

The Analysis of User Satisfaction Towards Electric Vehicle Adoption: An Exploratory Study

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Abstract: *Electric vehicles (EVs) have been around since the earliest days of the automotive industry. However, in recent years, as the oil price has risen steadily and concerns about the environment have increased, interest in EVs has intensified. EVs have been promoted by many governments over the last several years, driven by public concern over pollutant emissions from internal combustion engines. However, the conditions related to driving EVs are not yet satisfactory for many EVs users (Kwon, Son, & Jang, 2020). Thus, an essential aspect of analyzing the current conditions of EVs acceptance is to evaluate EVs user satisfaction. A survey from 140 individuals was conducted between September to October 2020 to gather the interest and satisfaction toward EVs among Malaysian participants.*

Keywords: Technology transportation, electric vehicle, satisfaction, greenhouse gas emission

1. Introduction

Increased demand for fossil fuels requires research into other energy sources in transport planning. The different of EVs is that it uses an electric motor instead of a petrol or diesel engine. The EVs have distinct characteristics, such as limited driving range, re-charging of the battery, and zero tailpipe emissions. On the other hand, EVs also bring benefits in low running costs, increase fuel efficiency, and reduce greenhouse gas emissions. At the same time, it also offers driving ranges that are not limited by battery capacity. However, these benefits will not be realized if consumers do not adopt this new technology. In the past decade, EVs have drawn attention as a potential solution to environmental issues in the transportation sector, which is heavily dependent on fossil fuels. This growth has recently become more prominent, driven by the diminishing cost of EVs technologies, the prevalence of charging facilities, various incentives, and the diversity of EVs models in the market (Liu et al., 2017) (Liu et al., 2017). As more EVs have been sold, more drivers have experienced EVs technologies.

A study by Kwon et al., 2020, found that people's acceptance of new fuels and vehicles are determinants of EVs' place in the vehicle technology package. The number of kilometers traveled on one charge and the need for frequent charging influence EVs' purchase and use, the vehicle's efficiency (weekly amount spent on traveling), and the vehicle's comfort. People are likely to trade off these features; their decisions will be affected by attitudes, preferences, and habits (Kwon et al., 2020).

Acceptance of EVs has grown since its inception more than twenty years ago (Brownstone et al., 2000; Ahn et al., 2008), with the latest research in the area being in Japan (Kudoh et al., 2011), Germany (Lieven et al., 2011), UK (Burgess et al., 2013), Belgian (Moon and De Pelsmecker, 2012) and USA (Axen and Kurani, 2003). The technology at the heart of this study

embodies significant advances, and the study is tasked with assessing how much these advances will improve and satisfied users of. Satisfaction judgments relate to product experience, purchase process, and future service. It is essential to represent user's satisfaction factors throughout their experiences in this automotive industry.

This survey only covers drivers' experience, which can help analyze EVs' current status of satisfaction and, consequently, formulate realistic and effective strategies for EVs promotion and adoption (Biswas, Saha, & Khan, 2019). A direct way of understanding user adoption is to evaluate user satisfaction and its relationship with various influential factors. To this end, user satisfaction surveys are widely used for post-choice evaluation of specific products because satisfaction is inevitably tied to the purchase and consumption of a product (Oliver, 2014) especially to new technology.

2. Measurement

This study has developed a list of measurement items to construct the survey. Respondents answered a list of questions on a five-point Likert scale (from 1, strongly disagree, to 5, strongly agree) for each variable. Thirteen questions were asked to measure five influential factors. Six questions for demographic and seven questions were asked to measure satisfaction related to EVs owners' experiences. Table 1 shows the result for demographic items.

