Public Perception on Autonomous Vehicle in Malaysia

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Abstract – *Autonomous Vehicle (AV), also known as self-driving or driverless vehicles, is a technology that intends to replace driving tasks traditionally performed by human drivers. This study aims to gain a better understanding of opinions, concerns, and general acceptance by Malaysian drivers regarding autonomous and self-driving vehicles. The survey questionnaires were adopted from Schoettle & Sivak (2014b) on the topic of public acceptance of driverless vehicles and what would the respondents do when they are not driving. The survey was conducted among the general public in Malaysia inclusive of 19 questions to address topics on public awareness and understanding about AV, benefits of AV, concerns on AV, attitudes toward owning or sharing AV, willingness to pay for AV and their use of free time while riding AV. A total of 520 respondents involved in this survey, however the analysis only considered the respondents who have heard of AV, which amounted to 361 via face to face interview and online survey form. Based on the survey,63.7% were male and 36.3% female. Only 15.2% of the respondents said that they would not ride in a completely self-driving vehicles. AV is also expected to provide a wide range of benefits that attracted most of the respondents. The majority of the respondents expect lower vehicle emission and better fuel economy. Most respondents were also concerned with issues related to AV especially on safety consequences of equipment failure. The survey also shows that most Malaysians are not willing to invest in owning a driverless vehicle. Future studies should continuously consider people's perception from different perspectives, by taking into account various user viewpoints and characteristics.*

Keywords: Autonomous vehicle, public perception, driverless car, self-driving, opinion

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1.0 INTRODUCTION

Autonomous Vehicle (AV), also known as driverless or self-driving vehicle, is a vehicle that is capable of sensing its environment and navigating without human input. AV intends to replace driving tasks traditionally performed by a human. AV started out as a dream that goes way back as early as 1920s and began picking up its pace in the 1980s (Weber, 2014) when automated highway systems were conceptualized and established (Ioannou, 2013). By adapting Vehicle to Infrastructure (V2I) technology, vehicles can get connected and communicate with road infrastructures.

AV has a strong prospect to modify the current travel and transport fundamentally. The technology is expected to reduce crashes, shorten travel time, lessen traffic congestions, improved emergency response to crashes, lower the insurance rates to name a few. Several studies have explored the acceptance of AV to the public (Hulse et al., 2018; Fraedrich et al., 2016; Casley et al., 2013). In this paper, a survey to gauge the public perception regarding AV is carried out among Malaysians.

2.0 AUTONOMOUS VEHICLE

2.1 Autonomous Level

The Society for Automotive Engineers (SAE) has established its international's standard (J3016) that outlined six levels of automation (SAE International, 2014). In general, between level 0 and 2, human driver is still responsible to monitor the driving and the environment. The crucial shift occurs between Levels 3 and 4, where the driver releases their responsibility for monitoring the driving environment to the system. Each level represents different types of automation with regards to the Dynamic Driving Task (DDT). DDT includes the operational (steering, braking, accelerating, monitoring the vehicle and roadway) and tactical (responding to events, determining when to change lanes, turn, use signals, etc.) aspects of the driving task, but not the strategic (determining destinations and waypoints) aspect of the driving task.

2.2 Public Perception of AV in other Countries

There are numerous surveys carried out in recent years in other countries such as Germany, Australia, United States, and United Kingdom. Schoettle & Sivak (2014a) examined public opinion regarding AV technology across the U.S., U.K., and Australia with 1,596 respondents over the age of 18. The study found out that the results were generally uniform among the countries with majority of respondents haven't heard of AV but had initial positive opinion of it; and that majority felt the expected benefits are likely to occur, especially on the crash reduction. In the case of public perception of AV in Berkeley, California, respondents are concerned about the price of the technology (Howard & Dai, 2014). Wealthier people are more likely to be interested in self-driving vehicles than those with lower incomes. Automated vehicles were also expected to provide a wide range of benefits which were the most appealing to the people surveyed. These expected benefits positively influenced the attitudes of respondents. A study carried out by Piao et al. (2016), showed that 'increased mobility for the

elderly, disabled and others' and 'reduced fuel consumptions and emission' with 58% and 53% (respectively) of respondents found it as the most attractive benefits of AV.

2.3 Aims of Current Study

The current study surveyed public perceptions of AV, focusing particularly on opinions, concerns and general acceptance of Malaysian drivers regarding the autonomous vehicle. Given this focus, it was of particular interest to gain better understanding of certain groups (male, younger adult) linked with choices of driving/riding/willingness-to-pay to own a self-driving car.

