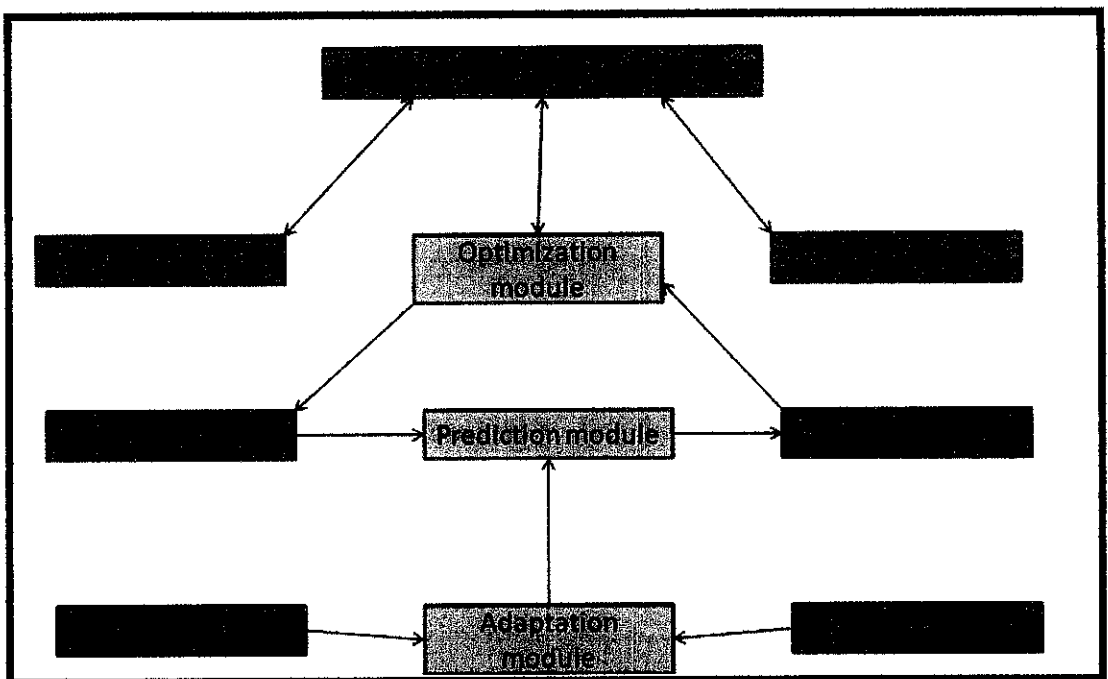
Figure 4.1: System Architecture/Framework

The figure above show the intelligent decision-support system. The prediction, optimization and adaptation modules feed information into the user interface, the information database, and the report module.

4.1.1 Prediction Modules

The prediction module consists of several components, such as the main criteria of the vehicle and also the requirement needed. After the default base information being set, the remaining modules will adjust the requirement to create a final predicted output.

In this module, the information given will be matched to the requirement that needed to produce the right output for the vehicle that will be present by the dealer to the customer. The prediction input are the information that already store in the database which are the vehicle information. The prediction outputs are the result from matching the information given by the user and the information already stored. It gives the prediction which vehicle that suited the user. User information such as the salary, transmission, color and also the features that they desire in the vehicle are the main criteria that being scan to the algorithm used in this system.

4.1.2 Optimization module

The optimization module's job is to recommend the best distribution of vehicle to the customers. This is because this recommendation is based on prediction, as it has a strong relationship with the prediction module. In this process the optimizer use the information given by the user and also the vehicle information that stores in the database so that the optimizer produces a possible solution, which become the input to the prediction module. The optimizer then use the prediction module's resulting output to evaluate the solution. For the car purchases, the optimizer use prediction modules as a guide to produce a possible solution in scanning the right car that hit the requirement.

4.1.3 Adaptation Module

Although intelligent software systems require a prediction module and optimizer, by themselves they're insufficient for today's rapidly changing environment. The prediction module must adaptive and learn from environmental changes, as today's accurate prediction might not be accurate tomorrow. The adaptation modules take recent input and output from very recent information. This module will be implementing to the database as the automotive industries can be rapidly change from time to time. This module take input from the admin who will input the recent update about the automotive industries and the it will be show the recent output to the user that will need recent

information about the vehicle they about to purchase or even the current information about the automotive industries. With the adaptation module the system will be keep updated within the automotive industries. From time to time, customer behavior in purchasing vehicle will change as the automotive industries will keep on expand. This is where the adaptation module takes part where it will also expand to keep parallel with the automotive industries. Recent input about newest vehicle and newest features that desire by the user will result in recent output.

From the information then will construct and train the prediction module. The whole system then makes regular recommendations in which car that suite the requirement by the customer. All this information will be save into the company database as if the customer decide to purchase the car, the system will show the report on which car sells the most and at the same time it can show the company performance.

4.2 Tools and Equipment

4.2.1 Standard Query Language (SQL)

This system will use SQL as the main database for all information that will be stored. SQL can easily be access and manipulate database as it is an ANSI (American National Standards Institute) standard. SQL can easily execute quires against the database, retrieve data, and insert records, update records, delete records, and easily create new database. SQL also can simply view the database.

4.2.2 PHP

PHP is a scripting language originally designed for producing dynamic web pages. It has evolved to include a command line interface capability and can be used in standalone graphical applications. PHP is a widely-used general-purpose scripting language that is especially suited for web development and can be embedded into HTML. It generally runs on a web server, taking PHP code as its input and creating web pages as output. It can be deployed on most web servers and on almost every operating system and platform free of charge. PHP is installed on more than 20 million websites and 1 million web servers.

4.2.3 MySQL

MySQL is a relational database system that is used to store information. MySQL can store many type of data from something as tiny as a single character to as large as complete files and graphic. Although it can be accessed by most programming languages, it is often coupled with PHP because they work together with ease. MySQL database are queried using a subset of the standard SQL commands. MySQL can be directly accessed. PHP and MySQL combine to be an easy yet powerful way to create dynamic web pages that actually interact with your visitors. HTML can create useful and well formatted web pages. With the addition of PHP and MySQL you can collect data from your users, create specific content on the fly, and do many other things that HTML alone can't do. To make it easier for the developer to update and to insert data in the database this system applies phpMyAdmin. PhpMyAdmin is set of PHP-scripts to administrate MySQL over the WWW. phpMyAdmin is intended to handle the administration

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of MySQL over the WWW. Currently it can create and drop databases that is create, copy, drop and alter tables to delete, edit and add fields also execute any SQL-statement, even batch-queries to manage keys on fields and load text files into tables to create and read dumps of tables. It also exports and import CSV data for administers one single database.

