Market Analysis on the Acceptance of Level 2 Automated Vehicles of Malaysian Public

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ARTICLE INFO	ABSTRACT
	Level 2 Automatic Vehicles are vehicles that have been equipped with some technological equipment as an additional aid for more comfortable driving. Vehicles are categorized under Level 2 when it has more than one Advanced Driver Assistance System (ADAS). This study aims to measure the level of public acceptance on the use of level 2 automatic vehicle. This was done by conducting a questionnaire study which involved 86 respondents. The questionnaire was separated into four sections where, section A focused on the profile of the respondents, section B focused on the awareness factor, section C focused on the willingness of the respondent, and section D focused on the accessibility to facilities or infrastructure. The results have shown that the main factor for the acceptance of level 2 automatic vehicle was the awareness of the respondents towards the technology. This was followed by the accessibility to facilities and, willingness had shown to have the lowest rated factor. The result from this study reveals the main issues of the Malaysian public and can be used to shape policies that can lead to a broader adaptation of level 2 automated vehicles.

1. Introduction

According to the Society for Automotive Engineers (SAE) [1], Level 2 autonomous vehicles is defined as a road vehicle that provides some degree of driver assistance that sometimes is referred to as the Advance Driver Assistance Systems (ADAS). The primary goal for ADAS is to increase the safety of the vehicle by improving the drivers' ability to react to rad hazards through a human-machine interface [2]. Examples of ADAS includes Adaptive Cruise Control (ACC), Emergency Brakes Assist (EBS), and Forward Collision Warning.

Previous studies have driver error is a factor in 94% of crashes [1]. Many of the most promising ADAS technologies are designed to identify and react to potential hazards faster than a human driver. Studies shown that if ALL vehicles were equipped with ADAS is estimated to be substantial, with up to a 40% reduction in crashes and 29% reduction in fatalities [4]. Another study has also shown that

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ADAS technologies have the potential to prevent 20,841 deaths per year or about 62% of total traffic deaths. Lane-keeping assist accounts for 14,844 of this savings, while pedestrian automatic braking accounts for another 4,106 lives saved in Spain [1]. This demonstrates the importance of the adoption of level 2 vehicle automation.

In Malaysia, ADAS technology have fully penetrated the car market with all the latest car models incudes most if not all the ADAS features [6]. Despite all its advantages, there is still resistance from the general public that prevents ADAS technology from being fully adopted. Studies have shown that factors that discourage the public include high cost of purchase [6], high cost of maintenance [7], car availability [8], lack of facilities / infrastructure [9], lack of service center [10], and lack of awareness [11].

However, there works that have been done to increase the pull of the public towards automated vehicles. In a work that focuses on the Singaporean market have shown that by focusing on the safety factor of the vehicles is key to attract customers to the technology [12]. Factors such as demographics are also shown to have been a factor as shown in study done in the American market where young males are shown to be quicker to adapt to new technology such as ADAS [13]. Other factors that have been highlighted including, the awareness towards the technology [14], awareness of the current implementation of the technology [5], and the overall driving experience [3].

While there are several works that have been done in gauging the public's reaction to ADAS technology, there are very few studies that reveals the main resistance from the perspective of the Malaysian public. Therefore, the objective of this study is to investigate the public acceptance of Malaysian drivers towards level 2 automated vehicles. Insights found in this study can be used to inform the future roll out of autonomous vehicles as well as future policy regarding vehicle safety requirements.

2. Methodology

The objective of this study is to investigate the acceptance of Malaysian public on level 2 vehicle automation. This is done by conducting a survey that asks about their awareness and willingness to use a vehicle with level 2 automation.

The survey was done involving the general public that was present at the Road Transport Department (JPJ) office where a total of 86 respondents answered the questions. The questionnaires were distributed using the Google form, by sending the link of the question via WhatsApp, Facebook mail, and other appropriate applications. An explanation was provided to clarify the research objective and the basic definition is provided in the questionnaire for the targeted respondent.

