# VENDOR RATE SELECTION SYSTEM APPLIED WITH DATA MINING

By

Mimie Suzana Solatin (10704)

Dissertation report submitted in fulfilment of
the requirements for the
Bachelor of Technology (Hons)
(Business Information System)

JANUARY 2011

Universiti Teknologi PETRONAS
Bandar Seri Iskandar
31750 Tronoh
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# CERTIFICATION OF APPROVAL

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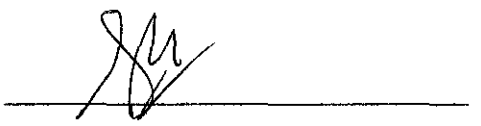

(Ms. Shakirah Mohd Taib)

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# 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.

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# ABSTRACT

In business world, making a good and correct decision is essential but for a person alone to make the decision, the result will be incorrect as human being will include their emotion while making the decision. In order to fix this problem, a business system that fully utilized their previous business's data and pattern should be developed. The scope of this report is to give an overview about how this system being developed and worked provided with some related research and discussion. In this project, it will use data mining technique in order to find the most suitable logistics vendor to be used in a company. In order to get the pattern, there are several factors that will be considered for examples the rate given, destination, services provided and etc. The main objective of this project is to analyze past vendor's data set from a company by using data mining technique, thus, it will help the user to make a better decision. By using the technique, the set of data will be group into vendor's company classes and the most frequent vendor that has been used before will be selected and the system will prompt the user. The methodology used in this project is Extreme Programming (XP) methodology because there are many advantages such as this methodology can apply to changes. This project will help a collaboration company to improve their decision making and business performance.

# ACKNOWLEDGEMENT

I would like to express my gratitude to a lot of peoples who directly or indirectly involved while I am struggling finished my final year project. I really indebted with those people who helping me during these times where their presences are the essence to make my project complete.

First and foremost, I would like to express a lot of thank to Allah S.W.T for giving me such a good health and help me completing this two semester smooth and successful. I also like to thank Him for giving me strength to complete my project. My big gratitude goes to my supervisor, Ms. Syakirah Mohd Taib, for guiding me completing my project. Furthermore, she also always help me if I have any difficulties and always kindly to share her ideas. To the MILS staffs especially Pn Alizah Taib and Mr. Affandi Saibani, a bunch of thank for their time in giving me help in collecting the company's previous dataset.

Last but not least, I would also like to express a special thank to my family members for their priceless support, encouragement, constant love, valuable advices, and their understanding of me. Without all of them, I would not go further like where I standing right now.

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## ABBREVIATIONS AND NOMENCLATURES

1. MISC Integrated Logistic Southern Region - MILS
2. Waikato Environment for Knowledge Analysis - WEKA

# CHAPTER 1

# INTRODUCTION

## 1.1 BACKGROUND

Each system which applied with data mining will be able to provide and extract pattern from data given. It means, the system will become an intelligence system because it has ability to make a decision based on information given. With the implementation of data mining in the system, it will make the system has more value and it will help people to make a decision faster without involving emotion or other difficulty.

Nowadays, there are thousands of systems or applications that help people making decision for example, shopping basket analysis system which it will examine the contents of the entire shopping basket as recorded at the time of checkout, store's owner can identify the items that tend to be purchased together. This system is using one of the data mining techniques which are called association rule. Moreover, there are a lot of companies had successfully installed data mining applications in their business work processes. There is a pharmaceutical company that can determine which marketing strategies will help them boost out their company's sales by analyzing its recent sales force activity. The constant and dynamic analysis of the data warehouse allows the organization to apply best practices in specific sales situations. Thus, for a conclusion, in this report, it will contain some research about existing system, the technique that will be used to gather and mine data and also work progression in order to complete the system.

## 1.2 PROBLEM STATEMENT

Currently, staff in the collaborator's company is having a problem in selecting vendor for the customer. In order to find vendors that suit with customer's preference, the staff needs to check back past transaction between the company and vendor's company. Therefore, sequentially, the user cannot make immediate decision each time they selecting the vendor company. Moreover, there is a lot of useful data produce in daily business activity between the company and vendor's company that has not being fully used by them.

Thus, having an intelligence system in a company will improve the speed for making decision. Moreover, making a good decision had become a crucial thing in a business world. Once a businessman took a wrong decision, it will affect the entire company. Hence, nowadays, with the help of technology, it is easier for a people to make a decision. In order to make the system works better, data mining can be applied in the system. With data mining, bunch of data will be analyzed and transformed into valuable information. Previously, the author had to develop a system which allows the user to view each of vendor's rates. However, the function of the system is just to view the vendor's rate and it does not help the user to choose which vendor is the best choice. Therefore, a system that applies with data mining is needed which means, the system will help the user to choose which vendor to be used after considering and analyzing some factors and make full use of data produced in the company.

It is important to develop this system because the company always received some complaints from customers about delivery time and poor services. This problem will affect company's performance and reputation. Thus, with the help of this system, it will increase company's performance and it also helps company to cut loses.

## 1.3 OBJECTIVES

The objectives of developing this project are:

- To analyze past vendor's data set from a company by using data mining technique.
- To calculate the highest probability result on which vendors can be used for next business activity.
- To produce the best result in order to assist people to make business decision.

## 1.4 SCOPE OF STUDY

This system will use data from the Freight Forwarding Department, MISC Integrated Logistic (MILS). In the system, it will allow the user from the author previous internship's company which is MILS to choose which logistic vendor will be used. The logistic vendors are categorized by several categories like inland transportation vendor, sea freight or crane/forklift rental vendor and sea freight vendor. Each vendor has their own vendor's and rate. MILS is a subsidiary of MISC Bhd, a well-known provider of best-in-class maritime transportation and logistics services. MILS is an intermediaries company between vendor who provides logistic services and customer who seek for their services. The dataset collected is about past data transaction between vendor, MILS and the customer. The target user of this system is the company's staff.

The system will provide a decision to the person in charge which vendor from a group of competing vendor, is the best choice to be used based on pattern that had been analyzed. Therefore, after data analyzing had been done by using the data mining technique, a system will be developed and the output from the system will be compared with the user's actual decision. All data had been collected from MILS. The system will be developed by using Visual Basic language and data mining machine learning software which is WEKA to compare whether the result produce by the system is correct or not.

# CHAPTER 2

# LITERATURE REVIEW AND THEORY

## 2.0 INTRODUCTION

A system or application applied with data mining technique can become a powerful tools and it allows great potential for a company to manage and focus of important data in their data warehouse. All data mining tools and techniques predict patterns and future trends in order to allow businesses make a good, proactive and also knowledge-driven decision. There are many businesses already applied data mining applications in making business decisions and most of them had successfully survive and gained more profits. Thus in this research, the definition of what is exactly data mining and vendor logistics will be explained as well as technique that will be used and some advantages of using it.

## 2.1 DATA MINING

Data mining is the emerging science and industry of applying modern statistical and computational technologies to the problem of finding useful patterns hidden within large databases (John, 1997). There are many references can be referred about classification from machine learning, statistics and pattern recognition such as from a book written by Weiss and Kulikowski (1991).

By mining all the information and knowledge from databases, it can become an important area and help generate major revenue to many industrial companies. Usually, analysis in data mining involved past events provided by retrospective tools of decision support systems. According to Ming-Syan, Jiawei and Philip who are interested in digging the beauty of data mining, with the existing capability, it is easy for us to generate and collect data. For example, the use of advanced database software, the computerization of many businesses and the use of widespread had provided us with a large number of data. Because of that, a new techniques and tools

which can intelligently and automatically transforms those data into useful information and knowledge are needed. As a result, data mining had become one of important research area to develop a powerful tool.

## 2.2 VENDOR LOGISTIC

Vendor logistics is a person or a company who manages the flow of goods, information or other resources between the point of origin and the point of consumption in order to meet costumer's requirements. Logistics involved transportation, inventory, warehousing, material handling and security of the goods. In a logistics provider company, for example MILS, they usually outsourced their logistic vendors in order to bring customer's goods from one point to the other point. Vendor logistics involved all processes that need to be done in order to move the goods from one place to another place.