Field	Type ⑦	Length/Values*	Attributes	Null	Do
name	VARCHAR	30		not nul	
age	INT			not nul	
height	FLOAT			not nul	
date	DATETIME			not nul	

Figure 4.2: MyPHPAdmin

4.2.4   Server

In information technology, a server is a computer program that provides services to other computer programs (and their users) in the same or other computers. In the client/server programming model, a server is a program that awaits and fulfills requests from client programs in the same or other computers. A given application in a computer may function as a client with requests for services from other programs and also as a server of requests from other programs.

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CHAPTER 5

RESULT AND DISCUSSION

5.1 Questionnaire

5.1.1 Customer

To make sure the system that build by the developer meet the requirement, a questionnaire had been done on analysis how do people what are the criteria that a customer search in purchasing a vehicle and how do they actually respond if there is such system. 50 respondents had done the survey and the result as below for the demographic analysis. This could help the developer to define what kind of user that need the system.
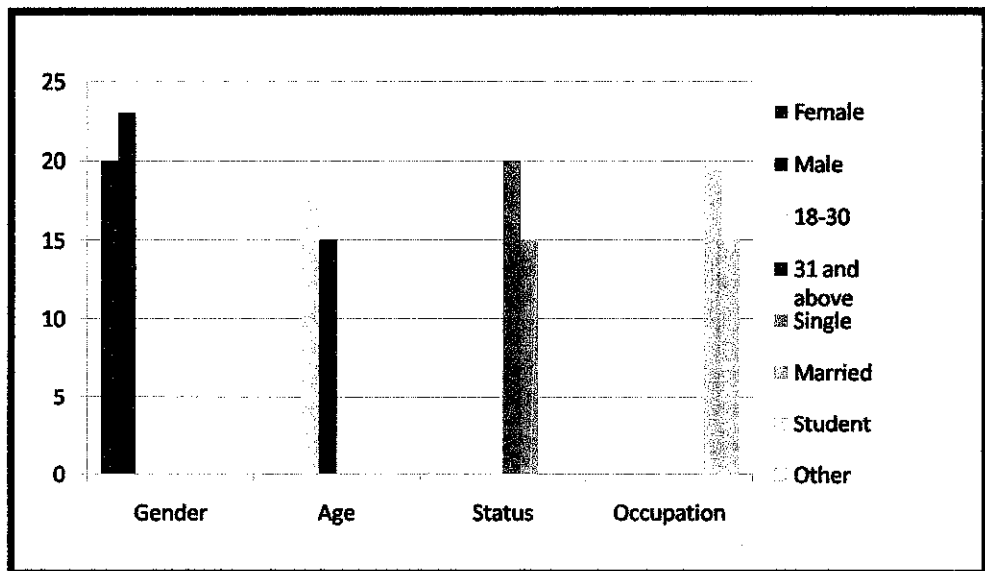
Figure 5.1: Demographic Chart

Almost 60 percent of the correspondents are female and the others are male. The circles of age that participate in the survey are most from 18 years old and above. This is the circles that already have the authority if having their own car. Most of the

participants are single in status and only few are married. This shows that most of them use internet all the time to find any information about vehicle or any other information. Most of the participants are student and only few participants are working. 80 percent of the correspondents are driving and others are not.
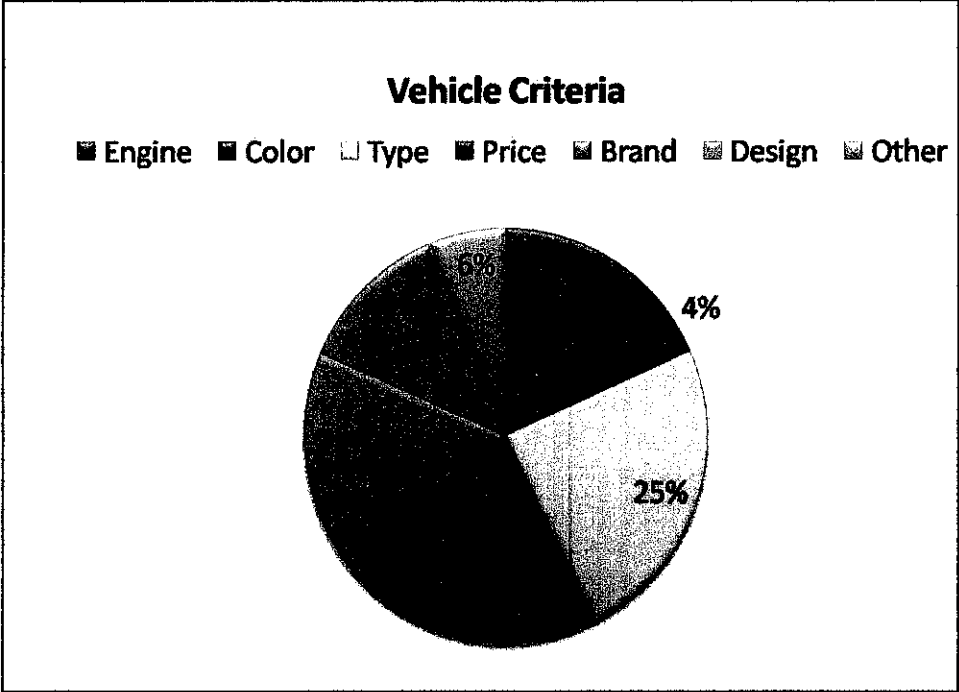
Figure 5.2: Vehicle Criteria Decision

For the question what are the vehicle criteria do the respondent see before actually purchase a vehicle, more than 60 percent participant choose type of the vehicle then more than 30 percent of them will check the engine of the vehicle. 15.8 percent of the participant chooses others such as external and internal design, price, design, space and also the brand of the vehicle. Only 10 percent of the participant will consider the color of the vehicle.