There were 27 questions contained in the questionnaire and the questionnaire was divided into four sections where section A asked about self - identification, these were related to the driving experience, type of vehicle owned, type of license owned, and also the level of education of the respondents. Section B inquired about user awareness of this level 2 automatic vehicle, ADAS technology, auxiliary cruise control system, anti-lock brakes, front violation warning, high beam safety system, lane change warning, and traffic signal recognition. Section c asks about the willingness to own this automatic vehicle based on the vehicle price difference table as well as the model of the automatic vehicle. Part D asks about the automated vehicle infrastructure that can attract consumers to own these automated vehicles. All answers are collected and remain private and confidential.

The survey tool Statistical Package for the social science (SPSS) was used to ensure that all the data collected is cleaned, sorted, categorized, coded, and analyzed. The Roasoft tools help to calculate and determine the sample size needed. All data analyses were performed to determine the

sample size. in other words, a descriptive analysis of the data set has been reported. analysis of correlation coefficients, regression, and reliability was used to confirm the results.

3. Results
3.1 Respondent Profile

A total of 86 respondents answered the questions provided. There were 27 questions contained in the questionnaire form which was distributed online using Google Forms. The questionnaires were given to the public present at the Road Transport Department (JPJ) office. The questionnaire was conducted randomly in which most of them did not have a level 2 automatic vehicle.

The first section of the questionnaire (Section A) focuses on the profile of the respondents. The demographic information collected included gender, age, driving experience, education, monthly salary, driving license, and the type of vehicle used, as shown in Table 1 below.

Table 1
Demographic profile of respondents

Profile	Category	Total	Percentage (%)
Gender	Male	72	83.72
	Female	14	16.2
Age	18- 25 Year	-	-
	26 -35 Year	22	23.1
	36-45 Year	46	53.49
	46-55 Year	10	11.62
	56-60 Year	-	-
	60 Years and older	-	-
Driving Experience	1-5 Year	1	1.16
	5-10	9	10.47
	10-15	17	19.77
	15-20	28	32.56
	20-25	12	13.95
	25 years and above	19	22.09
Education	SPM	15	17.44
	Sijil Kemahiran / Diploma	57	66.28
	Degree	11	12.79
	Master	2	2.33
	PHD	1	1.16
Monthly salary	RM 1800 to RM 3000	19	22.09
	RM 3000 to RM 5000	52	60.47
	RM 5000 to RM 7000	6	6.98
	RM 7000 to RM 9000	3	3.48
	RM 9000 and above	2	2.33
	Others	4	4.65
Driver's license	Yes	86	100
	No	-	-

Table 1 shows, respondents consisted of (83.72%) males and (16.2%) females. The majority of respondents were aged between 36-45 years (53.49 %) followed by respondents aged between 26-35 years and the lowest was aged 45-55 years (11.62 %). The majority of respondents have the highest certificate / Diploma in educational skills (66.28%) followed by SPM (17.44%), Degree (12.79), Master (2.33), and the least is Ph.D. (1.16%). (60.47%). Most respondents earn between RM3000 to RM 5000 per month, (22.09%) for income of RM 1800 to RM 3000, followed by (6.98%) for income

of RM5000-RM7000, (3.48%) for income of RM 7000-RM9000 and lastly (2.33%) for income exceeding RM 9000 and above. All respondents had a current driving license (100%).
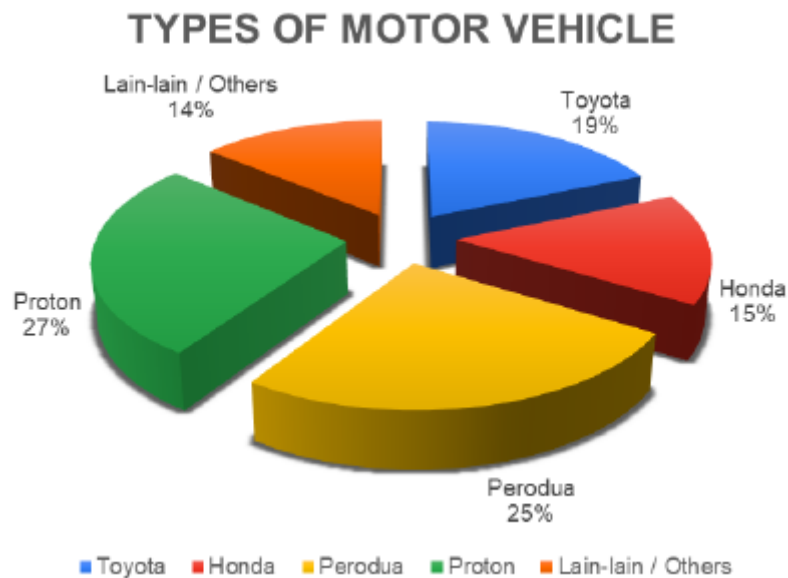
Fig. 1. The vehicle type breakdown of the respondents