Table 1: Data analysis for Demographic purpose

Sample Attributes		(%)
Sample Size		140
Gender	Male	28.6 (40)
	Female	71.4 (100)
Age	18-30	72.8 (102)
	31-59	27.2 (138)
Employment status	Working	40 (56)
	Self-employed	5 (7)
	Students	52.8 (74)
	Unemployed	1.4 (2)
	Retired	0.8 (1)
Income range (RM)	<3000	81.4 (114)
	3000-6000	13.5 (19)
	6001-9000	4.3 (6)
	>9000	0.8 (1)
Education Level	Post-graduate	15.7 (22)
	Higher education	80 (112)
	School	4.3 (6)
Staying at Langkawi Island	Yes	9.3 (13)
	No	90.7 (127)

Based on table 1, 140 respondents from Malaysia were solicited to respond to this survey via google form, sent through Whatsup, Telegram, Facebook, and emails. The survey was conducted in the Malay language from August to September 2020 is presented. For the gender sample size, 28.6% of respondents as male, while 71.4% as female. The majority of respondents age is between 18 to 30, 72.8%, and age between 31 to 59 is 27.2%. For the employment status, participants mostly from students 52.8%, followed by working with the government and private sectors is 40%, self-employed 5%, unemployed 1.4% and retired 0.8%. The result from income range, most of the respondents, have income range less than RM3000 which is 81.4%, RM3000 to RM6000 is 13.5%, RM6001 to RM9000 is 4.3%, greater than RM9000 is only 0.8%. Regarding the result from education level, most respondents are from a

higher education level, 80%, post-graduate 15.7%, and school level is 4.3%. To filtering respondents who are not a citizen of Langkawi Island, the survey shows that 90.7% is a tourist and only 9.3% of respondents staying at Langkawi. To deep study satisfaction from respondents toward EVs, seven questions were asked regarding respondents' experiences and interests. This show in figure 1 until figure 7 in section 1.3.

3. Satisfaction and Interest

The objective of this survey is to gain the satisfaction of user toward EVs at Langkawi Island. Langkawi's Island is located 30 km off the northwestern coast of Malaysia and part of Kedah state. With around 3.6 million visitors each year, and tourism is the primary source of their income. Langkawi is very popular for Malaysian tourists because it is the only free duty Island in Malaysia, which shows that 85 percent of visitors are domestic. Visitors can go to Langkawi by ferry and also by flight. Furthermore, Unisco was granted to Langkawi Island as World Geopark on 1 June 2007 (ITDP 2019).

It is essential to study the satisfaction among users who have experience in driving EVs to achieve the Country's Masterplan to be Langkawi Island as a Low carbon Island in 2030. This section offers a discussion of seven questions that may have effects on the satisfaction of EVs users. The first question is about the experience of driving an EVs, which is "Have you ever driven an electric vehicle before". The survey that 20.7% indicate "yes", 71.4% to "never, but interested" and 7.9% to "never and not interested". It shows that interested people in EVs is very high, and it is a good response from participants for this further study.



Figure 1: Have you ever driven an electric vehicle before?

According to figure 2, the question is focus on satisfaction: "Are you satisfied with the use of electric vehicles in Langkawi Island?". The result shows that most of the people are satisfied and very satisfied, which 31% for both. Moderate is 20.7%, not satisfied 3.0%, and very not satisfied 6.9%. The result showed that satisfied people towards EVs are very high and grown a good response among them.

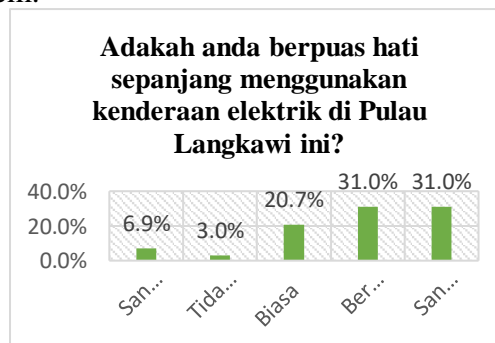


Figure 2: Are you satisfied with the use of electric vehicles in Langkawi Island?

To gain the respondents' interest in EVs usage, the question “ Do you intend to use electric vehicles on Langkawi Island in the future?” is asked. The result shows a good response when the answer to” yes” is 72.4%, “no sure” to 13.8%, “maybe not” is 6.9%, and “no” to 6.9%. Based on this outcome, people are interested in using EVs in the future, which shows that it will be a positive adoption of new transportation technology.