3.0 METHODOLOGY

The study was aimed to gain a better understanding of opinions, concerns, and general acceptance by Malaysian drivers regarding autonomous and self-driving vehicles. A survey was chosen as the method of data collection and a questionnaire was developed which include 19 questions to examine key topics related to AV. The main topics addressed were as follows:

- Public awareness and understanding of AV
- Benefit of AV
- Concerns on AV
- Attitudes towards owning or sharing AV
- Willingness to pay for AV
- Their use of free time while riding AV

3.1 Survey Approach

The survey was carried out using two approaches which is 1) online survey and 2) face to face interview survey. The online survey was conducted using Google Forms whilst face to face interviews were conducted among general public. Information regarding current vehicle of each respondent, including the autonomous level of respondents' vehicles and additional demographic information were collected to be included in the analysis.

3.2 Respondents

The online survey obtained 56 respondents whereas 464 respondents via face-to-face interview which accumulates to a total of 520 respondents. The respondents for the study were then divided into two groups: those who have heard of autonomous vehicles and those who haven't heard of it. Responses were excluded from analysis if the individual never heard of AV. Of the 520 completed surveys, 159 were removed, leaving 361 responses for analysis. Six different demographic groups were considered including age, gender, race, employment, and travel modes. Figure 1 shows demographic attributes of the people surveyed. The sample was 63.7% male and 36.3% female and slightly weighted towards young and middle-aged respondents. Most of the respondents are within 26 – 45 years old age group. 75.6% of respondents work in the government/private sector while 24.4% are either student or self-employed. Of the sample, 68.1% received education in bachelor's degree/diploma, 28.5% others and only 3.3% Ph.D./

master's. Majority of respondents also travels by cars (61.5%), followed by motorcycles (28.8%), MPV/ 4WD/ SUV (6.6%), public transport (2.2%) and UBER/GRAB (0.8%). Figure 1 below shows the demographics of respondents involved in this survey.
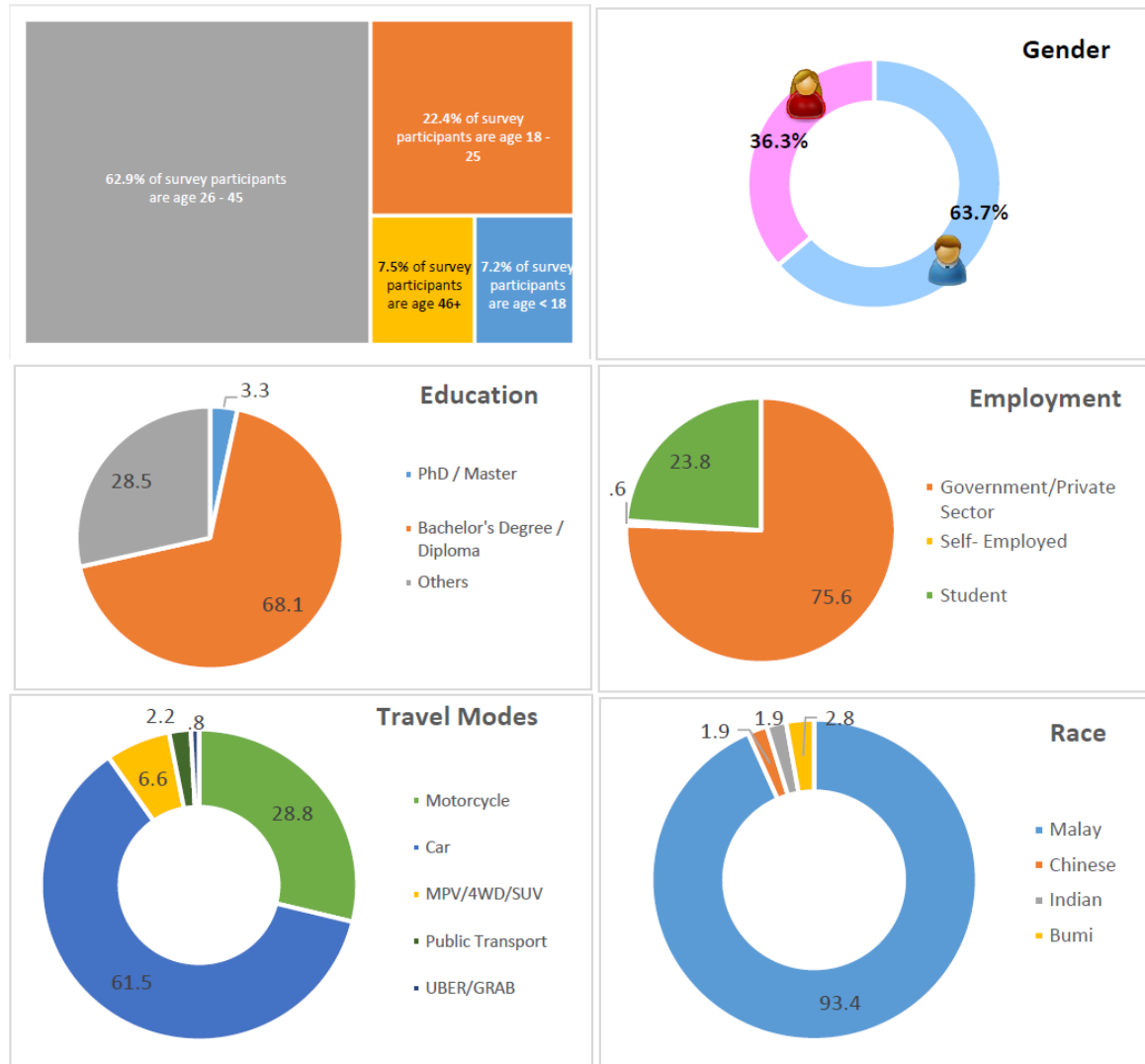