Source of Information Gathering

■ Car Dealer ■ Pamphlet ⌐ Internet ■ Other

30%
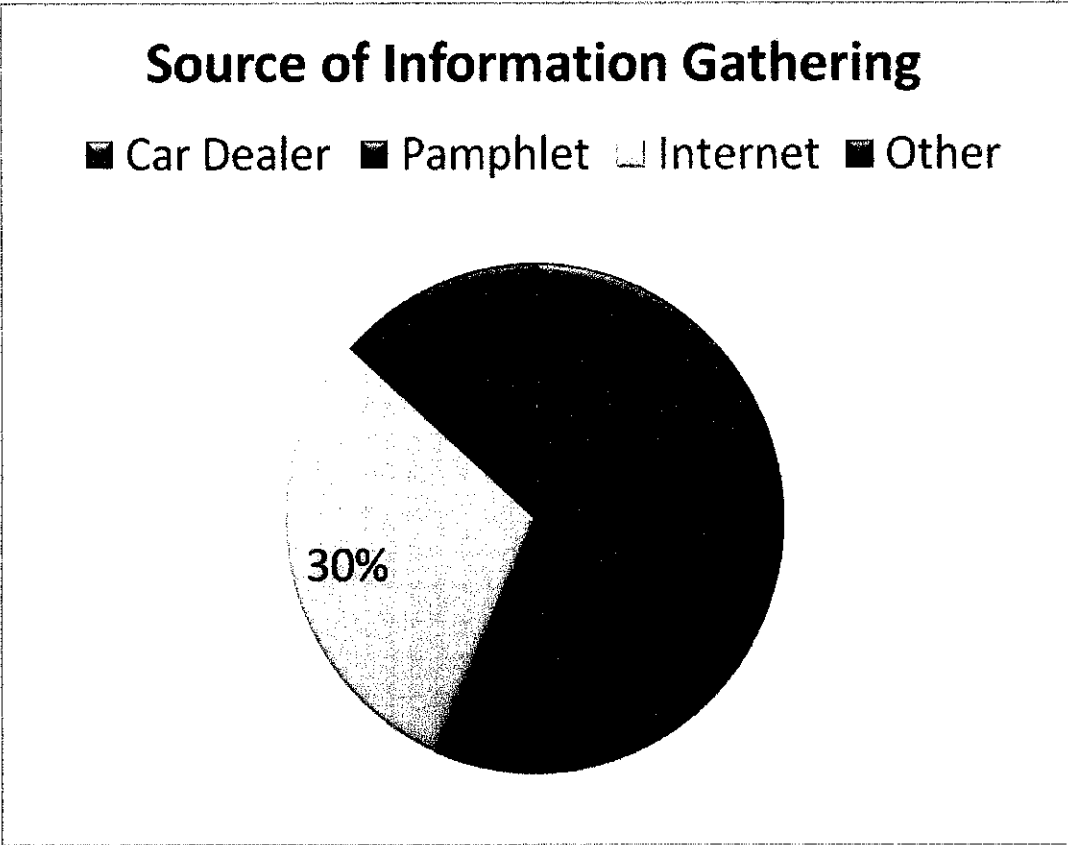
Figure 5.3: Source of Information Gathering

52 percent of the participants go to the car dealer for more information about the vehicle them about to purchase. 47 percent of them use the internet to gather information about the vehicle. Some of them also gather information from the pamphlet that given to them in car exhibition or that been given to them. Others are from car forum in the internet portal, they also ask for advice from family and friend and even the people with experience in vehicle and also from the newspaper. 80 percent of the participant says the method their using right now are helpful in deciding in purchasing vehicle. 95 percent of the correspondents also agree if there is a system that helps them to deicide in purchasing a vehicle because some of the comment it save more time, and it might help the them in budgeting their financial statement. Other comment such as the system might help them scope down the multiple choice of vehicle that they can purchase.

Almost 83 percent of the correspondent says the information gathering method such as car dealer; pamphlet and so on does work as a reference in purchasing the vehicle. Only 16 percent of them think that the method they using is not helping. The reason is the method doesn't help them especially to those who do not know anything at all about vehicle. They also commented on they don't give the whole idea about the current market that determine the vehicle price. From 83 percent of correspondent, more than 50 percent of them are female.

91 percent of the respondent agree and will use the system that can help them to decide which car to purchase. Some of the comment says it can give a better option by scooping down the choices and they actually can afford. With the match making by the salary, they said they can manage their financial decision better.

This questionnaire help the developer to build the system as the system main target user are the car dealer in helping the customer to choose the right car with the right requirement. Most of the customer will come to the car dealer for more information about the vehicle they about to purchase. According to the survey as well, customer so concern about what kind of vehicle will their purchase, with that the result display the complete information about the vehicle that hit the information that their given in to the system.

5.2 System Development

After the research that being done by the developer, the system built are slightly different from what have the developer have propose in the storyboard. The sign in page had been remove because computer that will be installing the application already have they own password. With that the information that kept by the system is secure. Moreover, car dealer usually have short of time in dealing with customer. So the system is simple and straight forward. For the admin purpose such as updating, and deleting the data from the database, the admin can just go through to the main database in MuPHPAdmin and update the database.
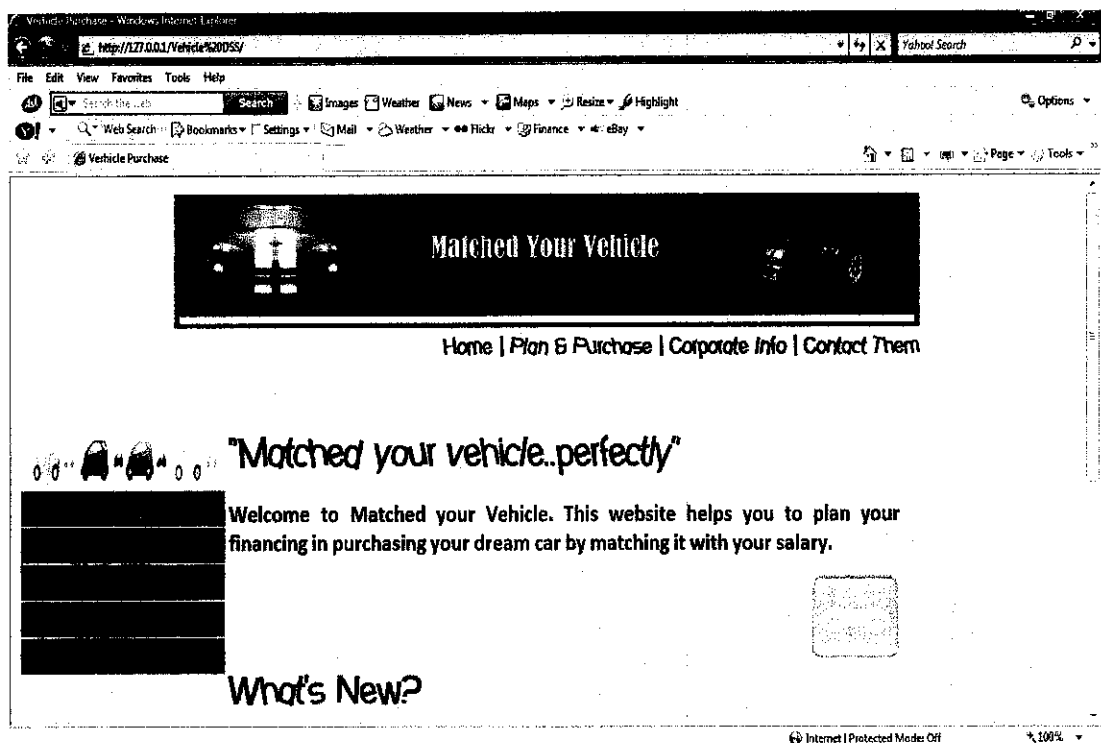
Figure 5.4: Home page

