THE MAIN FACTORS AFFECTING CHOICE OF VEHICLES AMONGST NEW GENERATIONS

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THE MAIN FACTORS AFFECTING CHOICE OF VEHICLES AMONGST NEW GENERATIONS

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DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed… .....ifhami.....(Mohamad Ifhami Bin Ab Razak)

Date… .....(02/07/2021)

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated.

Other sources are acknowledged by giving explicit references.

Bibliography/references are appended.

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This thesis titled “The main factors affecting the choice of vehicles amongst new generations” has been completed successfully with kinds of support and help from many individuals. I would like to express my sincere thanks to all of them.

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TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

FAKTOR-FAKTOR YANG MEMPENGARUHI PEMILIHAN KENDERAAN DI KALANGAN GENERASI BAHARU

ABSTRAK

Keupayaan untuk memahami faktor-faktor yang menyumbang kepada pemilihan kenderaan adalah penting kepada pengilang kereta, penggubal undang- undang dan pihak kerajaan dalam menyediakan sistem kenderaan terbaik kepada pengguna. Kajian yang dijalankan ini bertujuan untuk mengenalpasti faktor-faktor yang akan mempengaruhi pemilihan kenderaan dalam kalangan generasi baru berdasarkan kepada tujuan dan kemampuan membeli dan seterusnya mengklasifikasikan faktor-faktor tersebut kepada kriteria kejuruteraan dan bukan kejuruteraan. Kajian ini dijalankan dengan penyediaan boring soal selidik untuk menganalisa faktor-faktor yang akan menyumbang kepada pemilihan kenderaan. Keputusan yang diperoleh telah dianalisa untuk mencari persamaan di antara generasi baru. Hubungan di antara faktor-faktor yang terlibat seterusnya dikaitkan dengan umur, kawasan kediaman dan jumlah pendapatan bulanan kesemua responden. Dua faktor yang amat mempengaruhi pemilihan kenderaan adalah keselesaan dan kos sementara faktor-faktor lain seperti kekerapan servis, keprihatinan terhadap alam sekitar, kesesakan trafik, reka bentuk dan keselamatan turut menyumbang kepada pemilihan kenderaan.

THE MAIN FACTORS AFFECTING CHOICE OF VEHICLES AMONGST NEW GENERATION

ABSTRACT

The ability to understand the factors that contributed to the choices of vehicles is important for the car manufacturers, policy makers and the government in order to prepare the best vehicle system for the consumers. This research was aimed to identify factors that will affect the choices of vehicles amongst the new generations according to the purposes and affordability and then classifying the factors between engineering and non-engineering criteria. This research was conducted by preparing a survey to analyze the factors that will contributed to the choice of vehicles. The results obtained were analyzed to find the similarity of factors between the new generations. The relationship of the factors were linked to age, region of residence and the monthly income of the respondents. Two factors that heavily affected the choices of vehicles are comfort and cost while other factors such as frequency of service, concern on environment, traffic congestion, design, and safety also contributed to the choices.

CHAPTER 1

INTRODUCTION

1.1 Project Background

This project is focusing on the accumulating of data and analyzing it according to statistical views by using several method of analysis. The mode of transportation's choices amongst the new generations will be studied according to their purpose and affordability. Based on the rough observation, one of the main factor that will affect the choice of transports is for movement from one place to another place become easier. In this research, the term new generations were restricted to the ages of 8 up to 50 years old because the ability to purchase the transports also need to be considered. Bicycles and motorcycles seem to dominate the choices especially for people in the rural area. For the urban population, public transports such as buses, taxis and trains will be used frequently, as they are easily available in the cities.

This study will be focusing on both engineering and non-engineering factors that will affected the choices. People from wealthier backgrounds usually can afford to purchase a personal car on their own. For those who lives in countryside, motorcycles will be the best choices even though for the female. As time flies, we can see that cars also have become the parts of life for people no matter where they live.

Traffic congestion is one of the factors that will influence the type of transport that the new generation will choose from. Low availability of public transport is believed to be a major contributor to this problem [1]. As a result, people tend to have their own private transports to solve the problem, especially

with the policy of federal government that are actively promoting the local automotive industries in recent years. The issues of traffic congestion that resulted from the ownership of private vehicles not only caused loss of efficiency in the time saving, but also contributed to the air pollution issues as well. Hence, the responsibility to promote the usage of public transport can be a major turnout to solve the problem but our government also need to think of the best way on how to improve the efficiency of public transports as well.