Figure 1: Demographics attributes of respondents

4.0 RESULTS

As mentioned above, the results of the analysis will only discuss on respondents who have heard of AV which accumulates to 361 respondents.

4.1 General attitudes regarding Autonomous Vehicle

In the survey, a question was asked to participants on their general opinion regarding autonomous and self-driving vehicles. The majority of respondents chose to be neutral of the technology with 40.72%. That aside, respondents' impression of the technology leads towards

positive side with 24.38% were 'somewhat positive' and 20.22% were 'very positive'. Negative impressions only affected less than 10% of respondents with 9.14% were 'somewhat negative' and 5.54% were 'very negative'.
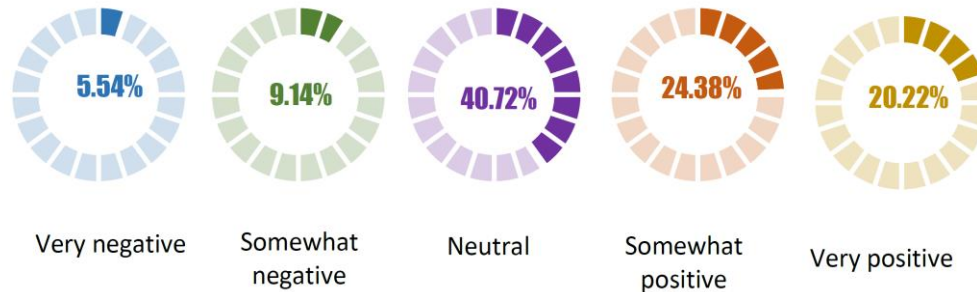

Figure 2: Summary of Responses to Q10, *"What is your general opinion regarding autonomous and self-driving vehicles?"*

In responding to the question of "How concerned would you be about driving or riding in a vehicle with level 4 and 5 of self-driving technology", again most respondents voted for 'neutral' (40.44% driving/riding AV level 4 and 31.0% riding AV level 5). For concerned in driving or riding level 4 AV, the answer 'not concerned' has slightly higher respondents with 30.2% than 'concerned' with 29.4%. Conversely, respondents were more concerned about driving or riding level 5 AV with 36.0% than 'not concerned' with 33.0% when collapsed.
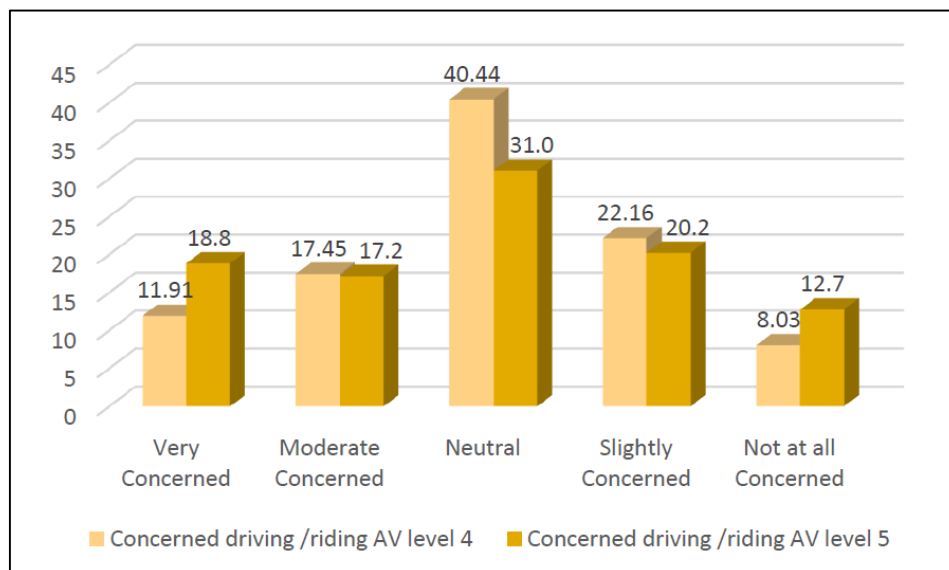