In this page, every picture will lead to their own website where the sites will show all the information that might needed by the customer or even the car dealer. It is useful to the dealer as they can convince the customer more as they given more information

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such as the services that they can get after purchasing the vehicle. For car dealer they can gain much more knowledge about their company and deliver it to the customer.
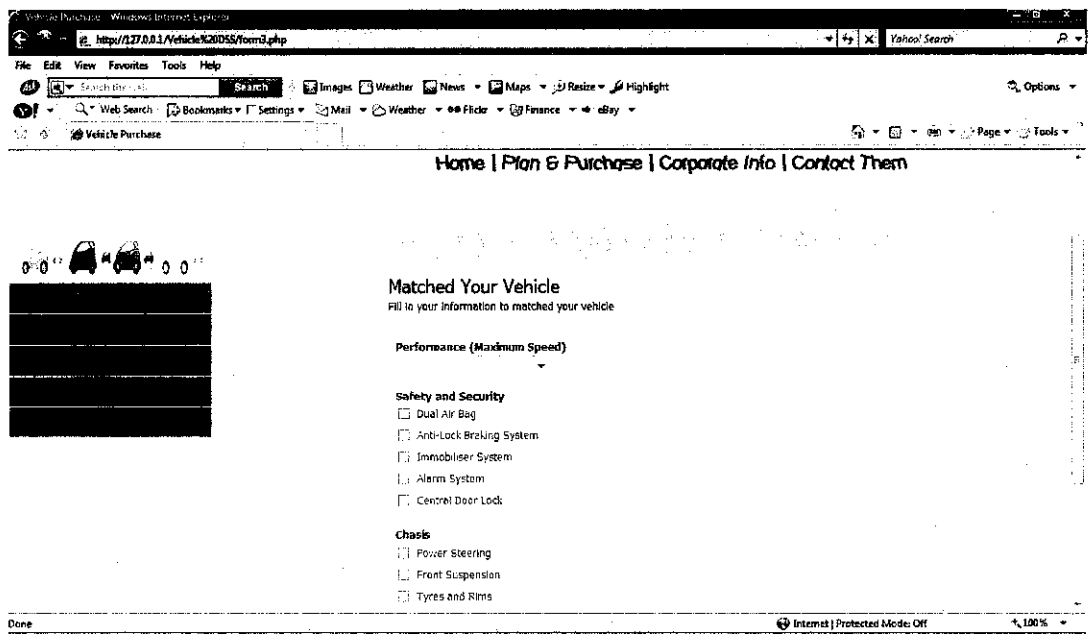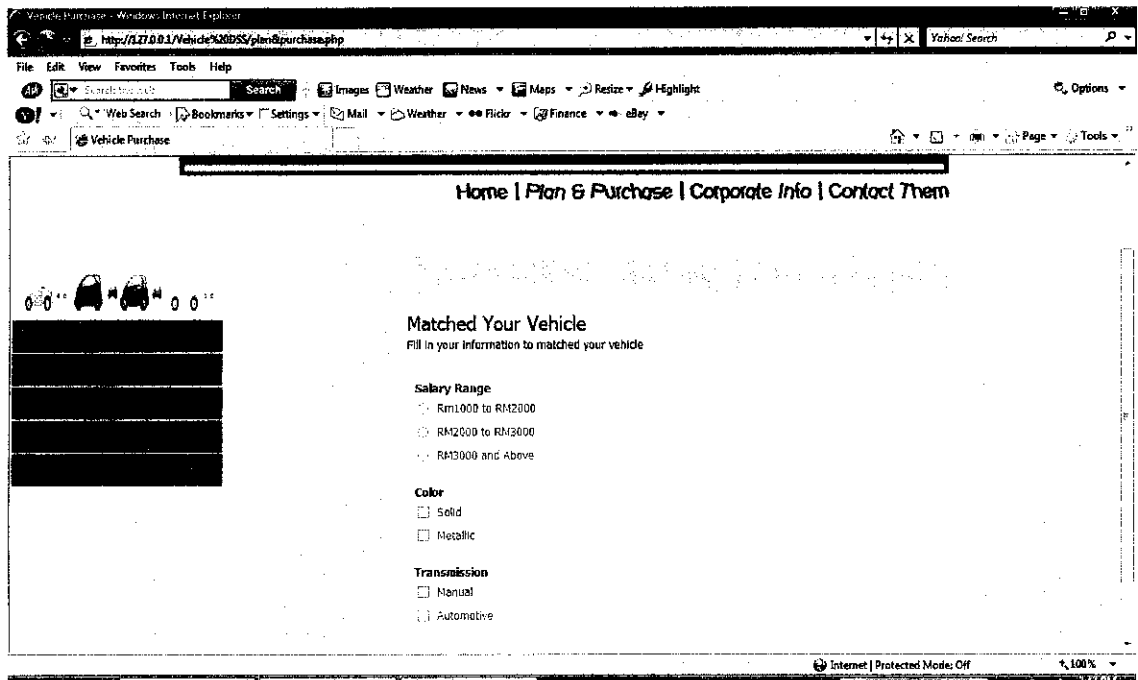
Figure 5.5: Criteria of vehicle