1.2 Problem Statement

Regardless of where you lived, what types of lifestyle you lead, work you are involved, vehicles are highly important and essential to the human beings. The term ‘new generations’ can be classified as the generation Z or generation that were born in the digital era of technologies. Basically, researchers and popular media use the mid-to-late 1990s as starting birth years and the early 2010 as ending birth years [2]. To make the scope even bigger, the generation in the 1980s will also be considered as the target groups because this generation are also are getting up-to-date with the current technologies and they have the purchasing powers. The main purpose of this research is to analyze and compute the data from the factors that can contribute to the choices of vehicles. Thus, these common factors can be used by designers and engineers to design better transportation technology and system that will satisfy the demand from the consumers.

1.3 Objectives

As mentioned in the previous section, the key factors in this research can be summarized as follows:

- To identify factors that will affect the choices of vehicles amongst new generations according to the purpose and affordability.
  - Done by collecting data through online survey with set of question that are related to the factors of choosing.
- To classify engineering and non-engineering factors that will affect the choices of vehicles.

1.4 Scope of Work

Generally, the main scope of this research is focusing on the new generations; the target age groups are from 8 to 50 years old. Demographic information such as the gender, age and income are crucial to generate the relationship between the choosing factors. After the data have been gathered, analysis of the data by using regression method will be conducted by using the Minitab or SPSS software. The period of the survey is 1 month after it has been distributed to the respondents. The number of targeted respondents to fill in the survey are 250 people.

CHAPTER 2

LITERATURE REVIEW

2.1 Urban Growth and Transport

Transportation and urbanization are closely tied. Indeed, there is a symbiotic relationship between transportation and urbanization [3]. According to the United Nations, about 55 percent of the world's population lives in cities in 2018, and this number is expected to rise to 68 percent by 2050. Tokyo is the world's largest city, with a population of 37 million people, followed by New Delhi (29 million), Shanghai (26 million), Mexico City (22 million), and Sao Paulo (22 million). By 2030, the globe is expected to host 43 megalopolises with populations of more than 10 million people, the majority of which will be in developing countries.

In urban growth, transportation is critical. Transport systems provide critical movement alternatives for people and products, and their accessibility to land determines growth patterns and economic activity levels. For example, we can see that rapid urbanization in the west coast of Peninsular Malaysia due to the construction of the PLUS (Projek Lebuhraya Utara Selatan) highway that facilitate the movement of people for work and the transportation of goods across the Peninsular Malaysia.

The economy in the east coast of Peninsular Malaysia is slower compared to the west coast. Therefore, it is proven here that the transportation system contributed to the economic growth. As we can see, Kuala Lumpur is a megacity with population approximately about 1.6 million and have form larger metropolitan area of The Greater Klang Valley that have populations of 7 million inhabitants. The development of the public transport in Klang Valley is one of the most recognized public transport system in Southeast Asia, along with Singapore, Bangkok and Manila city.

The development of national highway that connect different cities in the country and between cities and rural areas have boost the economy of Malaysia. This is important that can help farmers and people in the rural area to export their businesses to the city. As an example, vegetables, fruits and dairy products from farmers can be transported by lorry to the city in a short time to prevent the product from being out of date. These products can be commercialized at the markets and will help to increase the income of the people in the countryside. Table below listed the top 10 biggest cities in the world in term of populations.

The advantage from this example is the trade activity can run smoothly between cities and between cities and rural areas. When the trade operation develop, the standard of rural areas will increase because more small businesses will bloom. The rural areas will start to develop with the development of new infrastructures such as hospital, clinic, police station, supermarket when the system of transportation is progressing. As a result, it will reduce the migration of the younger generation to the cities because the standard of the rural areas have increase as well. Table 2.1.1 below shows the World City Population in 2021 according to the [1].