Figure 3: Summary of Responses to Q12 and Q13, *"How concerned would you be about driving or riding in a vehicle with level 4 and 5 of self-driving technology?"*

4.2 Level of Autonomous Vehicle Owned

Figure 4 illustrates the level of AV owned by three different demographic groups including salary, age, and gender. It was shown that 'male' possessed vehicle with higher level of AV (level 1 and above) as compared to 'female' with 29.1%. As for the respondents' age, those

aged more than 46 years old tend to have higher percentage (51.9%) of level 1 and above AV owned. Moreover, respondents with salary of more than RM5000 per month accounted for 68.2% of owning AV level 1 and above. It can also be seen that low percentage of respondents owned level 3 of AV which was less than 5%, regardless of salary, age or gender.
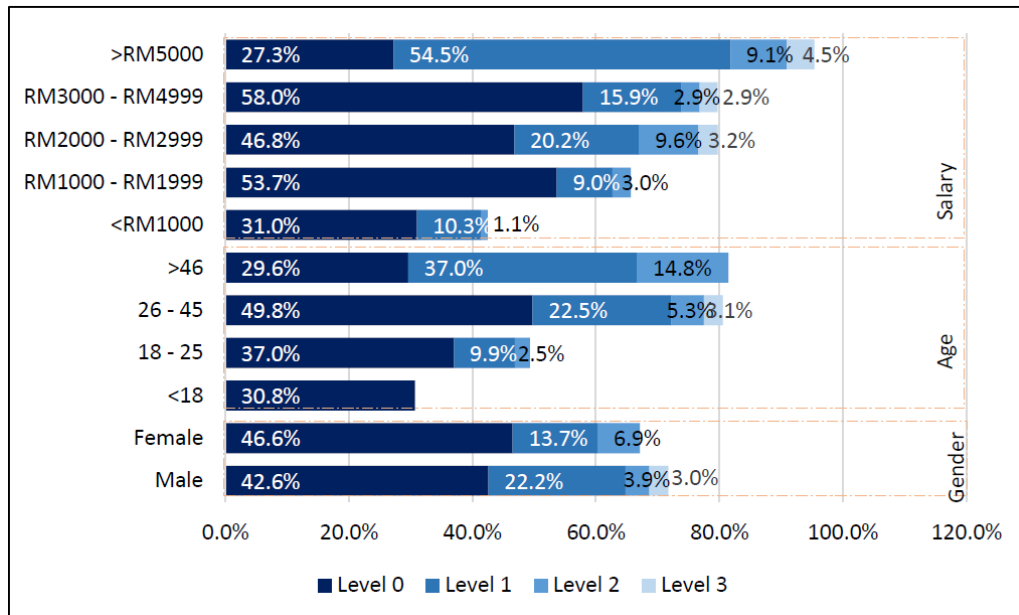

Figure 4: Level of Autonomous Vehicle Owned

4.3 Benefits of Autonomous Vehicle

Autonomous vehicles are expected to have several advantages including lower insurance rates, better fuel economy, lower vehicle emissions, shorter travel time, less traffic congestion, improved emergency response to crashes, reduced severity of crashes and fewer crashes. In the survey, a question was asked on the benefits of level 5 autonomous vehicles. Respondents were asked to select between 'very likely', 'somewhat likely', 'neutral', 'somewhat unlikely' or 'very unlikely' for each item listed of expected benefits for completely self-driving vehicles (Level 5). Figure 5 presents a complete summary of the responses. From the survey, 'neutral' was the most frequent response for every item. Disregarding the 'neutral' response, each of the expected benefits were likely to occur with self-driving vehicles. The most appealing benefits were lower vehicle emission (when collapsed, 51.5% said this was likely), and was followed by a better fuel economy with 49.9% when collapsed.