Figure 1 shows the types of motor vehicle model owned by the respondents in this study. From Figure 1, Proton Model was the highest owned by the respondents with 23 (27%) followed by Perodua with 22 (25%), Toyota with 16 (19%), Honda with 13 (15%), and the lowest was other types model of vehicles with 12 (14%).

3.2 Questionnaire Results
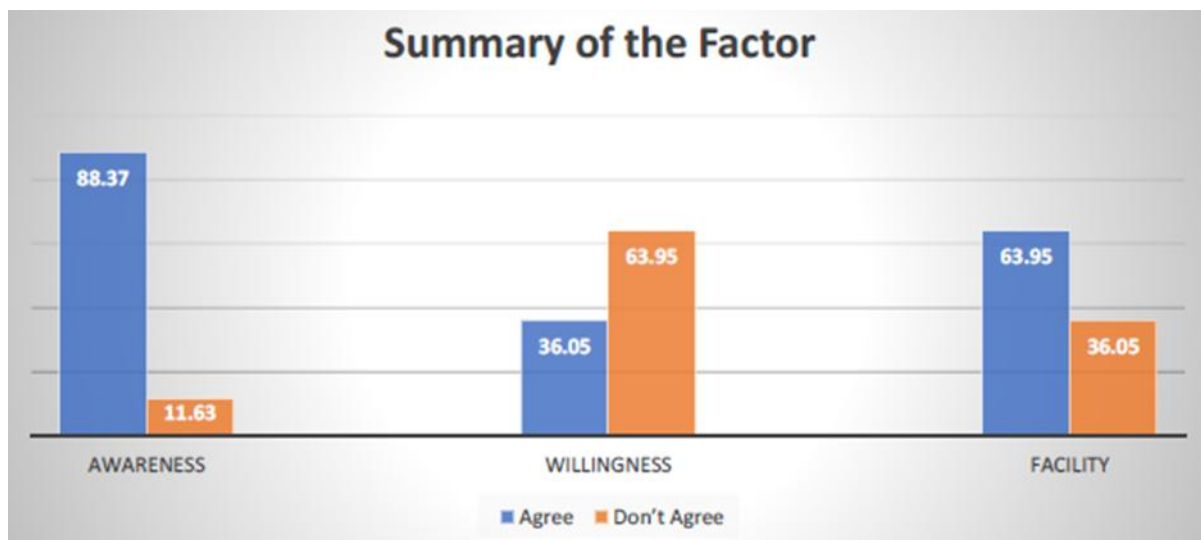
Fig. 2. Result summary of the factors towards level 2 autonomous vehicles acceptance

In terms of acceptance of level 2 autonomous vehicles, this study identified 3 main theme that served as factors; awareness, willingness, and facilities / infrastructure availability. Figure 2 shows the breakdown of each of these factors. First, awareness of level 2 vehicles according to the results of respondents there are (88.37%) agree and (11.63%) disagree about the presence of level 2

automated vehicles. Second, the willingness to own a vehicle, there are (63.95 %) disagree with the price provided by the manufacturer, refer (table 2.1), only 36.05 agree with the price provided by the manufacturer. lastly, there are facilities as many (63.95%) agree with the existing facilities at present, as many as (36.05%) do not agree with the facilities available at present.