Rank	Name	Country	2021 Population	2020 Population
1	Tokyo	Japan	37,339,804	37,393,128
2	Delhi	India	31,181,376	30,290,936
3	Shanghai	China	27,795,702	27,058,480
4	Sao Paulo	Brazil	22,237,472	22,043,028
5	Mexico City	Mexico	21,918,936	21,782,378
6	Dhaka	Bangladesh	21,741,090	21,005,860
7	Cairo	Egypt	21,322,750	20,900,604
8	Beijing	China	20,896,820	20,462,610
9	Mumbai	India	20,667,656	20,411,274
10	Osaka	Japan	19,110,616	19,165,340

Table 2.1.1: World City Populations 2011

2.2 Electric Vehicles (EV)

An EV is also known as electric vehicle. EVs are automobiles that are powered entirely or partially by electricity. The introduction of the electric vehicle to replace the use of conventional vehicles is quite challenging especially in Asia. The costs to run an electric vehicle is quite low because they contain less moving parts for maintaining plus they are very environmentally friendly.

High oil costs and energy consumption, as well as dependency on fossil fuels as the primary source of energy, are significant issues for the transportation sector. In terms of the environment, the transportation industry emits a significant amount of carbon dioxide, causing greenhouse gas (GHG) emissions to skyrocket [4]. Energy-related GHG emissions in the ASEAN region will nearly twice by 2040, reaching 2.3 billion tonnes, if there is no significant decarbonisation in the energy technology fuel mix [4]. Some countries in Asia have tried to use electric vehicle cars especially China, Japan and South Korea that have emerged as the leading industries in the production of the electric vehicle in this region.

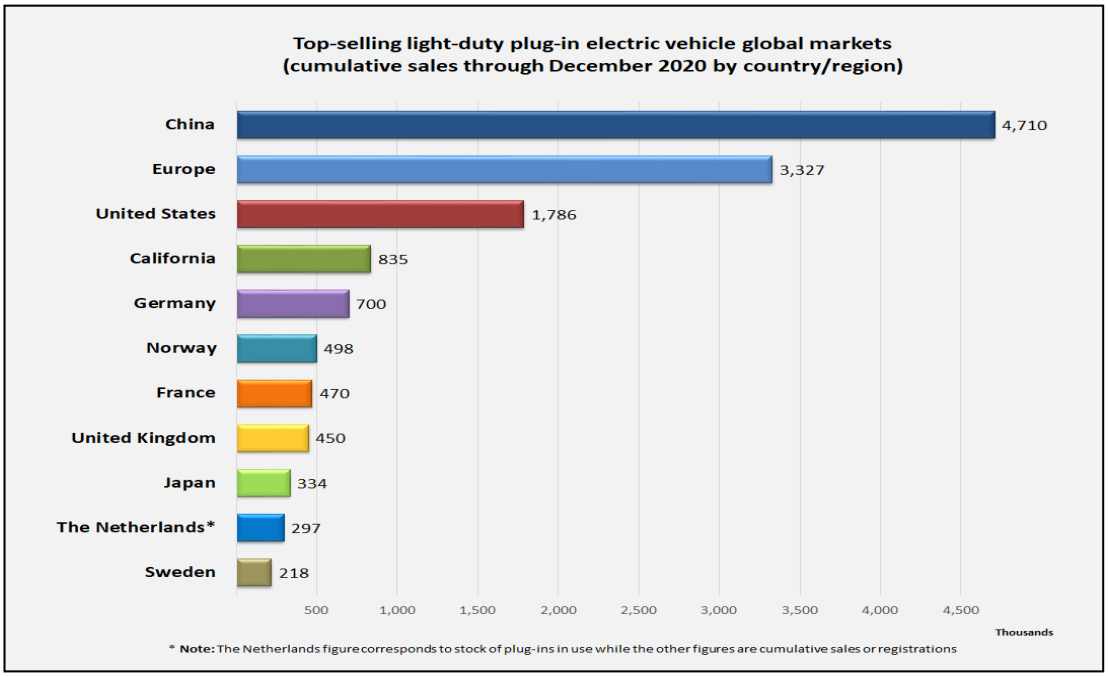

Figure 2.2.1: Top-selling light-duty plug-in electric vehicle global markets (cumulative sales through December 2020 by country/region)

From Figure 2.2.1, we can see clearly that China is the leading country that sells light-duty plug-in electric vehicle in the global markets with 4,710 vehicle. This figure shows that China leads the Europe and the United States of America in term of cumulative sales through December 2020. California is the leading state in the United States of America that sells electric vehicle; about half of the electric vehicles that have been sold in the USA. The next country that sells second highest light-duty plug-in electric vehicle in Asia is Japan with 218 electric vehicles that have sold.

