SUPERVISOR VALIDATION

I hereby declare that I have read this thesis and in my opinion this project is sufficient in terms of scope and quality for the award of Bachelor of Technology Management (Innovation Technology)

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A STUDY ON ACCEPTANCE TOWARD CONSUMPTION OF NATURAL GAS VEHICLES AMONG CAR DRIVERS IN MELAKA

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DECLARATION

I hereby declare that the report has been prepared by my own self except the summaries and citation that I have been clarify the resources.

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DEDICATION

To my amazing family and all my friends. Thank you.

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ABSTRACT

For this research, it is a study on consumption of NGV among car drivers in Melaka. This research will be conducted in Melaka which involved the respondent which is car drivers in Melaka. This study also conducted to concern of air quality in order to protect our environment from any danger. One of the biggest issues is the emission of carbon monoxide from automotive car and the gases have been produce by petroleum which is one of the transport fuel. This research also has been conducted because of the policy of state government of Melaka. The aim of this study is to identify the degree of understanding and factor impact the consumption of natural gas as replacement for transportation fuel and the benefits of this replacement for petrol fuel. The populations of these study 100 respondents. The appropriate question will be asked and data collected will be shown as figure to make this result more clear. This research used a method like a survey, filed observation, and quantitative methods. The researcher objective will be archived and answering the research question.

KEYWORD; BENEFIT of NGV, MELAKA, PERCEIVED USEFULNESS, PERCEIVED EASE OF USE

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CHAPTER 1

RESEARCH OVERVIEW

1.0 INTRODUCTION

This chapter is about the introduction of the research. This introduction is important to determine and identify the success of the research using iron triangle. This research is conduct to investigate about a study on acceptance toward consumption of natural gas vehicles among car drivers in Melaka. This chapter comprises several part of study. The first part of study is research background regarding Natural gas Vehicle (NGV) revolution and history of Natural gas Vehicle. The second part is discussing about the problem statement that may arises from Natural gas Vehicle around the world. The problem statement acts as the core of this research. Third part from this research is research questions. The research question for this study divided into two main questions that will be further on discuss the dimensions that give impact towards consumption of NGV among car driver in Melaka. Next, this study will continue to discuss on research hypothesis, scope and key assumptions of the study, limitation of study and significance of the study which will be explain the study on acceptance towards consumption of NGV of this research. Last parts of this study are the structure of thesis and summary from overall chapter.

1.1 Background of the Study

This study is about technology adoption of natural gas vehicle (NGV) among car driver in Melaka. The consumption of natural gas has been discovered early in 1930 in Italy, however, it only has been consume in year of 197-s while the fuel oil has a crisis (M. I. Khan,2015). Transportation sector is one of the major components of globalization and makes a vital contribution to the economy but this activity is major energy consumption and use most of the limited non-renewable energy that creates a negative impact to living environment (H.C. Ong, 2011). According to Hooi Ling Khoo, it is important to cities in developing countries to have an effective and sustainable transport system because it can make the economic growth is sustainable (H. L. Khoo, 2012). Based on statistic shown by Energy Information Administration (EIA) that it around 120,000 natural gas vehicles operated in the U.S. and that they consumed about 250 million gasoline gallon equivalents (GGEs), while NGVAmerica estimates there are 150,000 on-roads today in the year of 2011 (EIA, 2015; NGVAmerica 2014).

Previous study shown that there are some factor that affecting the growth of the NGV fleet in Russia which is location of NGV and the determination of the actual quantity of the natural gas (E. Chikishev, 2016). However, NGV offer the benefits of reducing oil use, CO2 emissions and air pollutants compared to conventional gasoline and diesel vehicles according to Han Hao (H. Hao, 2015). NGV technology has both technical and logistical obstacles to overcome before becoming a viable general solution for vehicle fuels but the CSC is a perfect place to improve upon the technology and promote student innovation while doing so.

In Malaysia, the awareness of consumption of natural gas vehicle (NGV) has been promoted by government. According to Zulkifli Abdul Majid (2015), the urban transportation and industrial activities in Malaysia have aggravated the problem with the consumption of transportation fuel and petroleum, diesel and oil in industrial activities. According to H.C. Ong (2012), Malaysian government has launched the biofuel policy which is EnvoDiesel in all fuel station and industrial sector in 2008, however, this policy

is unsuccessful and then government implement the mandatory use of biofuel for vehicles in 2011. These statement shows that Malaysia is among other developing countries that show their commitment to replace transportation fuel to natural gas.