3.2.1 Section B: awareness factor

Table 2
Section B questions results

Item		Frequency	Percentage
Have you ever heard of self-driving vehicles before participating in this survey? (A1)	Yes	76	88.37
	No	10	11.63
Do you know the advantages of level 2 automatic vehicles? (A2)	Yes	47	54.65
	No	39	45.35
Do you know the functionality of the "ADAS"	Know	41	47.67
Is the technology available on Automatic vehicles (Level 2)? (A3)	Don't Know	45	52.33
Have you ever used one of these systems? (A4)	Yes	16	18.6
	No	70	81.4
ADAS technology is designed to help reduce accidents due to human negligence. Do you agree with this technology can help reduce road accidents? (A5)	Yes	75	87.2
	No	11	12.8
Accidents in the back of a vehicle often happen, can this technology help reduce those accidents? (A6)	Yes	50	58.13
	No	6	6.98
	Not Sure	30	34.89
Automatic vehicles can help reduce accidents as well as road congestion? (A7)	Yes	40	46.51
	No	15	17.44
	Not Sure	31	36.05
Are you confident to use this technology when driving in urban areas or highways? (A8)	Yes	70	81.4
	No	16	18.6

The second section (Section B) focuses on the first major factor which is awareness. The result of the section is can be seen in Table 2. Based on the data recorded through the questionnaire, 76 of the total respondents (88.37%) agreed to have heard and known about level 2 automatic vehicles. Furthermore, the majority of respondents knew the advantages of this vehicle through the percentage (54.56%) representing 47. The presence of ADAS technology shows that as many (52.33%) do not know about this technology. Therefore, as many (81.4%) of the public have never used this technology. There are (87.2%) agree that this ADAS technology can reduce accidents due to human negligence. In addition (46.51%) agree that this technology can reduce road congestion and accidents. Most respondents agreed (81.4%) and were confident to use this technology when driving in urban areas and highways.

3.2.2 Section C: willingness factor

Table 3
Section C questions results

Item		Frequency	Percentage (%)
Based on the table above, is the price of this level 2 is automatic vehicle affordable for the public? (W1)	Yes	31	36.05
	No	55	63.95
Is the price given reasonably in line with the technology provided by the manufacturer? (W2)	Yes	53	61.63
	No	33	38.37
	Stylish	18	20.93

Do buyers just buy Automated vehicles to be stylish or have the technological advantages of vehicles on that? (W3)	Have the latest technology	68	79.07
Does owning this automatic vehicle provide advantages and comfort while driving? (W4)	Yes	81	94.19
	No	5	5.81
You agree if only automatic vehicles could be on the road? (W5)	Agree	15	17.44
	Do not Agree	71	82.56

The third section (Section C) focuses on the willingness factor of the respondents. Table 3 shows that with the various price options given by the manufacturers depending on the technology provided. A total of (63.95%) of respondents stated that the prices listed are not affordable for the public. The price given by the manufacturer depends on the technology provided, as many (61.63%) agree.
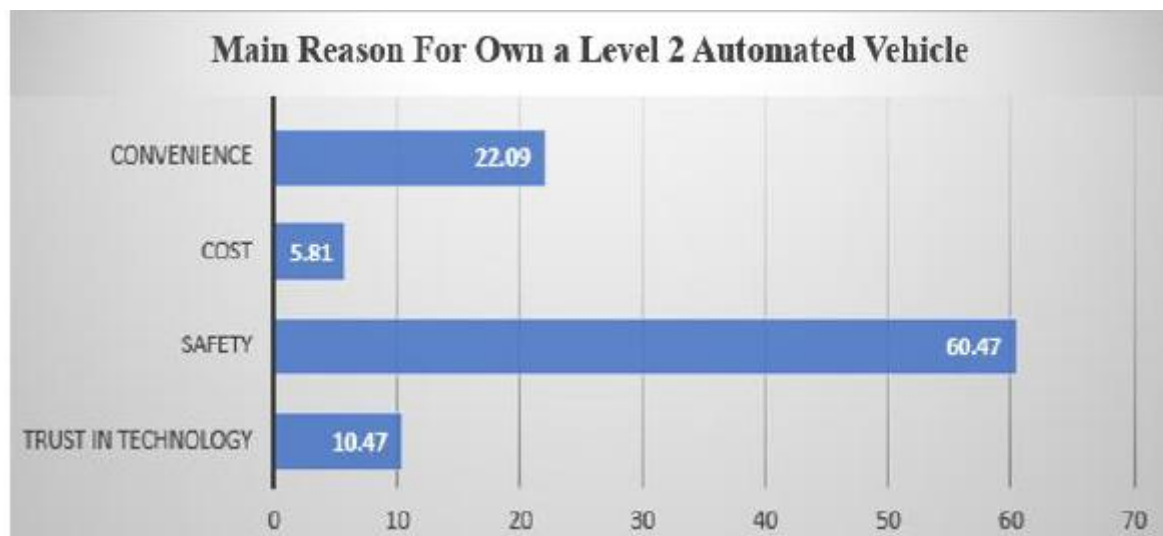