4.4 Concerns on Autonomous Vehicle

Respondents were asked: 'How concerned are you about the following issues related to completely self-driving vehicles (Level 5)?' (refer to Figure 6). They were asked to decide on 'very concerned', 'moderately concerned', 'slightly concerned' or 'not at all concerned' for each item in a list of concerns regarding self-driving vehicles. More than half of respondents are 'concerned' (very concerned or moderately concerned) regarding the issues related to completely self-driving vehicles (Level 5). For the respondents, issue on 'safety consequences

of equipment failure' that concerned them the most (41.0% very concerned), followed by system security from hackers (37.4% very concerned) and vehicle security from hackers (36.6% very concerned). The least concerned issue was 'learning to use self- driving vehicles' (11.9% answered 'not at all concerned'), followed by 'legal liability for drivers/owners' (10.0% not at all concerned) and interacting with non-self-driving vehicles (9.1% not at all concerned).

Respondents were asked about their concerned regarding the possible scenarios with completely self-driving vehicles (Level 5). Similar to the previous question, they were asked to select 'very concerned', 'moderately concerned', 'slightly concerned' or 'not at all concerned' for each item in a list of possible scenarios involving different methods of using or deploying self-driving vehicles. Figure 7 shows the percentage of responses for the above-said question. 'Very concerned' was the most frequent response for all the items with the exception of 'self-driving vehicles moving by themselves from one location to another while unoccupied' (majority were 'neutral' concerning this scenario with 32.1%, higher than 'moderately concerned' respondents with 24.7%) and 'taxis that are completely self-driving (again majority chooses 'neutral' with 27.1%, slightly higher than 'very concerned' with 25.5%). In general, respondents were most concerned about 'commercial vehicles that are completely self-driving' (41.6% were very concerned) followed by 'riding in a vehicle with no driver control' with 31.3%, self-driving buses (28.0%), self-driving taxis (25.5%) and self-driving vehicles moving by themselves from one location to another while unoccupied (21.6%).
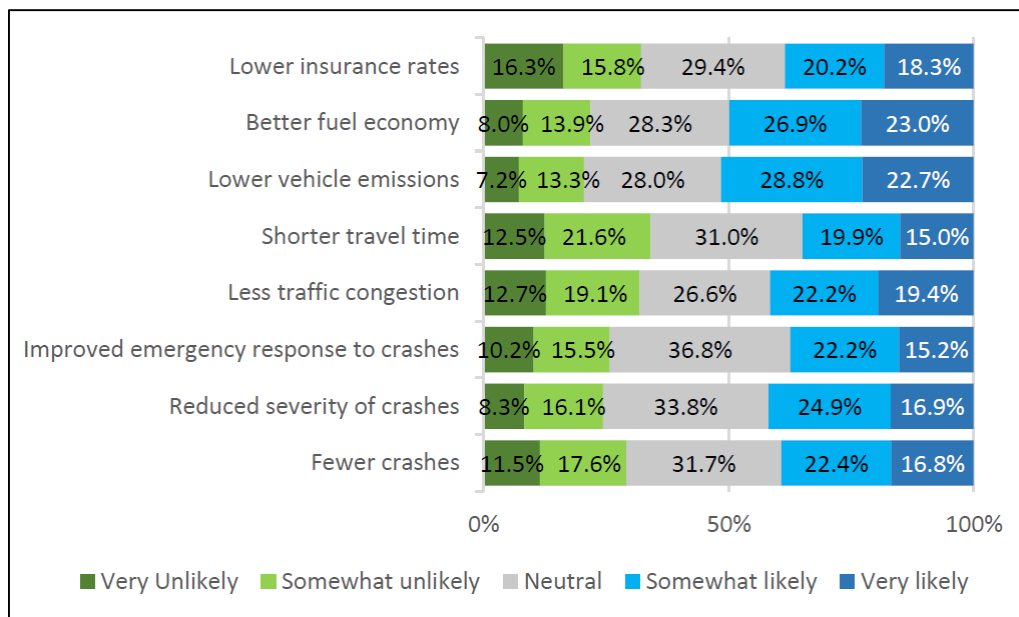