On the other hand, statistic shows that there was an increase in emission load for CO and SO2 with an increase of 3.71 % (2010) and 1.69 % respectively compared to 2009. These shown that Malaysia is one of the contributors for producing the gas emission and it is definitely need to be overcome by government. This study is to identify the degree of understanding of consumption of NGV among car drivers in region of Melaka while recognize the factor impact of the usage of this technology besides explaining the benefits for it consumer.

1.2 Problem statement

Nowadays, the issue of gas emission has shown us to replace the consumption of transportation fuel to more green technologies and the consumption of natural gas vehicle (NGV) really can reduce the emission of gasses carbon monoxide produce by transportation fuel. According to Sonia Yeh (2007), the adoption of alternative fuel vehicles (AFVs) such as NGV is one of the most important strategies to address the issues of energy dependence, air quality, and, more recently, climate change. As we know, natural gas vehicles (NGV) really can give environmental benefits for reducing local air pollution compare to diesel buses or heavy-duty (S. Yeh, 2007). Therefore, some countries have launched the policy in order to protect environment from any pollution produces by transportation fuel. According to Beth-Anne Schuelke-Leech (2013), the policy of incentives and economic reality encouraged the diversification of transportation fuel in Europe countries. This statement proves that support from government is important in order to implement and promote this technology. On the other hand, developments of green technologies also make this NGV become more

establish to replace transportation fuel. The adoption of NGV not only gives benefit to environment, it also gives benefit to car driver.

In Malaysia, the transportation sector alone accounted for 36% of total energy use in 2008 and it shown that the consumption of energy is increased (H.C. Ong, 2012). Plus, it is estimated that in 2010 the combined air pollutant emission load was 1,681,440 metric tons of carbon monoxide (CO) (Z. A. Majid, 2015). A part from it, this statement raised serious concern in the Malaysian government about the need to overcome heightened energy expenditure by promoting the end-use energy efficiency. According to H. C. Ong (2012), Malaysia‟s crude oil production has declined in recent years and the average oil production is around 690 thousand barrels per day in 2008 with production rate is consistent at around 700 thousand barrels per day, the ratio between reserve and production of 21 indicated that Malaysia‟s oil reserves will be exhausted in next 21 years. This statement shows that Malaysian government needs other energy consumption in order to overcome this problem and natural gas vehicle (NGV) is one of the best replacements for it. As we know, the transportation sector which fully utilizes petroleum products is no doubt the main contributor in (CO2) emission and the pattern of emission for the gas CO2, SO2, NOx and CO emissions had increased steadily over the past 13 years and still moving upwards. (H.C. Ong, 2012). Malaysian government show their commitment by promoting NGV with giving incentives and legislation, exemption of import duty and sale tax on NGV conversion kit to encourage vehicle owner use natural gas (H.C. Ong, 2012). Besides that, the raise of petroleum price in Malaysia also makes this technology become more important to Malaysia citizens.

On the other hand, this technology is most important in order to respond and react on policy of state government for green technology in Melaka. There are two main issues in this study regarding state of Melaka. First is about policy of state government of Melaka which is want to make Melaka become a state that use green technology according to the slogan of Melaka. Second is the increasing cost of petroleum in Malaysia also affecting car driver in Melaka and it will make this technology become a good thing for all car driver especially in Melaka. Car driver need to find other source

that can replace petroleum as transportation fuel and absolutely NGV is the best technology to become replacement for petroleum. Car driver might save cost of increasing the petroleum in Malaysia.

1.3 Research Question

Research question that will be investigate including all listing below;

1) What are the benefits to consumption of NGV among Melaka"s driver?
2) What is the factors impact consumption of NGV in car driver in Melaka?

1.4 Research Objective

The objective of this study is to examine consumption of NGV. This study involved respondent which is Melaka"s driver. This research aims to identify;

1) Identify the benefits for using NGV among Melaka"s drivers.
2) Determine the factor impact consumption of NGV among Melaka"s drivers.

1.5 Scope of Study

The scope of this study is to identify and clarify the understanding and awareness about NGV among the driver in Melaka. Thus, the researcher makes a relationship between production line activities and environment burden. This project want to identify whether the car driver in Melaka manage to support environment with NGV technology which not giving a negative impact to our environment. Thus, target respondent in this project is any car driver in Melaka who are using or not using this NGV in their car.

They can give the response according to understanding and awareness of consumption NGV and clarify the obstacle for this consumption. This research also covered framework from previous research. It may help researcher to identify and clarify the entire research question accurately.

1.6 Limitation

The researcher assumes all respondents provide honest answer. The researcher has adequate knowledge to be part respondent for primary collection. The researcher assumes respondent has more experience in handling this research topic where she/he can provide justifiable answer.