Some of vendor logistics are inland transportation, sea freight or crane and forklift rental. Inland transportation is a service provide by vendor to move goods using lorry or prime movers. Sea freight vendors involved any activities in order to move containers by using sea transportation like ship or cargo. Most of companies involved in logistics believe that each delivery needs to have a right thing, at the right place and at the right time. Therefore, making a right decision in choosing a right logistic vendor is important if those companies want to keep their promises to their customer.

## 2.3 MINING VENDOR LOGISTIC DATA

### 2.3.1 Current Methods

In mining data from vendor logistic data, currently, most of the businessmen do not know the important of mining those data by using data mining technique. According to Liu and Zhang (2009), in China, logistics data have not taken any modern information technique as foundation, which they have not put all the information processes together and make efficiently, unimpeded comprehensive logistics system. There is very little analysis and thought is applied to make decision for selecting logistics vendor become more effective, efficient and automated (Frazell, 2002). The

opportunities of improvement for a better method are learned and gleaned thru data mining and the application of decision support system.

### 2.3.2 Data Mining Techniques

Dr. Fred Menger had said that, "is nothing else than torturing the data until it confesses, and if you torture it enough, you can get it to confess to anything" which means by manipulating and analyzing data, those data can transform into any useful and helpful information people's need. There is article written by Graettingger (2009) which showed a step on translating customer knowledge into actionable business strategies. This can be prove that, by using data mining, there are a lot of predictions can be made before venture in any area.

In data mining, there are many techniques can be used, for example, decision tree, polynomial networks, consensus models, regression and many others. In article written by Jiawei and Micheline (2006), it showed in details on how each of those techniques being used. Therefore, in order to manipulate and find patterns of the data, we need to follow steps in the technique used as well as their algorithm. Finding the correct technique is important in order to get the correct pattern without wasting much time analyzing the data. There are many products of data mining that used the same concept as this system. For example, in article written by Chen, Chou and Hwang (2003), they did a research about analyzing prescription patterns for antacids in Taiwan. In this research, they used association rule technique to identify the drugs prescribed with antacids. By using that technique, they managed to come out with some rules that had been used widely. Many researchers had used this technique to analyze behavior or pattern based on past data. For example, there is an article about evaluating methods that had been used to predict word tendency that often been used in a text (Atlam, Oono and Aoe (2003)). In this research, they used decision tree technique in order to get the result.

In developing vendor rate system, the author used Naïve Bayes Classifier to analyze data because this technique can be successfully used in decision support system.

### 2.3.3 Naïve Bayes Classifier

Naïve Bayes Classifier is an approach for modeling probabilistic relationships between the attribute set and the class variable. This technique is based on Bayesian theorem and is particular suited when performing sophisticated methods. According to Meiner (2003), the Naïve Bayes classifier selects the most likely classification with given attribute values.

## 2.4 ADVANTAGES OF USING DATA MINING TECHNIQUE

In this developing world, knowledge is power. Whoever has more knowledge and information, they definitely can survive. But how we can get more data? This is exactly what data mining is about. Knowledge allows us to make strategic decision which at the end of the day, it will help our businesses to be succeed. In order to efficiently used data mining tools, a large amounts of past data are needed. Many businesses are using automated tools to study the behavior of their customer or supplier. Once information has been obtained, it can be used in various ways which will allow the company to predict behavior of those parties.

## 2.5 CONCLUSION

In nutshell, each dataset can be transformed into useful knowledge by using data mining technique. Therefore, in mining dataset for vendor logistic data, Naïve Bayes classifier will be used as this technique will helps the selected attribute find which class they belong to.

# CHAPTER 3

# METHODOLOGY

## 3.1 METHODOLOGY USED

After a few considerations, Extreme Programming (XP) methodology was selected as shown in Figure 1. There are many other methodologies that can be used like Agile Development methodology or Scrum and Dynamic System Development Method (DSDM).

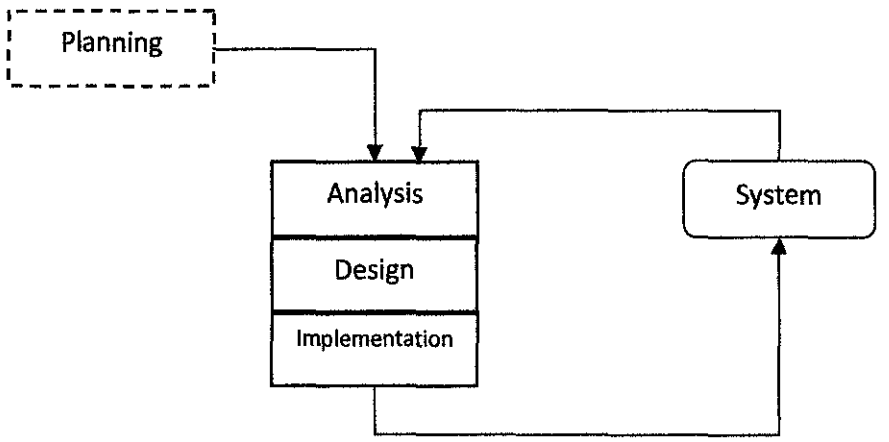



Figure 1: Extreme Programming (XP) methodology.

## 3.2 PROJECT ACTIVITIES

### 3.2.1 Planning Phase

In this phase, there are some plans and decision that had been made. First decision is in choosing the most suitable methodology than can be used in developing the system. After few considerations and studies, XP methodology is being used. There also some plans on how to gather data which through interview and by collect them personally from Freight Forwarding department. Work planned for the whole project also being created in this phase.

### 3.2.2 Analysis Phase

Data analysis had been done in this phase. Some research about which data mining technique will be used to analyze data also had been done in this phase. Those techniques had been analyzed and the best technique had been chose. This phase is crucial as pattern will be generated from data analysis. Data gathering, interview and survey will be conducted in this phase. From the results, data analysis from those techniques will be done. Thus, use case and sequence diagram also will be developed in this phase.

### 3.2.3 Design Phase

Basically, in this phase, codes and databases will be developed. Interfaces also will be created in this phase. Calculation and formula for Naïve Bayes theorem will be generated in this phase. From there, pattern and highest probability will be calculated and codes will be developed based on pattern's result.

### 3.2.4 Implementation Phase

After complete the development and design phase, error checking for the whole system will be done by user. In this phase, the system will be installed in user's computer and user decision in choosing vendors will be collected. The data collected will be compared with the system result.

## 3.3 GANTT CHART

From project's activities, proper Gantt chart that showed activities for each phase and time period that will be taken for each activity had been developed like showed in Figure 2.

| TASK NAME | August | September | October | November | December | January | February | March | April |
|---|---|---|---|---|---|---|---|---|---|
| **PLANNING PHASE** | | | | | | | | | |
| 1. Identify problem statement | | | | | | | | | |
| 2. Identify Objectives | | | | | | | | | |
| 4. Creating Work Plan | | | | | | | | | |
| **ANALYSIS PHASE** | | | | | | | | | |
| 1. Data Gathering | | | | | | | | | |
| 2. Data Analysis | | | | | | | | | |
| 3. Conducted Interview | | | | | | | | | |
| 4. Conducted Survey | | | | | | | | | |
| 5. Analysis Data | | | | | | | | | |
| 6. Creating behavioral models | | | | | | | | | |
| 7. Creating functional models | | | | | | | | | |
| 8. Creating structural models | | | | | | | | | |
| **DESIGN PHASE** | | | | | | | | | |
| 1. Designing Database | | | | | | | | | |
| 2. Designing Decision Tree | | | | | | | | | |
| 3. Designing Pattern | | | | | | | | | |
| 4. Designing Interface | | | | | | | | | |
| 5. Designing System | | | | | | | | | |
| **IMPLEMENTATION PHASE** | | | | | | | | | |
| 1. Construction and Testing | | | | | | | | | |
| 2. Implementation and Training | | | | | | | | | |

Figure 2: Gantt chart

## 3.4 TOOLS AND EQUIPMENT

In this system, Microsoft Visual Basic 2008 Express Edition will be used to developed interfaces and codes. WEKA machine learning software will be used as tool to compare the data set result with the result generate by the system. Microsoft Access 2007 will be used to store database for each supplier. Personal computer is needed in order to run the system.