There is huge advantages of using electric vehicles compared to the conventional vehicles. The benefits of electric vehicles are linked to their green practices and lack of pollutants, small size, lower cost, and inexpensive "fuel" electricity [5]. The usage of the electric vehicle will minimize the release of the greenhouse gas (GHG) compared to the gas-powered vehicles. Based on a comparative analysis of the lifecycle of EVs and gasoline-powered vehicles in Quebec published in 2018 by the

International Reference Centre for the Life Cycle of Products, Processes and Services (CIRAIG) in Figure 2.2.2 below, EV vehicles released 65% fewer greenhouse gas emissions compared to gasoline-powered vehicles that runs for same mileage, which is 150,000 km. The emissions of the greenhouse gas increase when the mileage also increased.

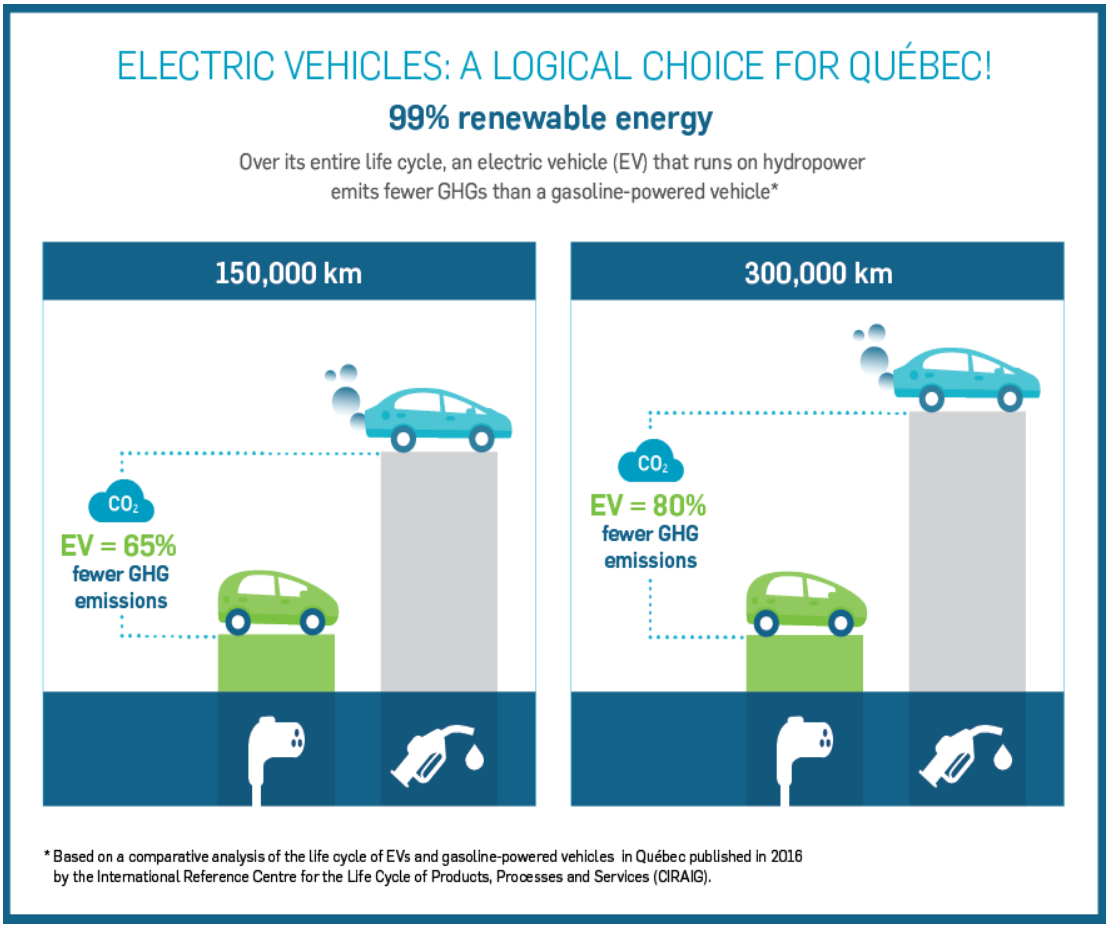

Figure 2.2.2: Electric Vehicles: A Logical Choice for Quebec!