1.7 Important of this project

This study will benefit on the university because this research conducted for academic research. This study also can be a reference for other student especially in University Teknikal Malaysia Melaka to improve and makes new research related to this study. Besides, the project also provides a deeper study on technology adoption which the consumption of Natural Gas Vehicle (NGV). Other important is it can build up awareness and understanding of consumption NGV among Melaka‟s driver. This study also will encourage them to use NGV and promote a green technology in order to reduce pollution and save our environment. The mainly things of this study is to identify and justify the awareness and understanding among Melaka‟s driver and what the obstacle that making them not choose this technology.

1.8 Summary

This chapter 1 covered for introduction and background study, problem statement, research question, research objective and significant study. In significant study, it includes limitation, scope of study, and the important of this project. Thus, further study on this topic will make reader clearer about the consumption of NGV.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter wills discussed about literature review that relate to technology adoption of natural gas vehicle (NGV) among car driver. In emphasized car drivers to adopt new technology in their consumption for their daily life also and the same time can reduce air pollution in order to improve the quality of environment especially air. As we know, most of countries are concern about to adopt green technologies in order to save our environment. To achieve the objective of this study, the information about technology adoption, and the framework were obtained from various source for example journal and online article and also published book. All the data collected is useful especially for organization and government for potential future.

2.1 Previous Study & Definition of NGV

A Natural Gas Vehicle (NGV) is an alternative fuel vehicle that uses compressed natural gas (CNG) or liquefied natural gas (LNG) as a cleaner alternative to other fossil fuels. CNG may also be mixed with biogas, produced from landfills or wastewater, which does not increase the concentration of carbon in the atmosphere. Thus NGV is a technology that can help environment in order to improve quality of air.

According to H.C. Ong, the transportation sector which fully utilizes petroleum products is no doubt the main contributor in CO2 emission (H.C. Ong, 2012). This statement shown those petroleum products absolutely are the main reason for environment pollution. To overcome this problem, efficient decision making and proper formulation of policies are necessary for promoting sustainable transport in a region according to Hooi Ling Khoo (H. L.Khoo, 2012). In Melaka, the policy to protect environment from pollution has been launch to encourage the consumption of green technology in Melaka. It showed how government concern about issue of the pollution. From the previous research, the researcher can conclude that the consumption of natural gas vehicle (NGV) is not only Malaysian issue but it becomes global issue in order to protect environment from any danger, thus, it can raise the quality of air.

2.2 Factors Impact The consumption

Typically, there are some factors that influence car drivers to use natural gas as replacement for transportation fuel. Recently, global shows that many car drivers are converting their vehicles to natural gas consumptions effect by reasonable factors. In Russia, there are three main factors that cause their car drivers change their consumption from transportation fuel to NGV which is because of locations of NGV, determination of the actual quantity of natural gas, and design features of NGV and methods of gaseous fuel consumption control (E. Chikishev, 2016). According to Beth-Anne Schuelke-Leech (2013), the adoption of any technological change is influenced by many factors such as economic, political, market, capital, and institutional factors. However, in the United States, there is no coherent energy policy or consistent incentives to spur the widespread adoption and use of natural gas as transportation fuel (B. Schuelke-Leech, 2013). These statements had shown every country that wants to adopt natural gas as replacement needs to have support from government through government policy.

Meanwhile, in Malaysia, the factors impact consumers to use NGV involve brand, service, price, and promotional strategy creates acceptance to the PETRONAS NGV (A. Amer, 2010). That statement shows that government of Malaysia is committed in order to overcome the problem related to cost saving and environment. According to H.C. Ong (2011), the factor led to a drastically increase in the number of new NGV in Malaysia is about fuel subsidies were gradually removed from year 2008, the subsequent 41% price hike on petrol and diesel. He also state that government‟s support for NGV development also one of the factor might influence consumer to choose this kind of technology. According to Hooi Ling Khoo (2012), he agrees that government‟s support is one of the factors of growth NGV besides awareness, and service availability. From previous research, the researcher can review that all the factors can give an impact toward consumption of natural gas vehicles (NGV).

2.3 Benefits Toward Consumption of NGV

Based on study conducted by Zulkifli Abdul Majid (2015), he has conduct an experiment for testing the consumption of NGV to prove that NGV is one of the green technologies that can overcome the problem of air pollution with the result shows that the natural gas fuelled engine gives a complete combustion, which decrease 99.6 % of carbon monoxide and 72.5 % of unburned hydrocarbon at a speed of 70 km/hr compares to gasoline fuel. He also state that natural gas also give benefits for the technical in term of the combustion, exhaust emission, and engine oil temperature compare to the consumption of petrol and diesel.