# CHAPTER 4

# RESULTS AND DISCUSSION

## 4.1 DATA GATHERING AND RESULT FROM INTERVIEW AND SURVEY

### 4.1.1 Interview

After conducting an interview with staffs from Freight Forwarding department, information about present method they used in choosing vendor has been gathered. Currently, when choosing a vendor, the staff in charge will compared each of vendor rates. The lowest rate offered by vendor will be selected. If there are several vendors offered the same lowest rate, the staff in charge will choose based on personal preference or another staff's opinion. Raw data about each vendor's information like price rates and contact's details also collected from the department. Moreover, they still used manual system to compare the rate which is by using table rates store in vendor's file. There is already a system to compare vendors' rate in the department but it is not being used because not user-friendly and quite complicated.

### 4.1.2 Data Gathering from Interview

Data was gathered from collaborator's company. Logistic suppliers are divided to three groups which are Inland Transportation, Sea Freight, and Crane and Forklift Supplier. Rates for each services and company's detail had been gathered. The department deals with fourteen different suppliers including in house supplier. For in house supplier, they only offered several services and for those services, the department is encouraged to use Haulage Department services. The details for three types of services are:

*1. Inland Transportation*

Inland transportation is used for local deliveries in Peninsular Malaysia and Singapore by prime mover or lorry. For this service, the department can choose whether to use in house service which provided by Haulage Department or conventional supplier. Each of suppliers has two types of rates which by trip basis or by tonnage basis except for Haulage Department. The type of rate used is determined by customers themselves. There are eight suppliers including Haulage Department offer inland services which are:

i. Arasis Sdn Bhd

ii. Aero Eagle Sdn Bhd

iii. First City Entreprise Sdn Bhd

iv. Lima Bintang Logistics Sdn Bhd

v. Sankyu (M) Sdn Bhd

vi. Western Cineplex Sdn Bhd

vii. Xin Hwa Trading & Transport Sdn Bhd

*2. Sea Freight*

Sea Freight suppliers offer local deliveries to East Malaysia (Sabah and Sarawak) by ship. There are three suppliers offer this service to MILS which are:

i. MISC Agencies Sdn Bhd,

ii. JM (Johan)

iii. HUB

*3. Crane/Forklift Rental*

In several deliveries, crane or forklift rental are needed to move container or tanks from prime mover to warehouse. Thus, for this department, there are four suppliers offer this service which is Superior, Tiong Wang, Tiong Hang and Gan Fatt.

### 4.1.3 Survey

A survey had conducted to twelve staffs who directly communicate with the suppliers. There are two departments that deal with suppliers which are Freight Forwarding department and Customer Service department. In the surveys, there are five factors each staff need to rate which are service's rate, service quality, on-time delivery, services availability and customer satisfaction. The staffs will grade each factor from scale one to four.

### 4.1.4 Result from Survey

In the survey, the author had analyzed each of questions answered by respondent. Detail for each result is as follow:

Service's Rate

For services rate offer by inland transportation suppliers, there are four companies offer very good rates and had agreed by all surveys' respondent as shown in Figure 3. While for sea freight, about 70% respondents agreed that HUB company offer very good price compared to MISA and JM (Johan). As for crane and forklift services, they agreed that Superior, Tong Hang and Gan Fatt give lowest rate.

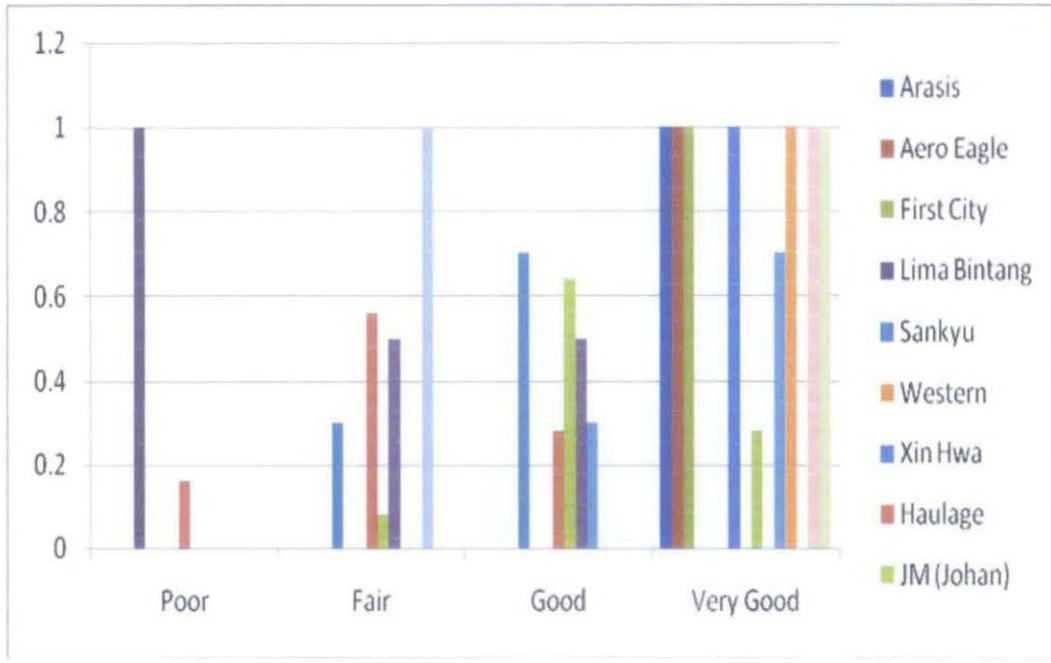



Figure 3: Result of Service's Rate

Service Quality

For this factor, respondents need to consider how good each supplier finished their works, how they take care each delivered goods and how they threat MILS as the customer. From the result in Figure 4, even though there are companies offered low rates but they offered bad quality services.


Figure 4: Result of Service Quality

On time Delivery

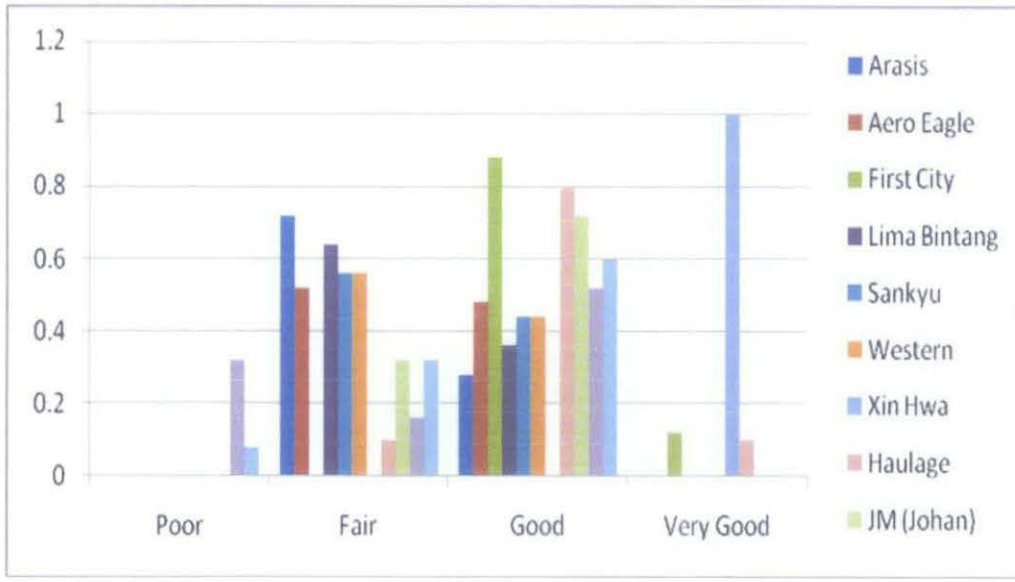



Figure 5: Result of On time Delivery

For this factor, the respondent needs to evaluate each supplier that offers inland transportation and sea freight services. From the survey, all respondent agreed that Xin Hwa is very good in delivered goods on time while for sea freight, JM (Johan) give better on time service compared to MISA and HUB as shown in Figure 5.