Figure 3: Do you intend to use electric vehicles on Langkawi Island in the future?

Regarding participants of satisfaction, this question is continues to ask about the recommendation to others. The question is, “Would you recommend to family members and friends to use an electric vehicle in Langkawi Island?”. The positive result shows that the respondent's answers to “definitely yes” is 75%, “maybe yes” to 10.3%, “maybe no” is 3.4%, and only 10.3% to “definitely no”. The respondents show their confidence of satisfied using EVs and share with their family, relatives, and friends.

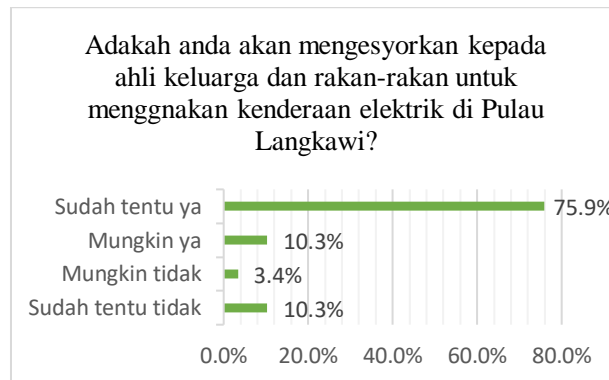


Figure 4: Would you recommend to family members and friends to use an electric vehicle in Langkawi Island?

Next is the question to know about the knowledge of EVs among participants regarding GHG emission. The question is “Do you agree with the following statement: The use of electric vehicles can reduce smoke pollution in Langkawi Island”. The most answer is “agree” 49.6%, strongly agree to 40.1%, “not sure” is 7.1%, “not agree” 2.2%, and “strongly not agree” only 1.0%. The result shows that most respondents agree that EVs will help reduce GHG emissions on Langkawi Island. Referring to this question, the respondents already have an early awareness of the benefit of using EVs. At least the knowledge that they have can change their thinking toward EVs adoption in Langkawi Island.

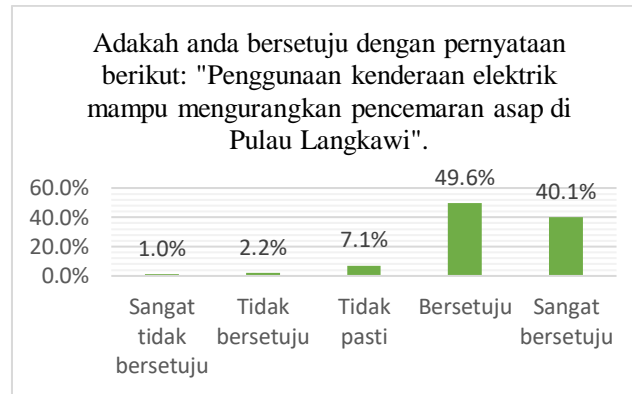


Figure 5: Do you agree with the following statement: The use of electric vehicles can reduce smoke pollution in Langkawi Island

Figure 5 also discusses EVs' knowledge, but this question focuses on general knowledge about the benefit of using EVs. The format is in a statement where participants can choose more than one answer. The question is "Please mark the statement you agree about the electric vehicle". There are four statements that respondents can choose. First, "Electric vehicle technology has improved and now has a much better reach" (57.5%). Second is "The cost of replacing an electric vehicle is much lower than the fuel cost of a petrol or diesel vehicle" (33.0%). The third is "Electric vehicles have excellent acceleration" (13.2%), and lastly is "Electric vehicles are much quieter than other vehicles" (61.5%). The result has shown that most of the respondents have a good knowledge of EVs benefits; they know that the EVs are good, but there is still small mastery in EVs ownership.