According to Muhammad Imran Khan (2015), the benefits are divided by four aspects which are technical aspect, environment aspect, economic aspect, and safety aspect. There are three elements in technical aspect which is mixing, maintenances, and engine performance shortcomings and all the elements show that NGV give full benefit in term of combustion, easy to maintain, and engine design (M. I. Khan, 2015). He states

that NGV might be good for environment because of the consumption might reduce gas emission that can cause greenhouse effect and air pollution. On the other hand, NGV also give benefit to economic by preparing affordable source energy and it is cheaper than diesel and gasoline (M. I. Khan, 2015). NGV also give benefit through safety aspect and NGV is the safest transportation fuel. According to Muhammad Imran Khan (2015), NGV will not burn even in the presence of a spark because NGV is lighter than air, therefore, it can reduce the probability of a fire if the tanks is breached. From the previous study, it shows that many benefits are provided by NGV consumption.

2.4 Model Used

In 1989, there are new model and theory developed by Davis which is Technology Acceptance Model (TAM). TAM has been developed by Davis to evaluate users‟ subjective satisfaction rates and use such rate prediction of system or technology„s success (Davis, 1989). TAM is to provide a basis for tracing the impact of external variables on internal beliefs, attitudes and intentions and was designed to predict technology acceptance and consumption. There are two important factor in explaining the consumption which is perceived ease of use and perceived usefulness. Perceived of usefulness (PU) is the degrees of person believe that using a particular system would enhance his or her productivity (Davis, 1989). PU of NGV consumption is determined as the person feel that it is a tool to save some money in order to face the increasing of petroleum price in Malaysia. Perceived ease of use (PEOU) is how easy the technology to be used. They may feel that the technology is too hard to use and learn even the user believe that the technology or application is useful (Davis, 1989).

There are five elements according to original version of TAM model which is perceived usefulness, attitude towards using, behavioral intention, and actual use. However, the attitude construct was removed from the model on later revisions (Venkatesh and Davis, 2003). Figure below shows the final version of the TAM model.

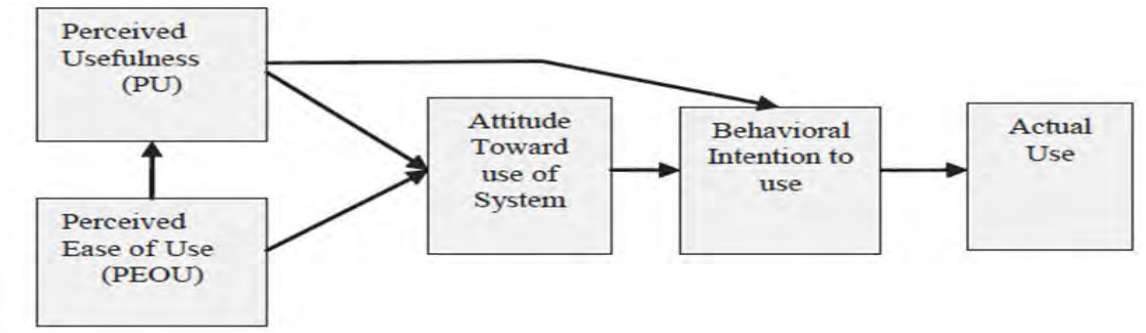

Figure 2.5 shown TAM model by Davis

Perceived Usefulness: According to Davis (1989), perceived usefulness has been defined as the degree to which people or organization believes that using a particular system would enhance their job or daily performance. In this case, car drivers in Melaka believe that adopt of natural gas vehicles (NGV) will enhance the performance of their vehicles as well as to maintain the quality of vehicles.

Perceived Ease of Use: This element refers to the degree to which organization or people believe that using particular system or technology would be requiring no effort. In this issue, car drivers in Melaka believe that acceptance towards natural gas vehicles (NGV), they do not require high cost to convert to natural gas consumption. Moreover, it is an advantage to them because they can enjoy the cost efficiency while using this technology.

Attitude: attitude was defined by Davis (1989) as an individual is not the only factor that determine his use of a system or technology, but it also influence by the impact which the technology may have on his performance. In this case, even if a car driver does not welcome any information, the probability that he will use it is high if he perceived that the technology will be improving the performance of vehicles. Furthermore, before natural gas are adopted in Malaysia, car drivers in Malaysia especially in Melaka are using transportation fuel such as petroleum and diesel. The cost of petroleum is higher than natural gas. So that, with NGV car drivers might improve their vehicle performance and enjoy the benefits of consumption in term of cost benefits to their consumer. When they are converting from petroleum to natural gas, thus, they might save some cost of the transportation fuel.