Fig. 3. Reasons to own a level 2 automated vehicle

Section C also asked the reason for why a respondent would like to own a level 2 automated vehicle. Most of the respondents as shows in Figure 3 choose to have an existing security system on this vehicle as many (60.47%) choose to have an existing security system. Second, convenience (22.09%) chose comfort, third, many (10.47%) chose to trust the technology provided. The latter is a cost of (22.09%).

3.2.3 Section D: access to facility / infrastructure factor

Table 4
Section C questions results

Item		Frequency	Percentage (%)
Does the available infrastructure such as road lines or road types help these vehicles function properly? (I1)	Yes	55	63.95
	No	31	36.05
Is it convenient for automated vehicles to be provided? (I2)	Yes	27	31.4
	No	59	68.6
Are the service centres currently available adequate? (I3)	Yes	20	23.26
	No	66	76.74
Are the current traffic lights connected to automated vehicles level 2? (I4)	Yes	10	11.63
	No	76	88.37
Is smart parking available in public places? (I5)	Yes	8	9.3
	No	78	90.7
	Yes	21	24.42

In rural areas, there are barriers to this is technology being used? (I6)	No	65	75.58

The fourth section (section D) focuses on the availability of facilities or infrastructure factor for level 2 automated vehicles. The respondents' answers in Table 4 shows that a total of 63.95% of respondents agreed that the existing infrastructure is currently available for this vehicle. The majority of respondents (68.6%) chose not to agree with the facilities provided at present. A total of (76.74%) stated that the convenience of the service center is insufficient. (88.37%) Respondents stated that the traffic light facility is not related to this vehicle. A total of (90.7%) stated that there is no smart parking facility, provided. This vehicle is also not suitable for use in rural areas, as many as (75.58%) chose not to use this vehicle in rural areas.

4. Conclusions

Based on the data collected, it is found that the public's awareness of level 2 automated vehicles is moderate because most respondents are aware of this vehicle and its functions. According to the data, the main factor for the acceptance of level 2 automated vehicles was the awareness towards the technology followed by the availability of facilities infrastructure, and willingness have shown to have the lowest rated factor. In terms of awareness, the survey results have shown that most of the correspondents have at least heard of the technology. However, most have admitted that they have not used a vehicle with level 2 automation. The survey has also shown that most correspondents agree that the technology can help to reduce road accidents. In terms of the availability of infrastructure, most correspondents have answered that the current level of infrastructures such as smart parking, traffic lights and service centre is still not ready for level 2 automation which contributes to the low rating for infrastructure as a factor for acceptance. In terms of willingness, while most respondents have answered that they agree that level 2 automation can help them with their driving comfort, but more than half have answered that cars with level 2 automation is still unaffordable. The respondents have also answered that they are not confident that fully automated vehicles could be on the road. The results of survey have shown the main concerns of Malaysian drivers towards automated vehicles and can be used to inform policies and marketing that are still needed to be done for the implementation of automated vehicles in the Malaysian market.

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