Figure 5: Summary of Responses to Q14, *"How likely do you think it is that the following benefits will occur when using completely self – driving vehicles (Level 5)?"*
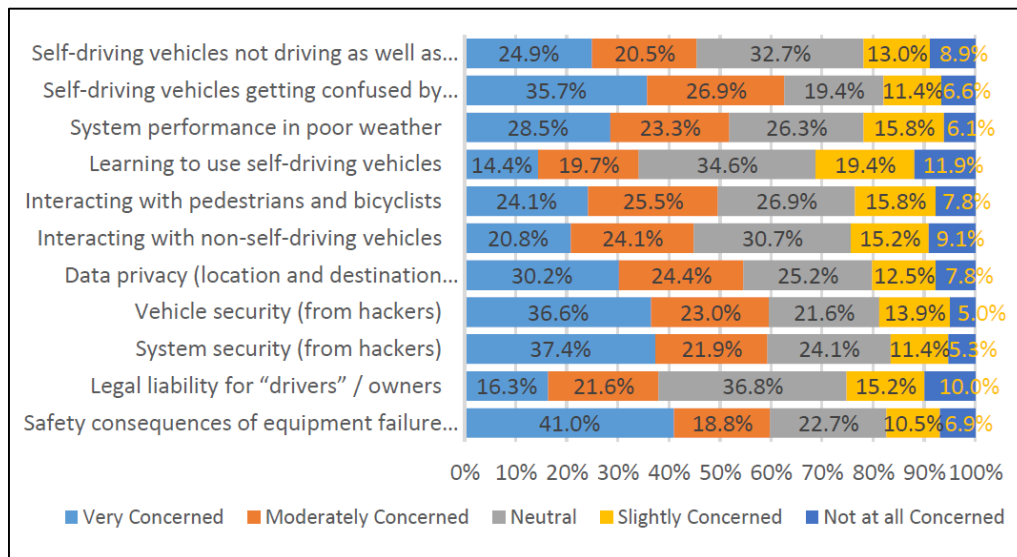
Figure 6: Summary of Responses to Q15, *"How concerned are you about the following issues related to completely self-driving vehicles (Level 5)?"*
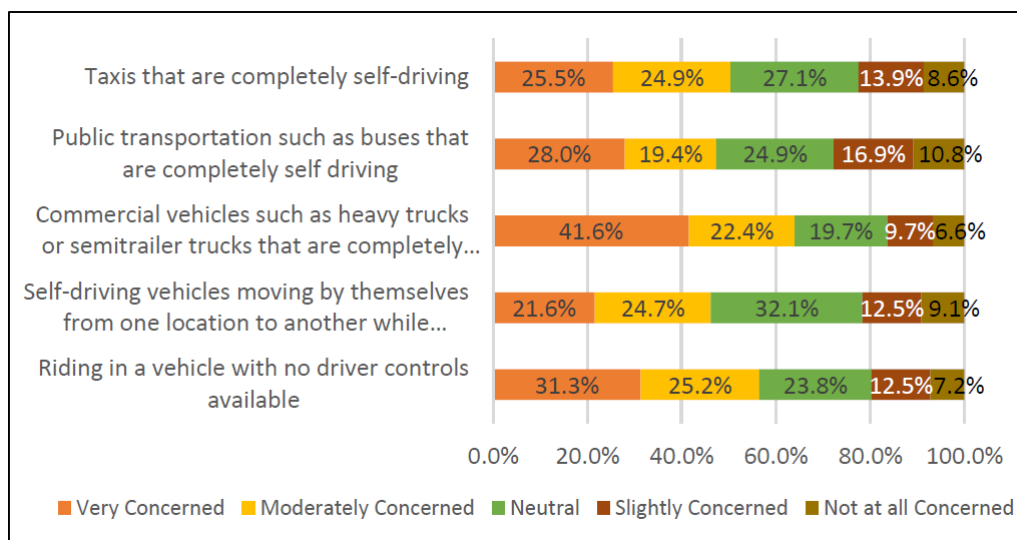

Figure 7: Summary of Responses to Q16, *"How concerned are you about the following possible scenarios with completely self-driving vehicles (Level 5)?"*