This form is to fulfill by the customer. The form is to match the information with the criteria that the vehicle have. The user will fill in the main criteria that will match the database according to their chosen criteria. Besides the main criteria that differentiate the price of the vehicle, that is the transmission and also the color of the vehicle, the form will also read the main criterion that is the main salary of the user. Besides that, the system also read the criteria that the user interested for the vehicle. At the second form, the user will be choosing the criteria that they desire in a vehicle. For example the safety and the security they wish in the vehicle. Other than that, criteria such as performance of the vehicle.
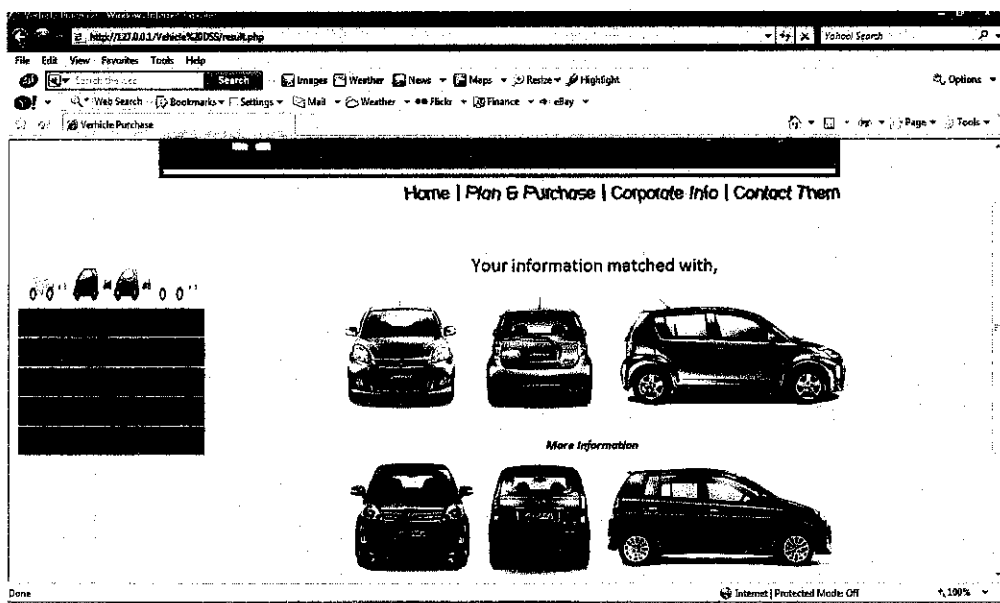
Figure 5.6: Result

In this window, lists of vehicle that match with the criteria that have the user choose. The result will only show the model of the matched salary. To view more information about the vehicle, the button more will display the rest of the information in the other window.
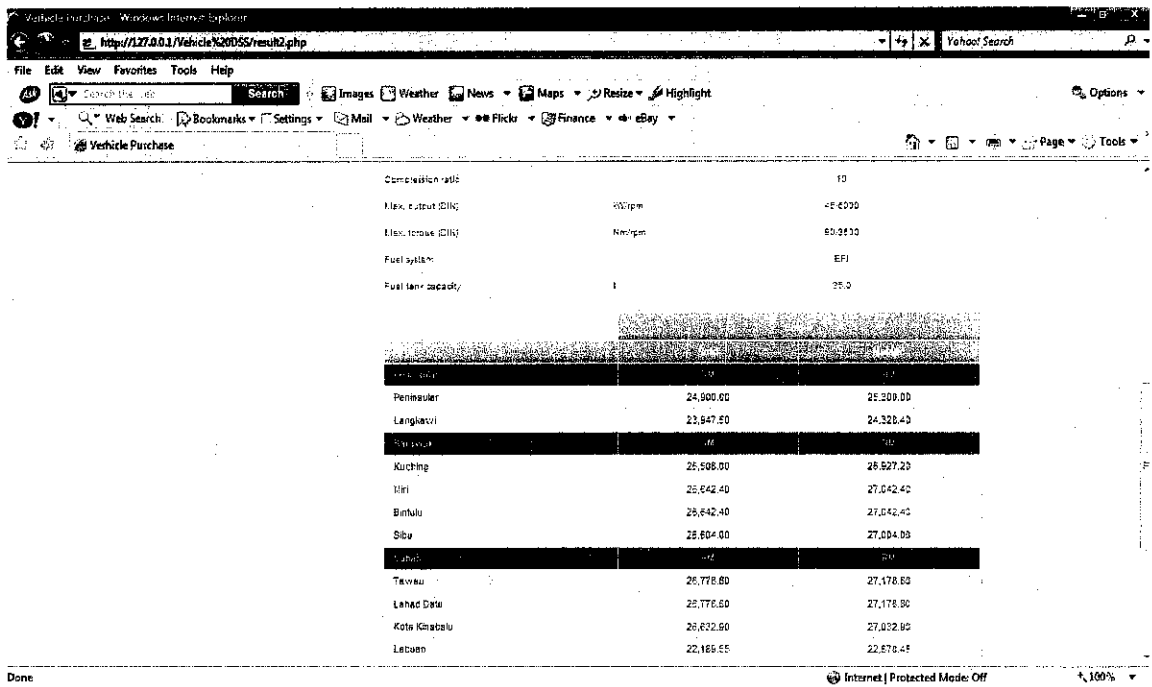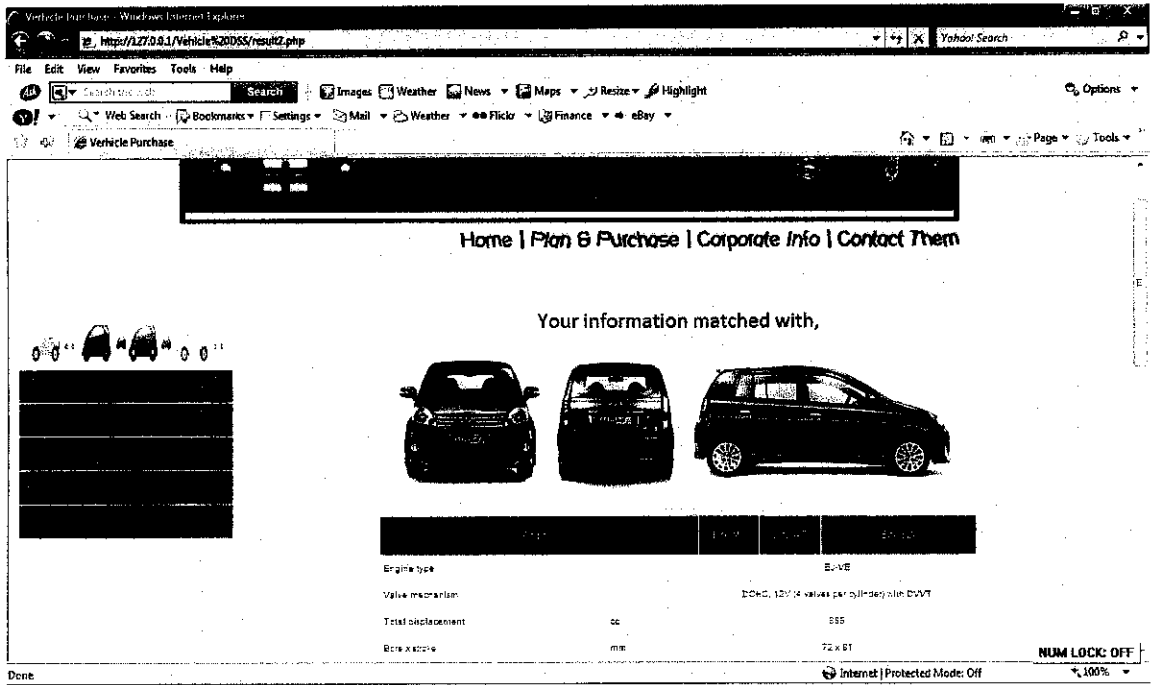
Figure 5.6: More Information Result