The reduction of the emission of carbon dioxide to the surrounding will create a healthy world for people to live in. The global warming issues can be solved as this problem poses a serious threat to the life on earth. If the greenhouse gases continue to increase, the weather will be very unstable that cause drought to happen frequently, heat waves, the rising of sea levels, melting glaciers and warming the oceans. This phenomenon will bring negative impact on animals and humans live as well.

2.3 Why the Usage of Public Bus in the Countryside Declined?

Public buses have a long story in the history of transportation in Malaysia. It has served people to arrive at their destination with reasonable price. Back in the 1970s until 2000s, the service of public bus was a popular choice and has being used frequently by people whether in the urban or countryside area. This is because at that time, most Malaysians still cannot afford to buy cars for their usage. Currently in the 21st century, most Malaysians really depend on private cars to travel from one place to another. This is supported by the fact that each year, the percentage of car ownership in Malaysia is increasing rapidly. The figure that has been released by Road Transport Department in 2014 shows that 48.5% of all the vehicles registered in Malaysia in 2013 are private cars [1]. With the increasing number of people that own the cars, the usage of public transport especially buses will decrease constantly.

The increase in ownership of the private cars has contributed to the traffic congestion especially during the peak hours. However, most of the people in urban area have turn to use public transport to reduce the traffic congestion. The usage of LRT and monorail in Kuala Lumpur and Klang Valley are significant because the system of LRT in Klang Valley covers most of the residential and important area in the city. However, in the countryside and rural areas, the availability of public transport is very low and have low degree of accessibility. Thus, people in that area have no choice because they still need to go to the nearest city or town to buy the necessary items. The figure below is the map of LRT stations in the Klang Valley.

The figure 2.3.1 below shows several rail line in the Greater Klang Valley and the Bus Rapid Transit (BRT) Sunway Line. These sophisticated systems have helped people in Klang Valley to arrive at their destination in a short time.

Figure 2.3.1: Klang Valley Integrated Transit Map

There are many reasons why people in the rural area have shown less interest to use bus service in their daily life. One of the reason is that buses are always associated with delays and its service may not be available when needed [6]. People always complaint about the duration of travel time that is too long when they are using public buses that have causes stress amongst them. The local buses have to stop at several places before it can reach the final destination. This is very different when we compared it to the service of express buses. The second reason why people not taken public buses is because the service has low frequency. Some people said that the service of public bus could attract more people if the frequency of the buses increase at least to 30 minutes per bus. However, the service of bus is still has its own advantages especially for the cheaper price that it can offer and the feeling of relaxation [7].

Commonly, in many urban and rural area, public transport system deals largely with issues and problems such as transportation services, operations, infrastructure and facilities [7]. These factors will affect the choices of transportation amongst new generations in rural area because they need to wait at least 2 hours to catch up another bus if they missed the previous bus. Many youngsters in the rural area prefer to use motorcycles in their daily activities. Any attempt to prepare to increase the efficiency of bus operation in rural area is quite challenging because of the small population and lower population density. The bus company need to think twice to upgrade the condition of the bus and the frequency of travel as they concern their investment in it will become unsuccessful.

2.4 Comparing the Usage of Private Vehicles and Public Vehicles

In Malaysia, we can see that the usage of private vehicles exceed the usage of public transport especially in the countryside and rural areas. As a result, Malaysia is facing the increasing trends in the vehicles ownership that can contributed to several environmental issues such as the air and noise pollution. Malaysian prefer to use private vehicles such as motorcycles and cars because of problems that are facing by public transports such as bad quality of service [8]. Malaysia's total number of registered motor vehicles is roughly over 18 million. This table 2.4.1 below shows the ownership of motorcycle that have been registered in Malaysia in 2011. This data was obtained from the [3].