4.5 Interest in Autonomous Vehicle

Overall interest in having completely self-driving vehicle technology (Level 5) indicated that most respondents chose 'neutral' which accounted for 35% (refer Figure 8). Approximately 20% of respondents said they were 'slightly interested', followed by 'not interested' (16%) and 'moderately interested' (15%) in having this technology. 'Very interested' is the least chosen response with only 14% of respondents replied to. When collapsed, with 'not interested', 'neutral' and 'interested' category, it can be seen that respondents mainly were 'not interested' in having a completely self-driving vehicle with 36%. Only 29% of respondents were 'interested' in owning a completely self-driving vehicle.
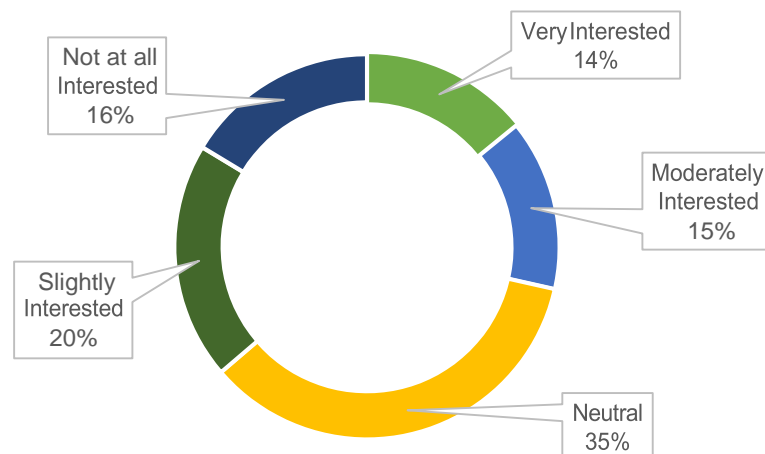
Figure 8: Summary of Responses to Q17, *"How interested would you be in having a completely self-driving vehicle (Level 5) as the vehicle you own?"*

When asked how much would they be willing to pay for a completely self-driving vehicle (Level 5 AV), a majority of respondents were not willing to spend their money on the technology with 35.7%. 34.6% are willing to pay RM9,999 and below which sums up to 125 respondents. Only 3.3% of respondents say they are willing to pay at least RM100,000 to have a self-driving technology on their vehicle. By looking at the trend, it shows that the higher the amount of money needed to be spent, the lower the percentage of willingness to pay.
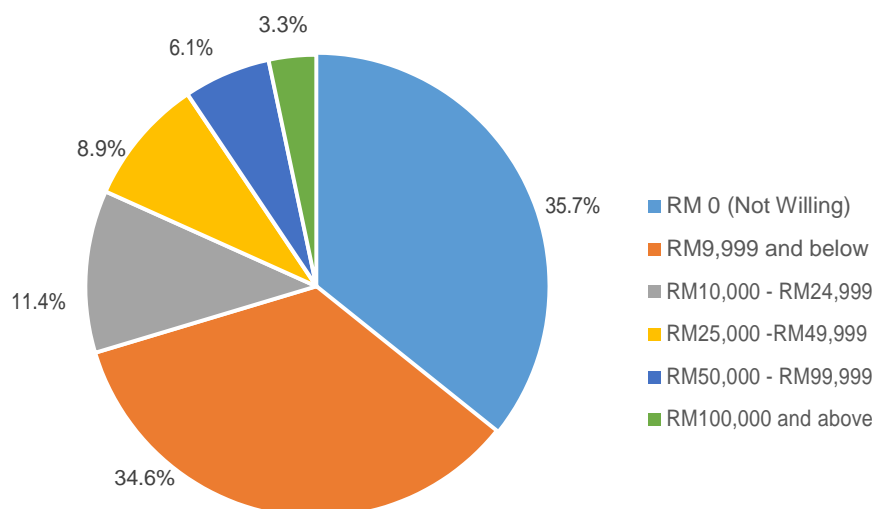

Figure 9: Summary of Responses to Q18, *"How much would you be willing to pay to have completely self- driving technology (Level 5) on a vehicle you own in the future?"*

4.6 Extra Time Used When Riding the AV

Respondent was asked how would they use their extra time if they were to ride a completely self-driving vehicle (Level 5). Figure 10 shows the percentage of responses with approximately will use their hand phones (52.9%) and watch the road even when they are not driving (51.8%). The next most popular choices were sleeping (45.2%), talk with the person next to you (38.8%),