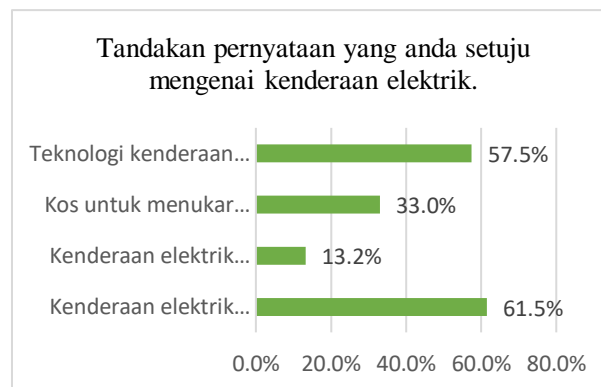


Figure 6: Please mark the statement you agree about the electric vehicle

Next is a question regarding the respondents' intention to own EVs in the future. The question is "Do you intend to buy an electric vehicle in the future?". The result for "definitely yes" is 9.3%. "Yes" is 55%. "Not sure" to 27.1%, "Maybe no" is 7.9% and "definitely no" is only 0.7%. Thru this result, most of the respondents are interested in buying EVs for the future. This question showed positive attention and presence of EVs has been well received among respondents in Langkawi Island.

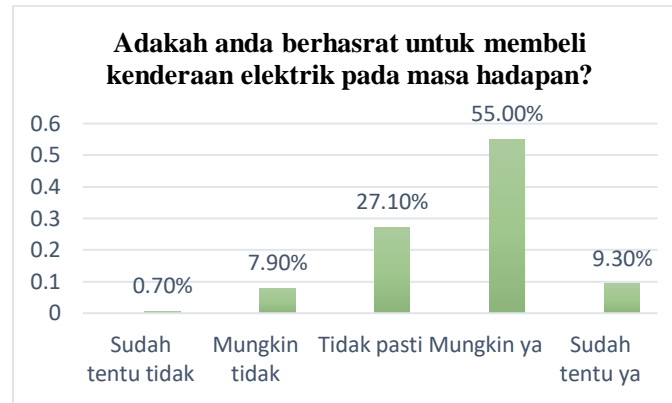


Figure 7: Do you intend to buy an electric vehicle in the future?

4. Discussion and Conclusion

The recent automotive market has actively promoted EVs nowadays. Malaysian is also interested in the environmental agenda, which introduces and promotes their automotive industries to implement EVs for the future. This government plans to bring Langkawi Island to a low-carbon Island in 2030 is the good initiative. However, this commitment needs its citizens' full supports. The EVs were first introduced in Langkawi Island in 2005, but users' adoption is still small. Thus, this study explores on actual EVs to diagnose EVs' current satisfaction level at Langkawi Island directly through survey. On the other hand, this survey can also help formulate a strategy for planning and operating EVs for government and manufacturing. Moreover, this study also evaluated potential factors affecting EVs user satisfaction and the consequential effects on adopting EVs for future use.

There are many factors to look at in realizing this plan. For this study, five factors have been arisen: advertising, government, infrastructure, technology, and consumer acceptance. Advertising is significant to spread the knowledge toward EVs in Langkawi; without advertising, there is no information that citizens can get. Furthermore, the government factor also highlighted where government involvement in supporting advertising, tax and subsidies are needed. Moreover, the next factor is preparing a good infrastructure to the place, especially on port charging, so users can feel more comfortable and safer when they drive. Next is the technology; the technology is referred to as the expert's readiness on EVs' technology. When the EVs break down, there will require an expert from the vehicle's technology to solve. Moreover, lastly is looking for a factor of consumer acceptance. For this factor, this survey showed a good result when most participants are accepted to use EVs for the future. In achieving Malaysian aims to be Langkawi Island as a zero-carbon plan island by 2030, many factors have to be looked at, and many researchers are most welcome.

5. Future study

It is believed that electric vehicles are an effective solution to reduce greenhouse gas emissions. The satisfaction of using EVs is essential to ensure the plan's success to be Langkawi Island as low-carbon Island in 2030 becomes true. Even though this study's sample is small, the result gaining is in many positive participants who are satisfied using EVs at Langkawi Island. This show that this project has good potential for future implementation. For future study, as suggested to survey in a large sample size with various area and knowledge. To better understand user satisfaction towards EVs, the study is suggested to get information from EVs owners all over Malaysia contact and worldwide.

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