Services Availability

The respondent said that sometimes, service's availability for companies like Xin Hwa or First City who offered good rate and good services is poor. Moreover, there is some period where prime movers or lorry in a company offered inland transportation services need to go to inspection or maintenance.

Customer Satisfaction

As shown in Figure 6, the respondents need to evaluate their satisfaction as customers and also considers any complaints from customer who used their services.

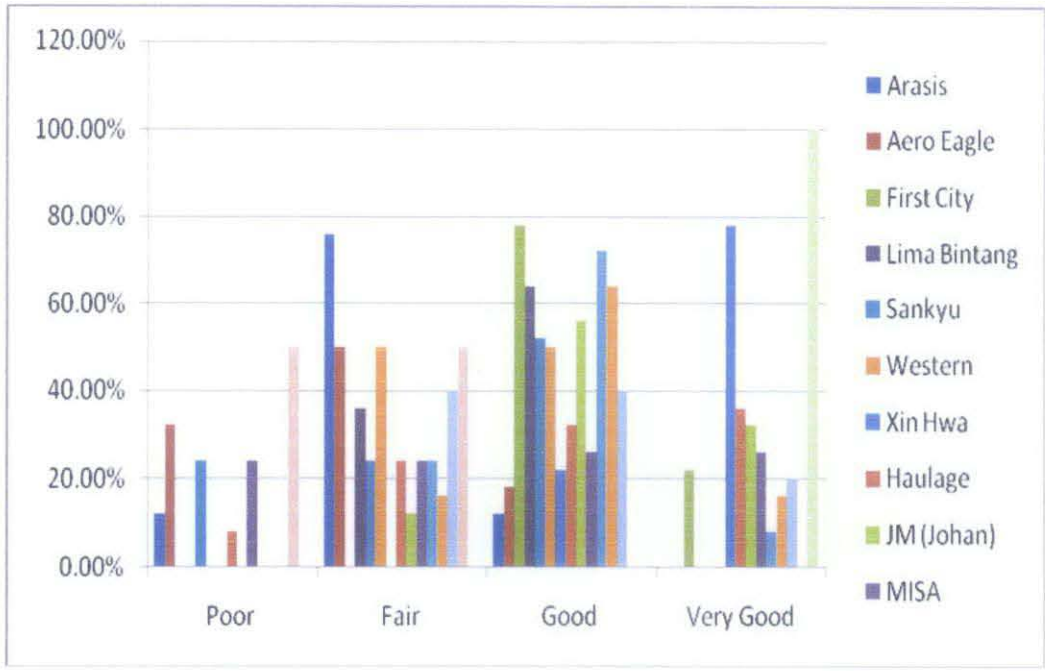



Figure 6: Result of Customer Satisfaction

## 4.2 FINDING FROM DATA GATHERING

Staffs in the department had encountered some problem using current method of choosing the vendor. The first problem is, although they choose vendor who offer lowest rate, the department still receives complaints from customers. This always occurred to sea freight vendor. Even though they offer low rate, but there are some of them provide low quality services such as late delivery, unsecure guard for delivery item, always broke customer's item or involve in major accidents. This can be clearly seen in the surveys' result answered by staffs in the company. All these complaint had effect company's reputation and performance.

Other problem is when there are several vendors who offer same lowest rate, it will be hard for a staff in charge to make a decision in choosing which vendor to use. This will result to late decision making and usually personal preference and other opinion can be bias and lead to wrong selection. Usually if they faced this problem, they need to discuss with their supervisor and checked into past transaction between the company and vendors that meet with customers' preference. Another encountered problem is the manual way they are using is outdated and difficult. By using file to store data, they do not have back-up file and all information in stored in only one

location. Staffs need to share those file with another staff in other department. Therefore, a system that complete with decision making function and user-friendly application to select logistic vendor is needed in the Freight Forwarding department.

## 4.3 ANALYSIS

After collected all information needed and realized current problems in the department, analysis of the data and result of interview need to be done. From the analysis, the author discovered that all the procedures/steps in choosing supplier use manual ways which is it too outdated for a big company like MILS.

To applied Naïve Bayes technique in this system, some new attributes need to be classified in order to calculate the probability. Therefore, from the survey that had been conducted, there are four important factors that will be used as attributes in order to find the vendor's class which are price ranges, destination, based location and type of each specific type needed. There is also services that need user to clarify whether customer complaint is one of important criteria for the customer.

From the analysis, functional models had been created which are activity diagram and use-case diagram.

### 4.3.1 Activity Diagram

Figure 7 is an activity diagram of the system. After the user opens the system, the user will choose one from three services. After choosing the services, the user will select attributes value according to customer choices. Then, the system will automatically calculate the probability for each vendor from dataset according to attributes that had been selected. The probability of each vendor that had been calculated will be compare and the highest probability will be selected. The system will prompt the user the best two vendors that they can used.

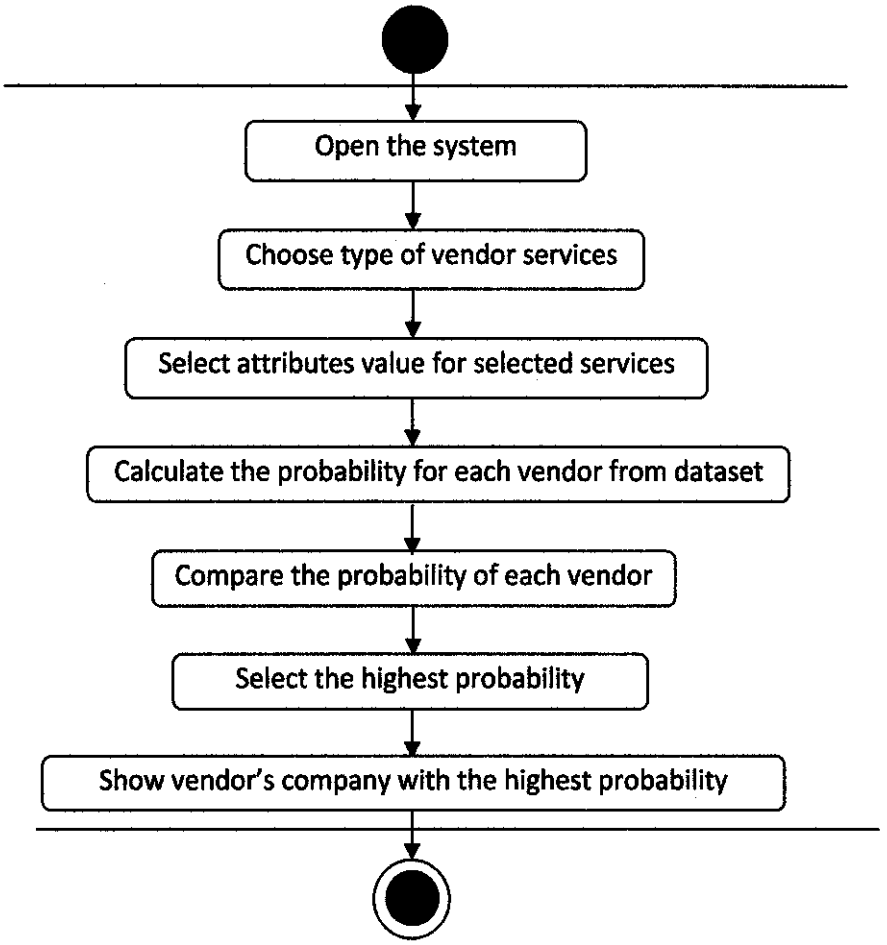



Figure 7: Activity Diagram

### 4.3.2 Use-Case Diagram

In Figure 8, it shows each user's activities when use this system. There are three persons will used this system which are the user who basically the department's staff, the database administrator who will update and manage the database stored historical data and data mining analyst who will regularly check the data mining technique pattern and result to ensure the result produced is always accurate.