	State	**Total**
1.	Federal Territory	4,012,840
2.	Johore	2,494,722
3.	Selangor	2,092,989
4.	Penang	1,914,865
5.	Perak	1,667,663
6.	Sarawak	1,112,077
7.	Kedah	901,988
8.	Negeri Sembilan	722,220
9.	Sabah	719,937
10.	Pahang	715,334
11.	Malacca	610,370
12.	Kelantan	567,644
13.	Terengganu	396,548
14.	Perlis	70,802
	Total	**17,999,999**

Table 2.4.1: Motor vehicle registration in 2011

This number from the table above demonstrated to us that nearly 60% from the population of Malaysia in 2011 (28.65 millions) have own at least one vehicle for their use. This is the main reason for the reduction of the public transports usage because most of the family in Malaysia can afford at least one vehicle on their own and they can use it anytime.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Quantitative Research

This research was conducted by using the quantitative research approach. Quantitative research is a type of research that emphasizes the measurement of data collection and analysis. Quantitative research aims to create and evaluate mathematical models, principles, and hypotheses that are significant to phenomena. In this research, a questionnaire is created to analyze the hypotheses that have been assumed earlier such as the usage of private vehicles exceed the usage of the public vehicles without the factors involved. Quantitative method offers several advantages such as saving the time and resources, generalization of data and allows for the usage of control and research groups [9]. This research combine certain method from the qualitative research such as personal interview but with the limited quantity. In other word, this research can be said to apply hybrid methods in order to collect the data but focusing more on the questionnaire and survey, which falls under quantitative research.

The utilization of statistical data for the study of statistical analysis saves the researcher time and effort that would otherwise be spent discussing his findings. Computer can be used to calculate and analyze data in terms of percentage, numbers and figures that can save a lot of time and energy. The second advantage of using the quantitative data is the generalization of interactions within a small group is possible [10] The results obtained from the group of respondents can be assumed as a reflection for a wider society that can be represented in a small number.

3.2 Collecting Data

Several steps have been used in order to collect the data for the future analysis:

1) Primary data will be used in this study. Primary data is a unique source of information, albeit it may take longer time to collect compared to the secondary data.
2) The survey will be conducted during the mid-semester break of the second semester from May 2021 up until June 2021. A constructed questionnaire were created and distributed amongst contacts of various ages.
3) To increase the scale of respondents, help from friends to distribute the link of the survey to their contacts is very important. This is the application of snowball technique because the existing study subjects will recruit future subjects among their acquaintances.
4) The number of respondents targeted for this online survey is 250 people.
5) This survey will be carried out in two languages:
    - Bahasa Malaysia
    - English
6) The survey will be carried according to the convenience sampling method that requires the sample that will be drawn from the part of the population that is close to hand. In the other word, it is the action to take the sample from a group of people that is easily to contact or reach. This is the easiest way to conduct a quantitative research because it is easily accessible.

7) The respondents who are qualified to answer the questionnaire are those who are mature enough in decision-making. For those respondents who are below than 17 years old, guidance and supervision from the adult is compulsory to understand the questions.
8) This online survey consists of three main sections that comprised of closed-ended questions that can be analyzed easily for the later stage.
9) The first section will indicated the purpose of the survey, procedure and confidentiality in keeping all the information of the respondent safely and only used for research purpose.
10) The second section will bring about the personal details of the respondents such as age, gender, monthly income and the region of residence.
11) The third section will include all the questions regarding the factors involved in making the choices of vehicles. This is the important part of the research because two objectives need to be achieved which involved the factors that will contributed to the choices.
12) Table 3.2.1 and 3.2.2 below list the possible modes of transportation and the factors that will involve in the decision-making by the respondents.

Modes of Transportation	
1.	Motorcycles
2.	Cars
3.	Taxi and Ride-Hailing Services
4.	Buses
5.	Train, Monorail and LRT
6.	Bicycles, Walking
7.	Ship, Boat and Ferry

Table 3.2.1: Modes of Transportation

Factors affecting the choice of vehicles	
1.	Availability (Range of Service)
2.	Comfort
3.	Cost
4.	Safety
5.	Frequency of service
6.	Concern on the environment
7.	Traffic congestion
8.	Distance and travel time

Table 3.2.2: Factors affecting the choice of vehicles

3.3 The Content of the Questionnaire

The questionnaire was created in order to help the process of analyzing the factors that can contributed to the choice of vehicles. It consists of three section, which are Section 1, Section 2 and Section 3. Section 1 is the head of the questionnaire that explains the purpose of the questionnaire, the background of the research, and the confidentiality of the information given by the respondents. All the information that are provide by the respondents will be treated with utmost confidentiality and only be used for the research purpose.