read (33.5%) and watching movies (30.2%). 19.9% of respondents say they will work during the ride while 15.2% would not ride in a completely self-driving vehicle. Only 2.49% of respondents stated others which comprise of eating, supplicating and composing of songs.
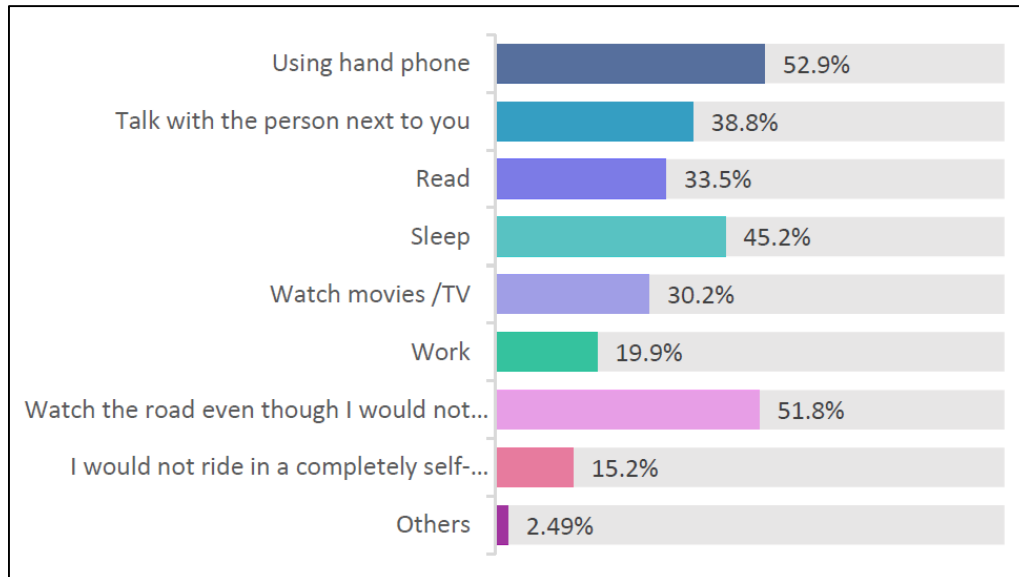

Figure 10: Summary of Responses to Q19, *"If you were to ride in a completely self-driving vehicle (Level 5), what do you think you would use the extra time doing instead of driving?"*

5.0 DISCUSSION

Public acceptance of AV is crucial to ensure early and fast adoption. In a detailed analysis by Sivak & Schoettle, 2015, it was concluded that AV may be no safer than an average driver and may increase total crashes when AV and human-driven vehicles mix in the traffic. Therefore, to increase AV adoptions, it is important for the public to be well-informed and understood the benefits AV may bring. AV penetration should be targeted to be as high as possible to avoid the opposite safety effect when AV and non-AV mixed in traffic.

In general, experts and the public are often positive about automated driving but also exhibit essential concerns. At the early stage of introduction, it is expected that some members of the public might be sceptical about the safety aspect of AV, given the fact that there is no human driver (Schoettle & Sivak, 2014a). A total of 520 respondents involved in this survey, however the analysis only considered the respondents who have heard of AV, which amounted to 361 via face to face interview and online survey form. Based on the survey,63.7% were male and 36.3% female. Only 15.2% of the respondents said that they would not ride in a completely self-driving vehicle.

The survey results also show that the general public still has doubts about the benefits of AV, including safety benefits. AV is designed to be safer than vehicles driven by humans by eliminating the human error factor. Road safety is one of the major issues that AV intended to solve and it would be a prerequisite before AV can be operated on public roads (Hashim & Omar, 2017). From the survey, only about a quarter of the respondents believe that AV can

help to reduce road crashes. This could be due to the low levels of awareness and understanding of autonomous driving.

6.0 CONCLUSION

The study was designed to gain a better understanding of opinions, concerns, and general acceptance by Malaysian drivers regarding autonomous and self-driving vehicles. AV represents a potentially disruptive and beneficial change to the way that we travel. The idea of driverless vehicles that at first may seem like a distant possibility, but now it is fast approaching. Evidently, some of the automation features are already offered in current vehicle models. The initial costs for owning AV will likely to be unaffordable to the general household income group at first, but as with any new technology introduction, the cost will further reduce as the technology grew and adopted by many more users. Owning an AV might be an issue as only 29% of respondents are interested in owning one. 35.7% of respondents were not willing to spend their money on self-driving technology while 34.6% were willing to spend from RM9,999 and below.

Based on the survey results, AV is expected to provide a wide range of benefits that were appealing to most of the respondents. The majority of the respondents expects lower vehicle emission and better fuel economy. However, most respondents feel that they were unlikely to experience shorter travel time, lower insurance rates, less traffic congestion, fewer crashes and improved emergency response to crashes.

Some concerns were reflected in the survey. Some 41.0% were "very concerned" for safety consequences due to equipment/ system failure (Level 5 self-driving vehicle). Given several scenarios, "very concerned" has the highest percentage for each possible scenario except for interaction with pedestrians or other non-self-driving vehicles and legal liability for drivers/owners. Respondents were most concerned about self-driving commercial vehicles with 41.6%.

Over the past century, our way of travel has shaped infrastructure and ideals, landscape and lifestyle, ethics and enterprise. With the introduction of AV, what we do with our vehicles would be exponentially different. Changes can be expected in travel demand, safety, vehicle ownership, how we commute, land use, insurance, and job creations. With the advent of AV in various countries around the world, it is important for countries especially the policymakers and road authorities to understand the issues and opportunities that lie with AV implementation.

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