To produce the desire result, the developer using this code of algorithm:

Rule#1: If Salary 1000 <= x < 2000 and Color is Solid and Transmission is Manual then Group 1

Rule#2: If Salary is 2000 <= x < 3000 and Color is Solid and Transmission is Automatic then Group 2

Rule#3: If Salary is >= 3000 and Color is Metallic and Transmission is Automatic then Group 3

Figure 5.7: Algorithm

5.3 Test Cases

From the system development, the developer uses the three main rules that used to do the matching for the desire result. Then rules are configured according to the information acquired. The rules are tested by the system and test cases are developed.

Test Case 1:

Configured Rules Involved:
If Salary 1000 <= x < 2000 and Color is Solid and Transmission is Manual then Group 1
Other Features Selection: 190 km/h Dual air bag Alarm system Power steering Reverse sensor
Result given by the system: List of vehicle in Group 1 : Myvi, Viva, Kenari, Savvy

Test Case 2:

Configured Rules Involved:
If Salary is 2000 <= x < 3000 and Color is Solid and Transmission is Automatic then Group 2
Other Features Selection: 190 km/h Dual air bag

Anti Lock Braking System
Alarm system
Power steering
Reverse sensor
Radio with CD and MP3 player

Result given by the system:
List of vehicle in Group 2: Myvi, Pesona, Gen2, Satria NEO

Test Case 3:

Configured Rules Involved:
If Salary is >= 3000 and Color is Metallic and Transmission is Automatic then Group 3

Other Features Selection:
190 km/h
Dual air bag
Anti Lock Braking System
Alarm system
Power steering
Reverse sensor
Radio with CD and MP3 player
Door mirror control

Result given by the system:
List of vehicle in Group 3: Pregio, Sorento, Exora, Naitica

5.4 System Testing Analysis

System testing had been done to several users. The users will use the system and have to answer few question to know the effectiveness of the system in helping them making decision purchasing the vehicle. The developer manages to find only 20 respondents. This is because the respondents will be testing the system and the system is still in the local web, so the responders will be using the developer's computer to test the system.

From the 20 respondents, 13 are female and the rest are male. The range of age is from 20 and above. All respondents are already having stable income every month. 17 of them already have a vehicle, but have the desire to change their vehicle in the short time period. Most of them are searching information for new vehicle
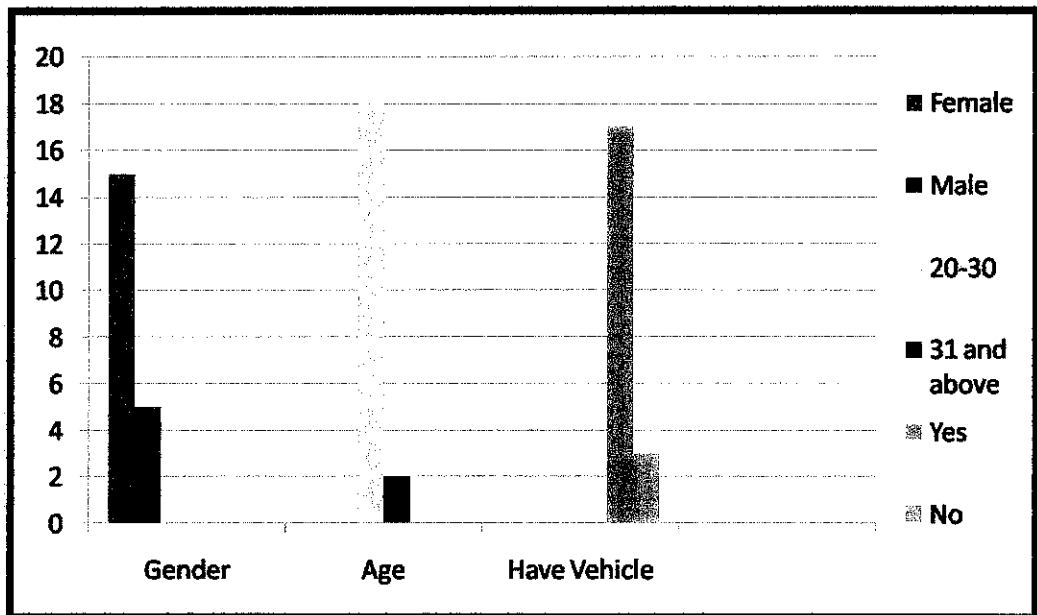
.Figure 5.7: Respondent that satisfied with the result

After testing the system, 90 percent of them satisfied with the result that matched with the information that they give. The remaining 10 percent doesn't really satisfy with the result because they already have the vehicle that they have in mind to purchase.

Even though there are some of the respondent doesn't satisfy with the result, all the respondents agree that if there is a system that can help them to

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matched their want and need at the same time in purchasing the desire vehicle. All of them also agree that the system can help them to budget they financial before actually purchasing the vehicle.