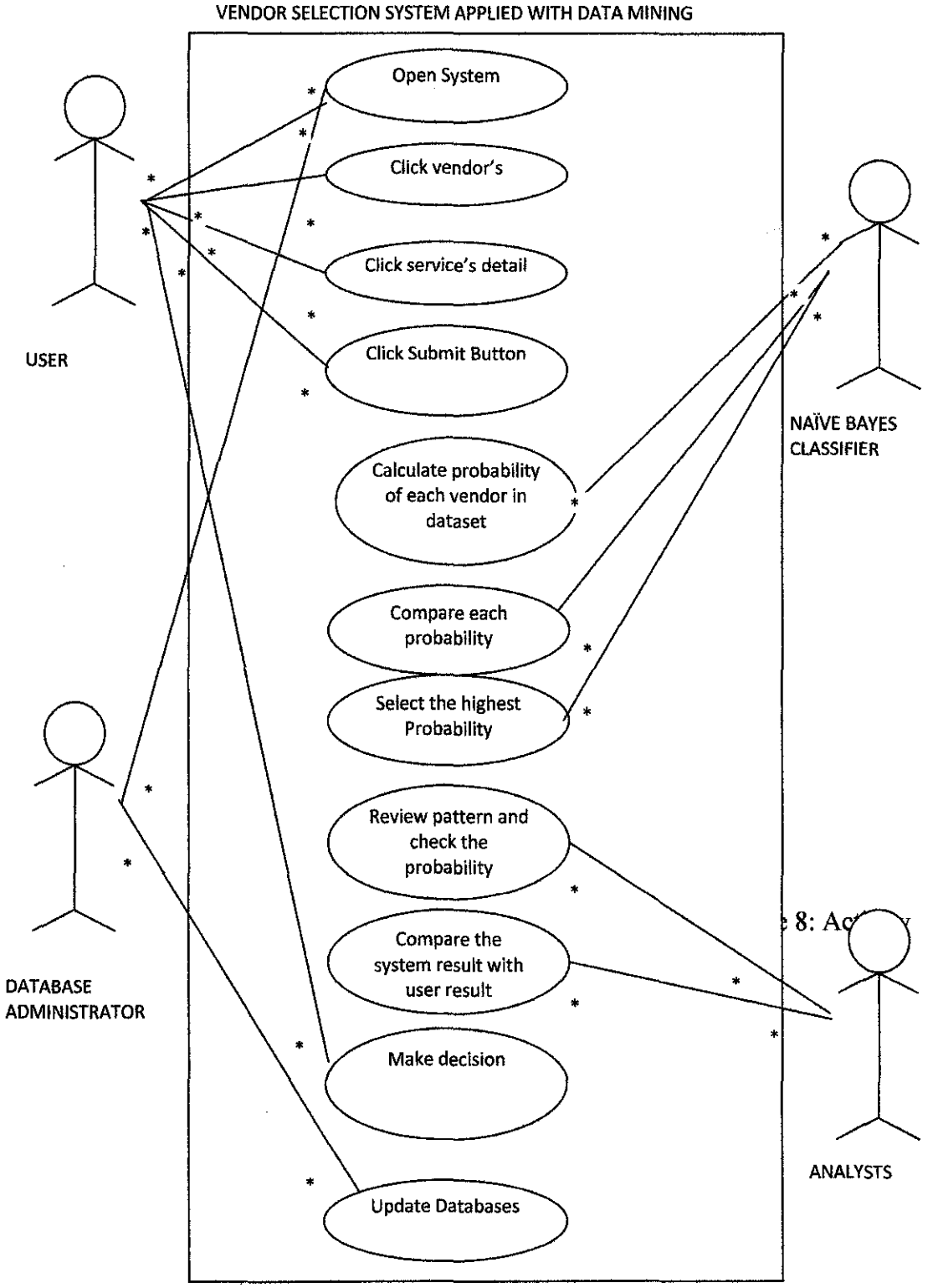



Figure 8: Use Case Diagram

## 4.4 The System

### 4.4.1 How the System Work?

After discovered the company's problem, the system had been developed according to what the user need. As being showed in the activity diagram (Figure 7), the user needs to choose which services they wanted to use. There are three services that the company need which is inland transportation, sea freight and crane/forklift. The interface for the main page of the system is shown in Figure 9.

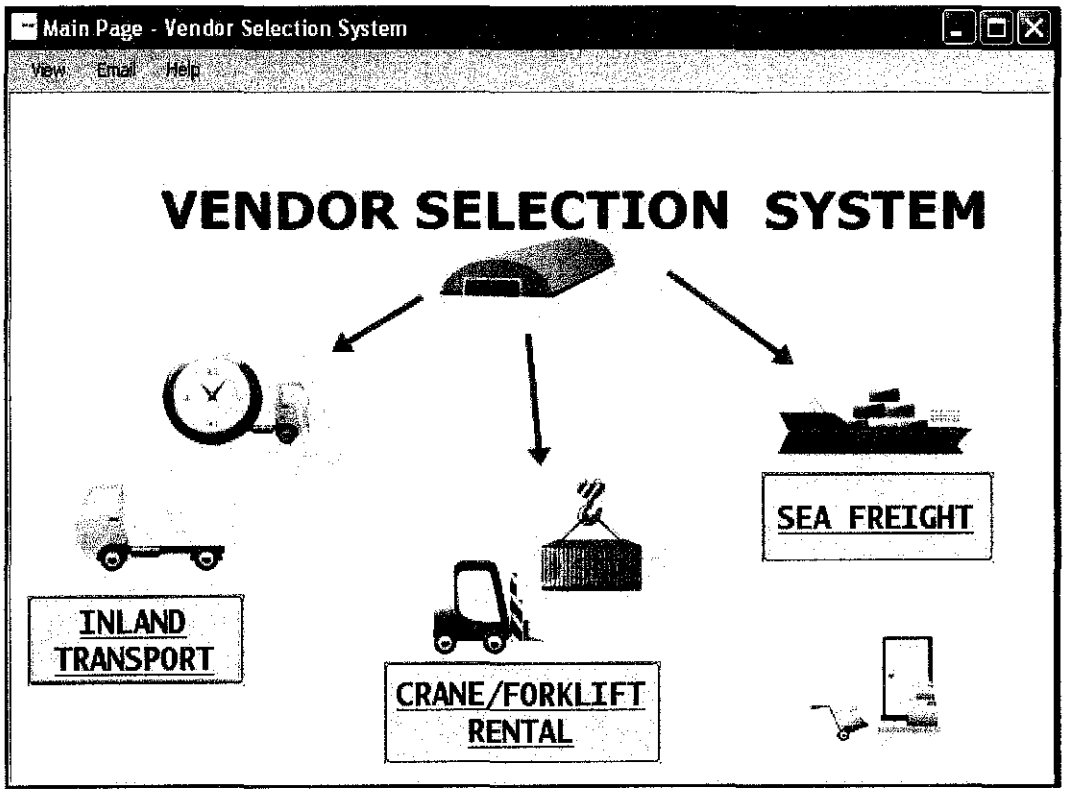



Figure 9: Main Page

There are specific functions for each service because according to the staff, each services had their own problem, thus the system had been developed in order to overcome the problem.

### 4.4.2 System Function

As being mentioned before, there are three type of vendor which are inland transportation vendor, crane/forklift rental vendor and sea freight vendor. The details for each vendor's system function are as follows:

### *Inland Transportation*

The system will show page as in Figure 10 when user click on the inland transportation button. In this page, user needs to choose type of inland transportation whether to use conventional vendor or in house services. Conventional vendors are divided into two types which are vendor who calculate their rate base on tonnage or by trip.