Section 2 contains the demographics information of the respondents such as gender, age, region of residence, monthly income and budget that the respondents will allocated for the transport per month. Each of the question asked in the section is important for the comparison between the data because most of the comparison will be based on the age, region of residence and the monthly income of the respondents. Age of the respondents is divided between two main groups which are the aspiring generation and the affordable generation. Aspiring generation is the group of age that started from 8 years old until 29 years old. This generation have the ambition of purchasing their targeted vehicles in the future but currently do not have the power to afford it because most of this generation are still studying or just entering the early stages of the working life. For the respondents of ages below 17, guidance and supervision from the parents to help them answer the questionnaire is very compulsory. The second group, which is the affordable generation, is the group that have the power to purchase their favorite vehicles because most of this generation have strong finances. This group is consists of people with group of ages started from 30 to 50 years old.

The information about the region of residence is important in this research because several factors such as traffic congestion and frequency of services are related to the geographical area of the respondents. Monthly income of the respondents rely much on the age group although this assumption is not always correct. Respondent from the affordable group usually have higher monthly income compared to the aspiring generation. The last question in the demographics section that asked the amount of money that the respondents would allocate for the service of vehicle per month can be associated to the previous question of the monthly income.

Section 3 of the questionnaire mainly consists of the factor-related questions. In this section, vehicles that are often used by the respondents and factors that will determined their choices of the selection will be elaborated based on the demographics information given. Deep exploration regarding certain factors such as the concern on environment, traffic congestion in their respective area, the modes of transportation for long distance travel and the knowledge about the electric vehicle amongst the respondents were explored.

In order to have a look and taken part in the questionnaire, the link provided below is the link of the questionnaire for the question that have been discussed earlier.

https://docs.google.com/forms/d/1RvpVuJ_3ME4vZGvxVVtE6FOQIb6RAorBdB5rcRojj0o/edit?usp=sharing

3.4 Budget

This final year project (FYP) only requires researching the Internet for existing publications and journals, as well as data collection via survey. There are no extra budget needed in order to finish this research. There is no need to use the laboratory in the Faculty of Mechanical Engineering in USM. The only thing that can be include in the list of budget is the Internet data usage per month, which is about RM 100.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Overview

In this chapter, various results from the survey will be shown in the form of pie charts, tables and graphs. Factors that were related to the choices of the vehicles will be examined and the discussion behind the reason of the chosen factors will be explored. Three criteria that can contribute to the factors are the income strata of individuals, region of residence and different types of generation. For this new generation, there is two main class; the first one is the aspiring generation, which mean the group that have hopes and ambitions to become specified person in the future. This group mainly consist of people that are still under their parent supervision and still studying. The second group is the affordable generation, which means group that have purchasing power to buy certain vehicle that they prefer. Most of the respondents from this group have work in their respective fields and have income. In this questionnaire, 250 respondents have taken part to answer the survey that have been distributed earlier.

4.2 Demographics Information

According to Dr. Charlie French from University of New Hampshire Cooperative Extension, Demographic data refers to data about the people of a specific geographic area, such as a town, city, state, or country [11]. In this questionnaire, basic information of the respondents such as gender, age, region of residence, monthly income and budget that they allocated for the transport every month were collected. This information are very useful to analyse the factor related to the choice of vehicles.

4.2.1 Gender

Figure 4.2.1 below show the distribution of the respondents based on the gender. Out of 250 respondents, 50.8% represents female, which is equal to 127 respondents, and 49.2% represents male, which is equal to 123 respondents. The distribution of respondents based on the gender is slightly balanced.