50 percent of the respondent thinks that the system should have its own news and information instead of using other blog news and information and also more automotive company collaboration to give more choices and line of vehicle that they can choose from the result that matched with they want and need. The reminding respondent says the web is already full with information that they needed and also attractive.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.0 Conclusion

In this project, research about decision support system as part of knowledge management element is being performed to understand the process in DSS and how to deliver it to the system that about to be developed. Research on automotive industries also needed to relate the system as the system is built for the industries and also the customer in the industries. Research not only to the industries but also the on the customer behavior on purchasing the vehicle. To develop this system, it only uses the System Development Life Cycle as a guide to make sure the system running smoothly. The module used in the systems is depending to one another to make sure the output of the DSS are stimulate with the requirement needed for the purchases. The tools that will be used in this system are Visual Basic Express Edition 2005 and Microsoft Access as the main database. A survey that been done by the developer shows that most of the customer will use this system to make it easier for them to choose the right vehicle for them by scooping down the choices and save time. The developer also finds this system will help them to plan their financial budget in purchasing their chosen vehicle.

6.1 Recommendation

For the system itself, the developer would recommend in enhancing the system by producing more its own news or information hub for the system, because in the mean time, the system only gives news and information from other web or blog sites to add in into the system. The developer also recommends having collaboration between the admin and also the automotive industries itself such as the car dealer from different several of automotive companies to keep on track newest vehicle in the market as the automotive are expanding their market.

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Appendix

Display Result
Flow Chart
Diagram
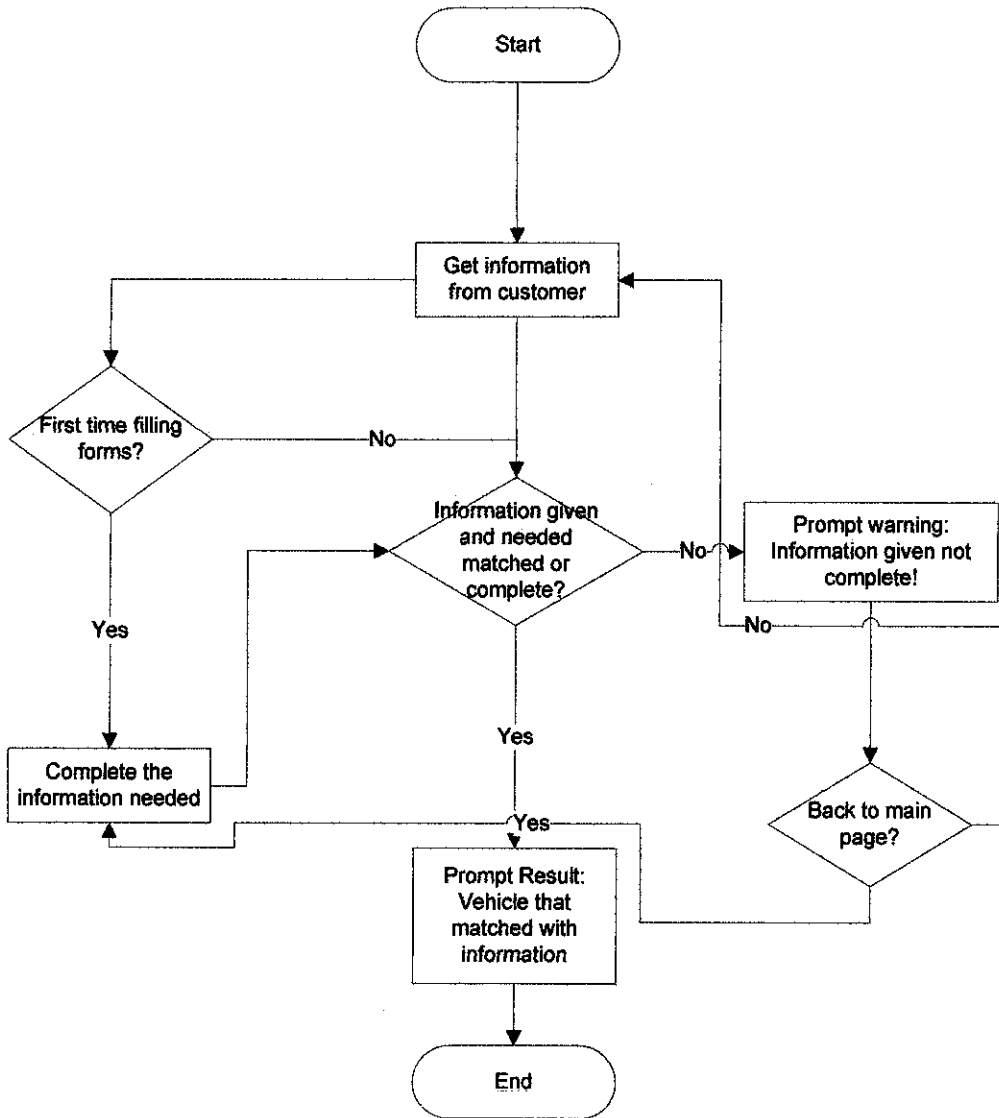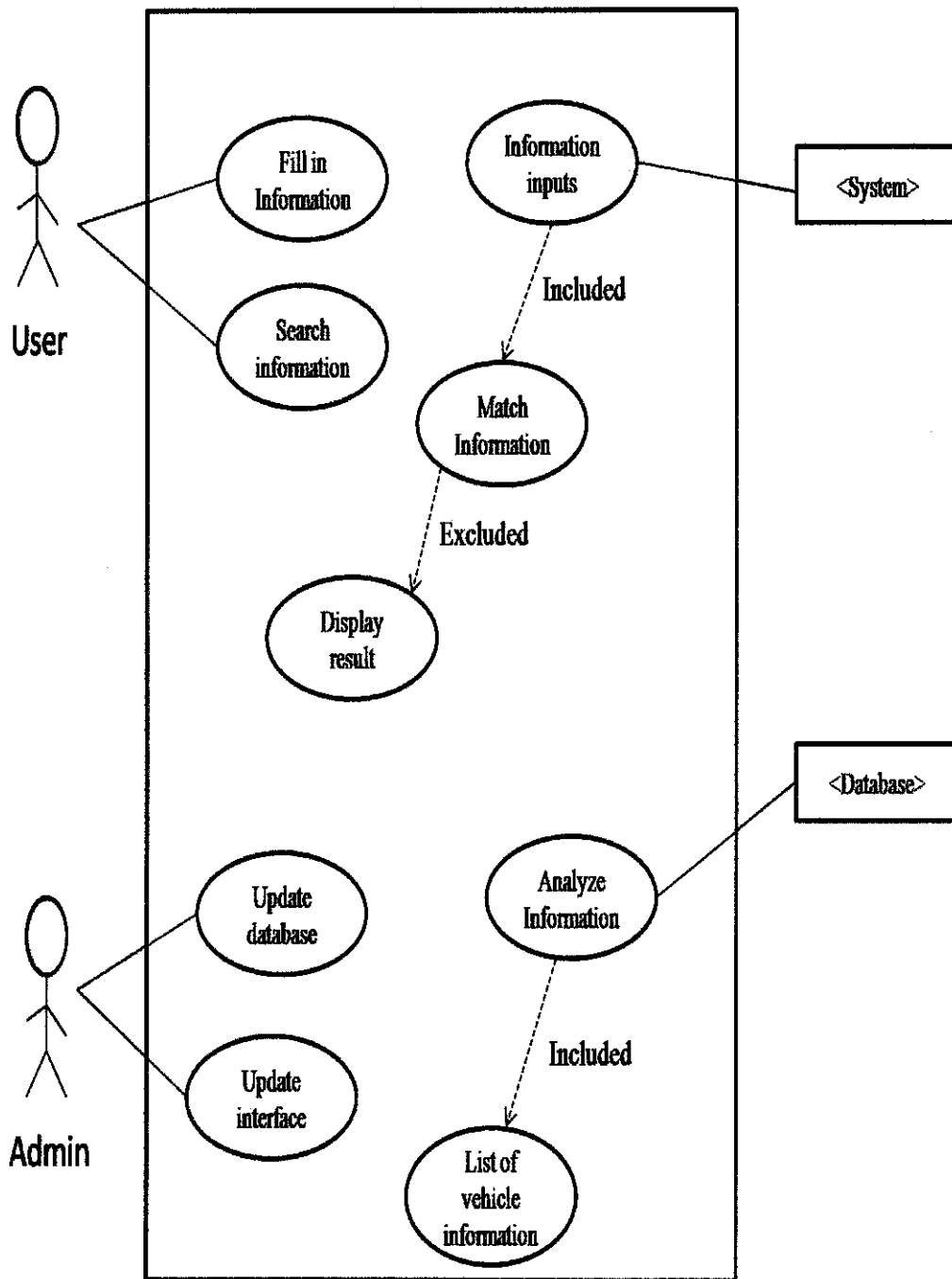
```
                        ┌──────────────┐
                        │    Start     │
                        └──────┬───────┘
                               │
                               ▼
              ┌────────────────────────────┐
              │      Get information        │◄──────────────┐
              │      from customer          │               │
              └────────────┬───────────────┘               │
                           │                                │
          ◇────────────────┼─── No ──────►                  │
    First time filling     │                                │
         forms?            ▼                                 │
          ◇      ◇ Information given ◇ ── No ─► ┌──────────────────┐
          │        and needed                  │ Prompt warning:  │
         Yes       matched or                   │Information given │
          │        complete?                    │   not complete!  │
          │         ◇                           └────────┬─────────┘
          │         │                                    │
          ▼        Yes                              ── No ──
    ┌─────────────┐ │                                    │
    │ Complete the│ │                                     ▼
    │ information │ │                              ◇ Back to main ◇
    │   needed    │ │                                    page?
    └─────────────┘ │                                    
                 Yes                                     
                    ▼                                    
           ┌──────────────┐                             
           │Prompt Result:│◄────────────────────────────┘
           │ Vehicle that │
           │ matched with │
           │ information  │
           └──────┬───────┘
                  │
                  ▼
           ┌──────────────┐
           │     End      │
           └──────────────┘
```