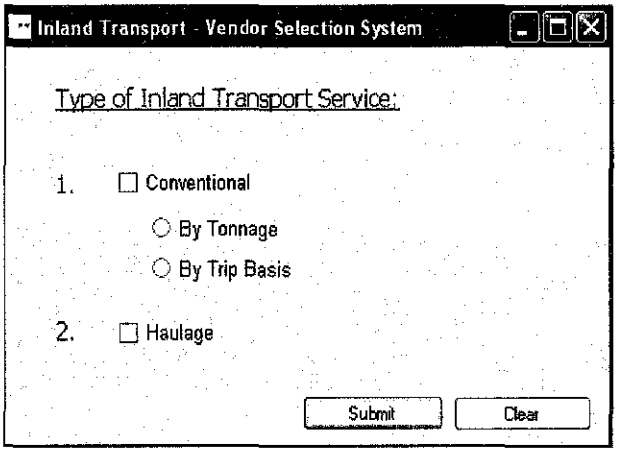



Figure 10: Inland Transportation

When the user chooses by tonnage or by trip conventional vendor, basically, the page like in Figure 11 will be showed. Although they have same page but they are connected to two different dataset stored in database. But, those two types of vendor provide different lorry's type to the customer. After the user choose the attributes value, the system will generate the result which are the vendor that has the highest probability like shown in Figure 12

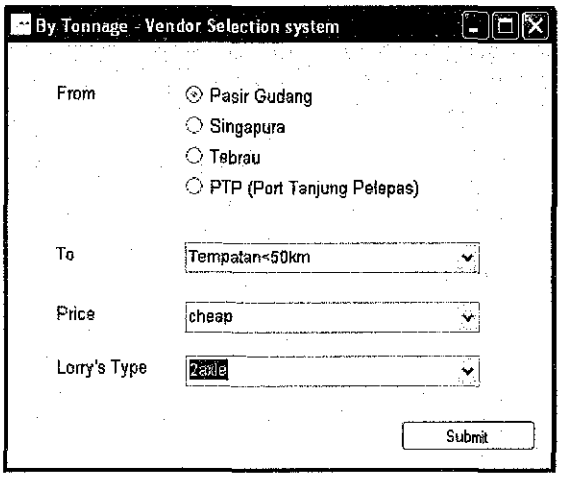



Figure 11: Inland Transportation – By tonnage

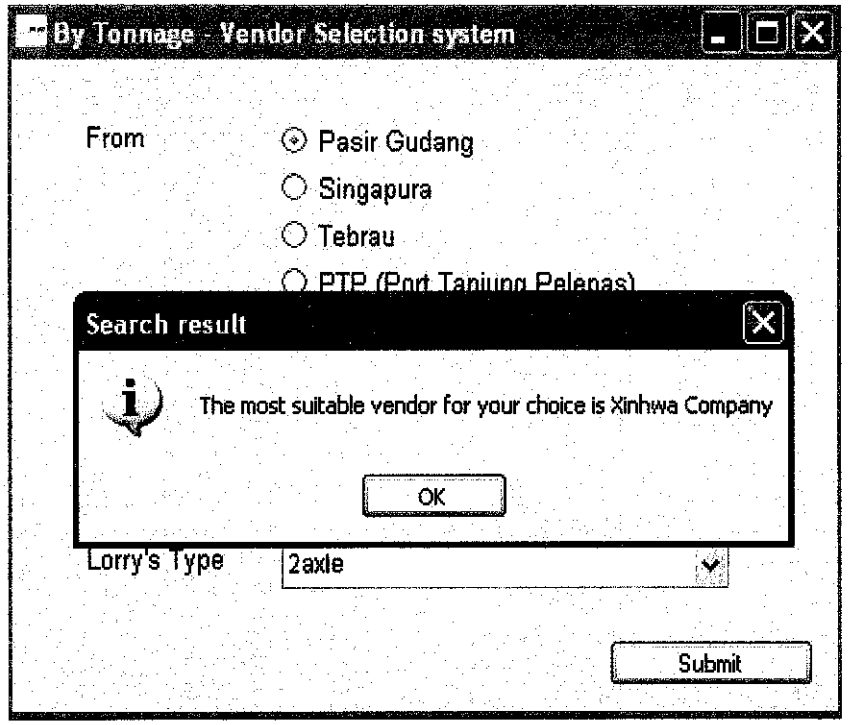
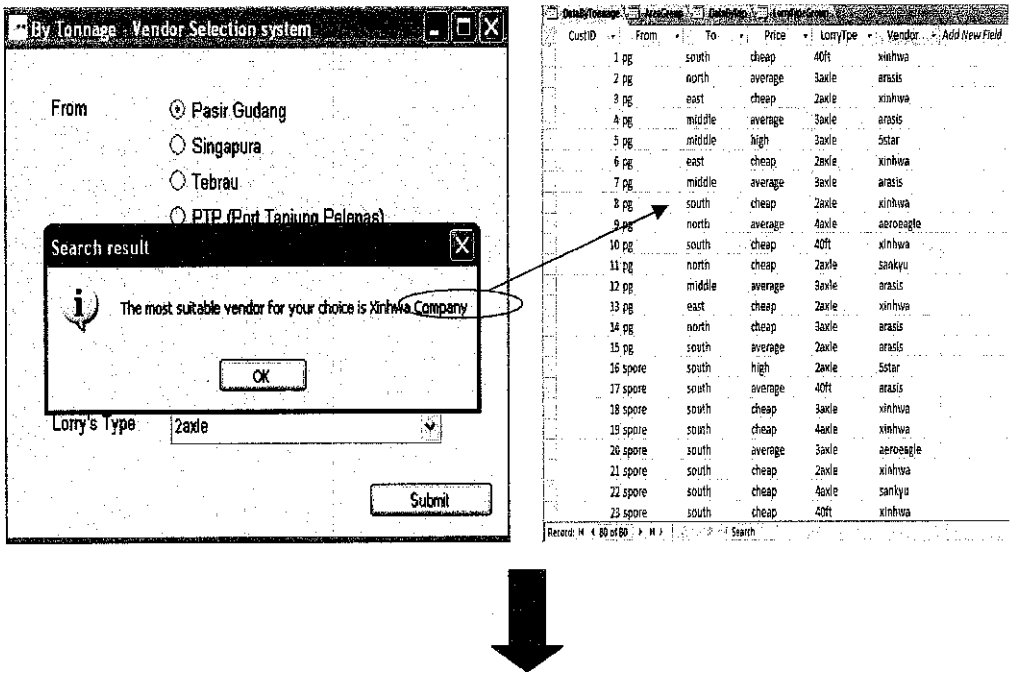



Figure 12: The result

How's actually the system generate the output? Like that has been discussed above, the system use Naïve Bayes formula to class the past transaction between vendor that have same attributes values as what had user chose. The attributes for this data are destination, base location, price range, lorry's type and vendor. The formula is being tested and compared on WEKA.



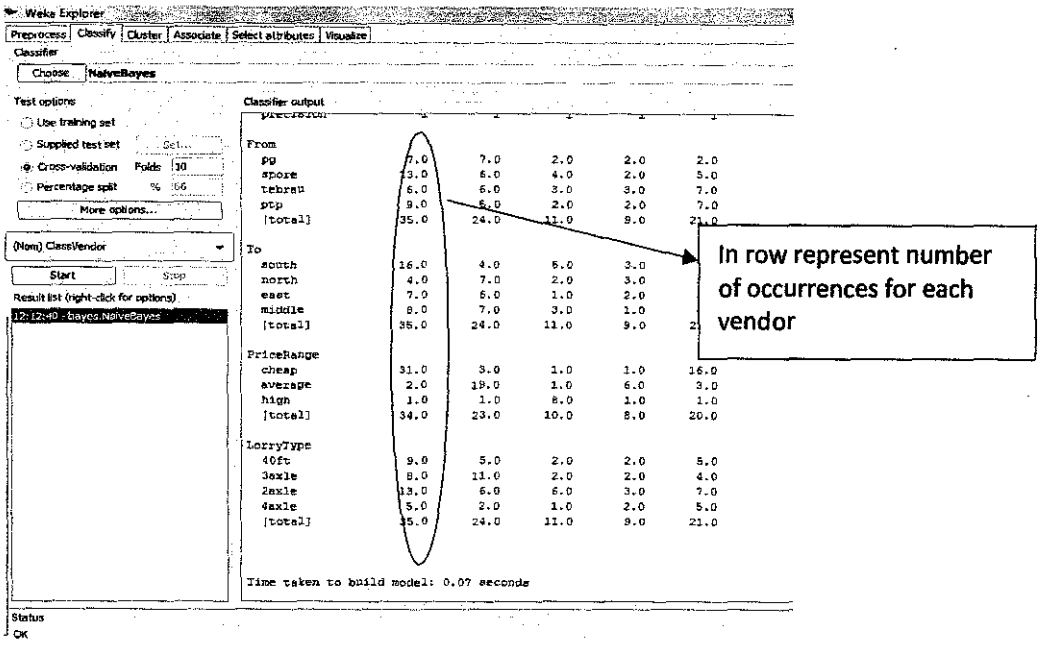



Figure 13: How the system generate the output

Based on Figure 13, the output was generated from dataset about the past transactions. From the dataset, the system will calculate the probability. Below showed how the formula works with database by tonnage conventional vendors.