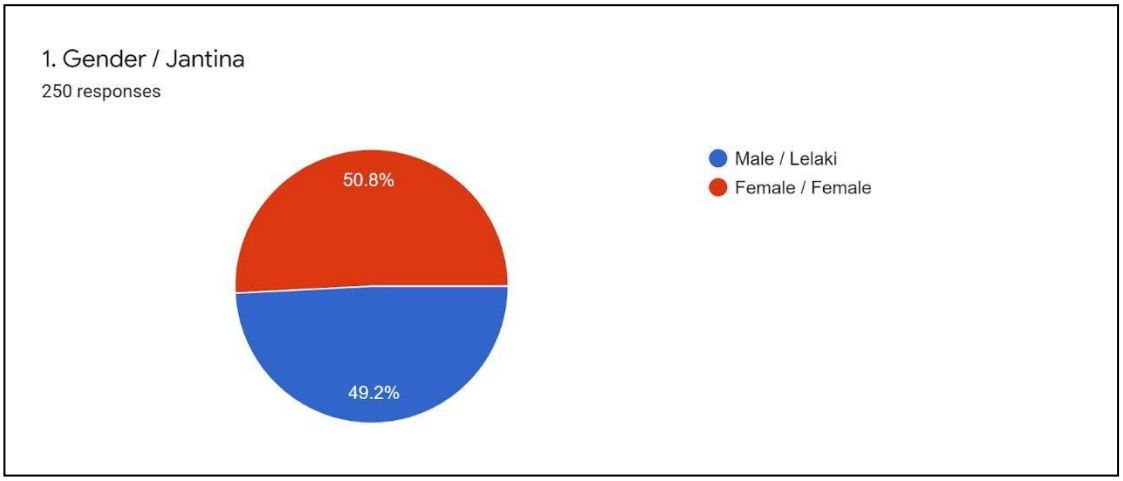

Figure 4.2.1: Distribution of respondents based on gender

4.2.2 Age

Age is the most important aspect in this research because the term new generation is only applicable for generation that have born in 1970s and afterwards. Earlier, this research is only focusing on the generation Z, which most of this generation were born in the turn of the century or in the simple word is after 1990s. In order to make the scope bigger, respondents that were born after 1970 and afterwards have been considered. Figure 4.2.2 below is the distribution of respondents based on age.

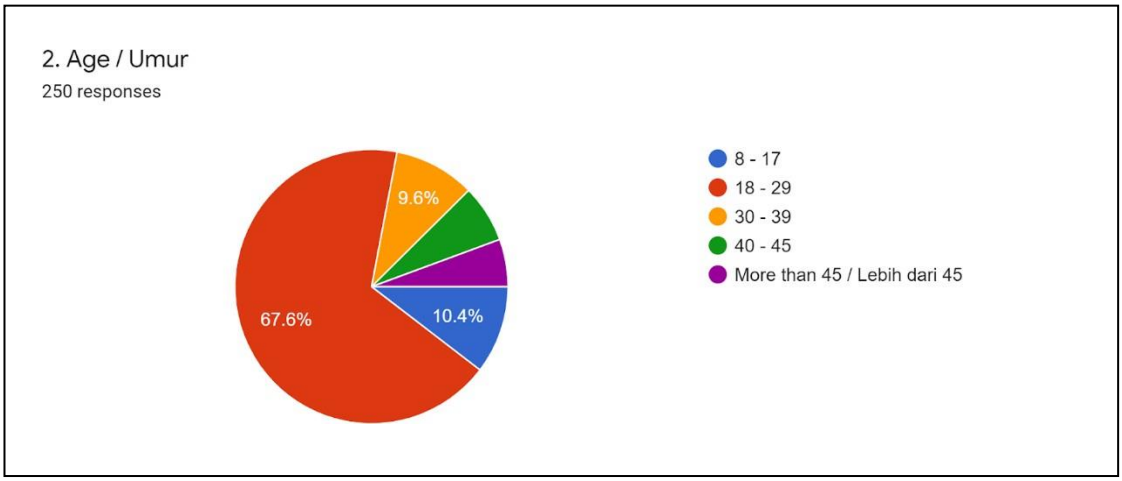

Figure 4.2.2: Distribution of respondents based on age

Based on the figure above, ages of the respondents were distributed according to five sub-groups. The first two subgroups are from the aspiring generation (8 to 29 years old) that mainly consists of students and the person that The first group is the group of ages 8 until 17 years old, which can be considered as the teenager groups. From the chart, this group represents 10.4% that is equal to 26 person. Although the number of respondents for this subgroup are small, their opinion are enough to indicate and represent their generation within the small scale. The second group is at the age of 18 to 29 years old which is at the early stages of adultery ages. This group represents about three quarter of the total respondents, which is about 67.6% (169 respondents). The main reason that led to the highest percentage for this subgroup is that most respondents from this age group are very active with social media and have a lot of free time to access the Internet. The remaining subgroups can be considered as the affordable group, which means the group that, have the purchasing power to buy type of vehicles that they want. For the subgroups of ages 30 to 39, it represents 9.6% (24 respondents), ages of 40-45 represents 6.8% (17 respondents) and for the last subgroup of age of more than 45 up to 50, it represents 5.6% (14 respondents).