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Before developing the system

1. Gender?

☐ Female

☐ Male

2. Age?

☐ 18-25

☐ 26-30

☐ 31 and above

3. Status

☐ Married

☐ Single

4. Occupation (If student, proceed to question 6)

☐ _____

5. Income per Month

☐ 1000-2000

☐ 2000-4000

☐ 4000 and above

6. Do you drive?

☐ Yes

☐ No

7. How do you choose your car? based on what criteria?

☐ Engine

☐ Color

☐ Type

☐ Other

Other (please specify) _____

8. Where do you find information regarding car sales?

☐ Car dealer

☐ Pamphlet

☐ Internet

☐ Other

Other (please specify) _____

9. Do you think the method you use help you in purchasing a car?

☐ Yes

☐ No

Why? _____

10. If there is a system that can help you to decide in purchasing vehicle, will you use it?

☐ Yes

☐ No

Why (please specify)

System testing questioner

1. Gender?

☐ Female

☐ Male

2. Age?

☐ 20 to 30

☐ 30 and above

3. Do you have a vehicle?

☑ Yes

☐ No

4. After the testing, do you satisfied with the result? Justified why.

☐ . Yes

☐ No

Why?

5. Do you agree that the system can help you in deciding vehicle purchase?

☐   Yes

☐   NO _____

Why? _____

6. How do you find the information in the sites help you searching information about the vehicle industries?

☐   Easy

☐   Hard _____

Why? _____

7. What are need to be improve about the system?

January 2009 Gantt chart

NO	DETAIL	1	2	3	4	5	6	7	8	9	10	11	12	13	14
									WEEK						
1.	Selection of project topic	■	■												
2.	Preliminary research work			■	■										
3.	Submission of preliminary report														
4.	Project work (Literature Review & Objectives)														
	Research on medicine & knowledge taxonomy					■	■	■							
5.	Submission of progress report														
6.	Seminar								■						
7.	Project work (Planning & Design)														
	Continuation of research on CDSS								■	■	■	■	■	■	
8.	Submission of Interim Report														
9.	Oral Presentation														■

MID-SEM BREAK

■ Progress
□ Suggested Milestone

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July 2009 Gantt chart

NO	DETAIL	WEEK 1	2	3	4	5	6	7	MID-SEM BREAK	8	9	10	11	12	13	14
1.	Project Work (Development & Interviews)															
	Developing DCSS Test System		▓	▓	▓	▓	▓									
2	Submission of progress report 2							■								
3	Seminar Progress Report 2									■						
4	Project Work (Testing & Survey compilation)															
	Research on Medicine & Diseases							▓			▓					
5	Poster exhibition and pre-EDX											■				
6	Submission of dissertation												■			
7	EDX													■		
8	Oral presentation														■	

Process

Suggested Milestone

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