$$P(Class|Vendor) = P(From|Vendor) * P(To|Vendor) * P(PriceRange|Vendor) * P(LorryType|Vendor)$$

1. $P(Class|Xinhwa) = (7/35) * (16/35) * (31/34) * (9/35)$
$= 0.02143$

2. $P(Class|Arasis) = (7/24) * (4/24) * (3/23) * (5/24)$
$= 0.002717$

3. $P(Class|5star) = (2/11) * (5/11) * (1/10) * (2/11)$
$= 0.0015026$

4. $P(Class|Aeroeagle) = (2/9) * (3/9) * (1/8) * (2/9)$
$= 0.0020576$

5. $P(Class|Sankyu) = (2/21) * (7/21) * (16/20) * (5/21)$
$= 0.006046$

As Xinhwa Company has the highest probability which means, for the attributes that user has chose, Xinhwa is the most frequent company that had been selected according to past transaction. Basically, for by trip conventional vendor also used same formula and concept as showed above. If user chooses haulage for inland

transaction type, it means the customer wants in house services provided by MILS. Thus when the customer choose this type of services, the user also need to select what the customer wants and the rate price for the selected criteria will be showed to the user as being showed in Figure 14.

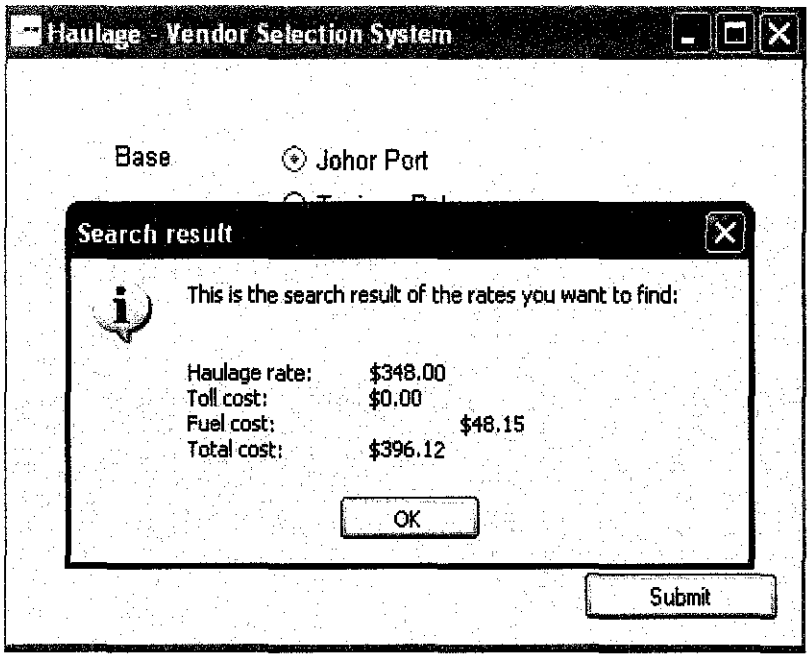



Figure 14: Inland Transportation – Haulage

***Crane/Forklift***

For crane/forklift services, currently, there is only one vendor that had been used by MILS. Thus, for this services function, the user can see the vendor rate by month or by daily basis after choosing the crane/forklift type like being showed in Figure 15.

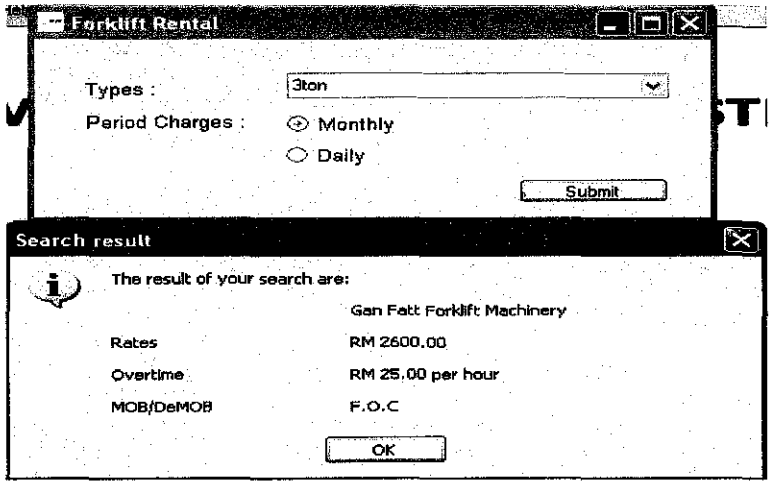



Figure 15: Crane/Forklift

***Sea Freight***

For sea freight services, there are some problems made by vendors thus it leads to customer complaints. Therefore, for sea freight service, before vendor selection being made by analyze past transaction of the vendors, the user will be asked whether the customer really care about vendor's reputation or they do not mind using vendor who has bad reputation regarding about customer complaint.

Thus, for that reason, after user made their selection about customer choice, the user will be prompt by the system whether the customer cares or does not care about customer complaint like being showed in Figure 16.

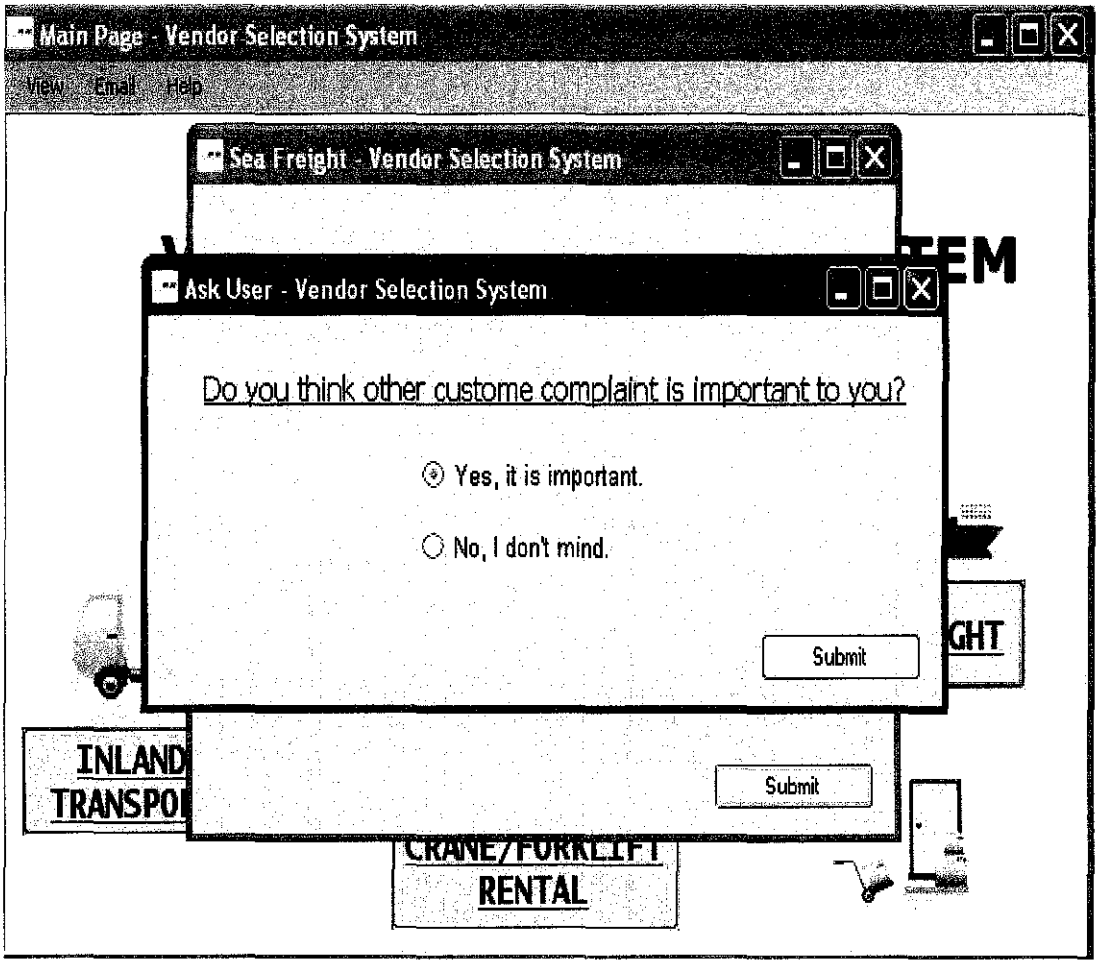



Figure 16: Sea Freight – Prompt User

If number of complaint become one of crucial factor to the customer in order to find the sea freight vendor, number of complaint will be consider and become a weightage when calculating the probability. For the company who has higher number of complaints, their weightage will be lesser compare to the company who has less

number of complaints. Below showed the two results if the choose to care about number of complaints and the other way around like in Figure 17

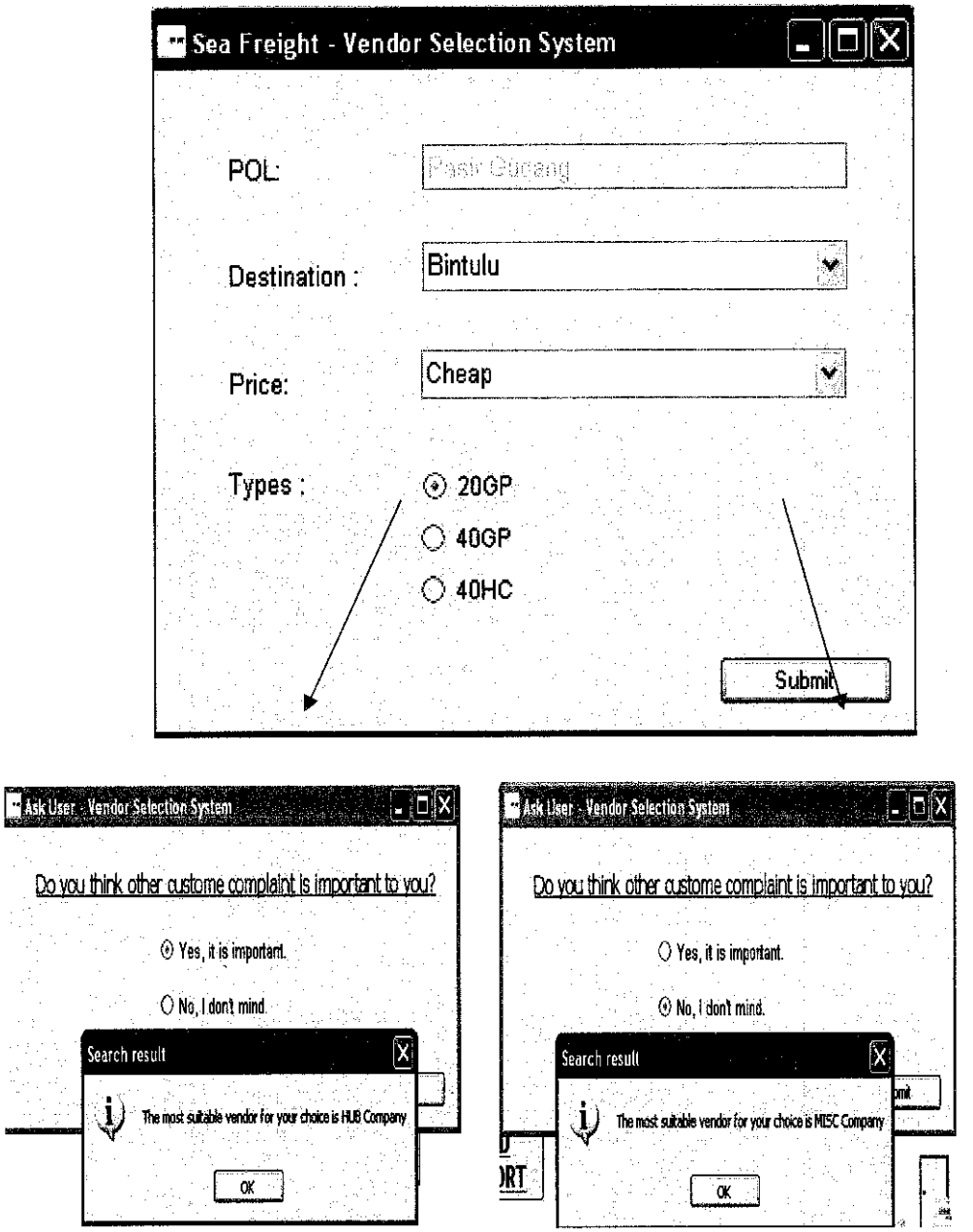



Figure 17: Result comparison for Sea Freight

**Others Function**

The other function include in the system is email function and information about each vendor's company. With the email function, after the user knows the best vendor that they want to use, the user can directly email the vendor through this function. All the details about the vendor like person in charge and the email address can be retrieved in the system as shown in Figure 18.

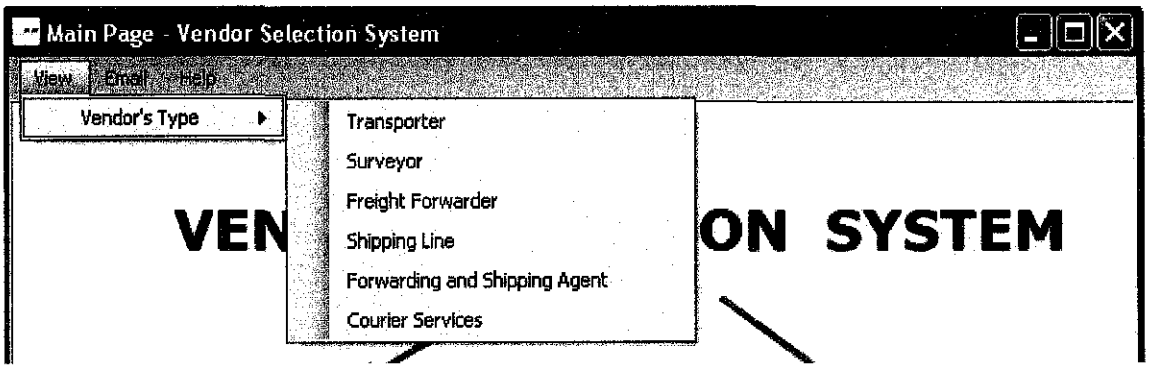



Figure 18: Email and Vendor's Information function

# CHAPTER 5

# CONCLUSION AND RECOMMENDATION

As a conclusion, with the existing of the system, it will prove that an intelligence system is very important for businesses in order to success. In this project, the result of the system that used data mining techniques will be compared with the actual result that being choose by the user. After doing some research, data mining is used in many areas such as financial application, basket stores analyses and others. There are also some projects that had been developed outside that quite similar with the system which need to come with decision but those projects are in the different area.

As this project used historical transaction data, there will be a problem if there are new vendor joined the company because this technique will choose the highest occurrence in selecting a vendor. Thus, for this problem, it is recommended for a user to revise the result produce by the system and it is up to company's management whether they want to give opportunities for the new vendor or not.

Therefore, in nutshell, each data contains business activity that have been produced and stored can be transformed into new and useful information. With this new information, this system can help people/staff makes decision quickly and improve business activity process. In order to see whether the developed system is useful or not to the department, analysis about the result produced by the system and the user final choice need to be done in the future.

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