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# **The Relationship between Satisfaction of Electric Vehicle Owners and Their Intentions for Repurchase and Recommendation**

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## **Abstract**

The electric vehicle (EV) market has expanded over the years, but the growth rate is very slow due to technological and economic limitations. Innovators and early adopters, who have already experienced EVs, can play an important role in complementing the shortcomings of products and establishing market expansion strategies. This study conducted a survey (n=153) to evaluate EV owners' satisfaction and their intentions for repurchase and recommendation. Survey responses were gathered from EV owners and analyzed using the Partial Least Square-Structural Equation Modeling (PLS-SEM). Results indicate that the satisfaction of EV owners has positively related to driving range of EV, positive prospects for the future EV market, and a long battery warranty period. In particular, the results show that owners' satisfaction with EV driving range greatly affects their overall satisfaction. On the other hand, consumers who suffered from inconvenience during the course of purchasing EVs and those who experienced frequent breakdowns were found to be less satisfied. However, there is no relationship between satisfaction and expectations with local development. The results also confirm that satisfaction with EV affects individuals' intentions for repurchase and recommendations. Therefore, in order to expand the EV market, it is necessary to provide EV purchasers with better service, to simplify complex purchasing process, and to encourage consumers to see future EV market and technology positively.

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## **1 Introduction**

Electric vehicles (EVs) are considered as a technology for resolving environmental problems including greenhouse gas emission in the transportation sector and as a powertrain for next generation in automobile industry. However, even 1% of global market share is shown to be a difficult goal to reach due to various barriers such as short driving range and high purchase price.

Under this market situation, EV owners who have already experienced the technology can play a key role in expanding EV market by telling people around them about positive reviews of EVs and recommending purchases. In this context, it is important to increase the satisfaction of innovators or early adopters who

own EVs. Due to the difficulty of collecting samples, however, only a small number of studies, including satisfaction surveys, have been conducted on EV owners.

This study was conducted to investigate the effect of various factors related to purchase and operation stage of EVs on owner satisfaction. We also examined whether overall satisfaction with an EV affected intention for repurchase and recommendation.

## 2 Methodology

A survey was conducted in 2016 to measure EV satisfaction, and intentions for repurchase and recommendation. The face-to-face survey was conducted for EV owners. Over 160 respondents were participated. After excluding 7 responses due to inconsistency and incompleteness, 153 responses were used in the final analysis. The survey questionnaires were composed of two parts: identification of socio-demographic characteristics of respondents and a measurement of EV satisfaction using a Likert Scale.

The proposed model was analysed using the Partial Least Square-Structural Equation Modelling (PLS-SEM) method. The PLS-SEM method based on OLS (Ordinary Least Square) is mainly used for analysing an exploratory model [1]. The major advantages of SEM-PLS are as follows: single indicator latent variables; small sample sizes; and weak theoretical background [2-4]. We implemented the PLS-SEM method by using Smart-PLS 3.2.6 software to analyse the responses.

## 3 Results and Conclusions

The purpose of this study was to investigate the factors affecting the satisfaction of EV owners as an indicator for future growth of the EV market and to analyse the effect of these factors on repurchase and recommendation intentions. As a result of our analysis, it was found that the range satisfaction factor has the greatest effect on EV satisfaction. Consumers who have low range anxiety and high satisfaction with the maximum driving distance were found to have a high overall satisfaction with EV. In addition, both consumers who have positive expectations for the future EV market and technology, and consumers who purchased an EV with a long battery warranty have high levels of satisfaction. On the other hand, those consumers who suffered from inconveniences in the purchase stage of EVs and those who frequently experienced faults with EVs tended to be less satisfied. There was no relationship between satisfaction and expectations with local development, i.e. the economic development and job creation resulting from the diffusion of EVs.

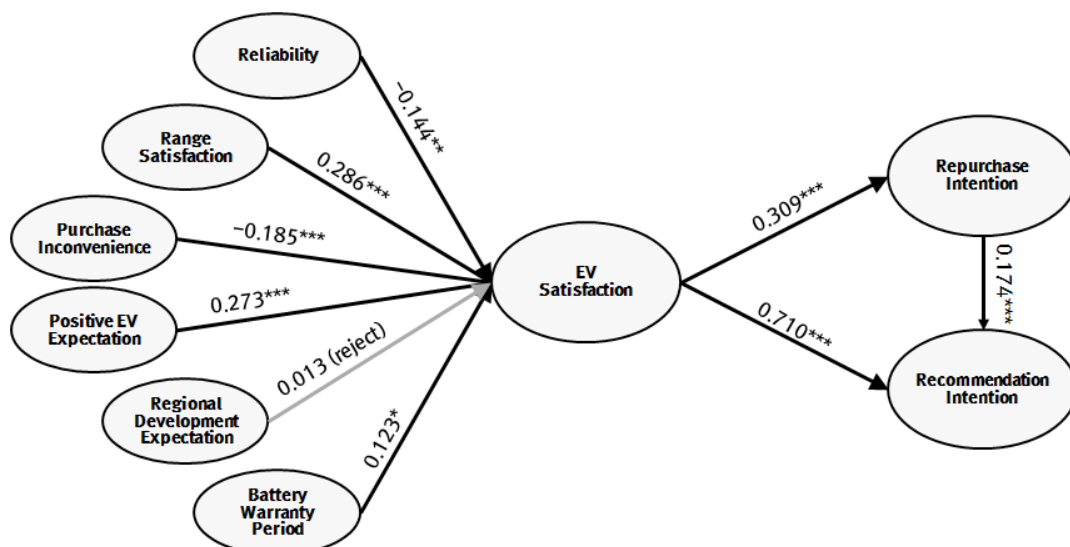


Figure1: Results of SEM-PLS analysis. \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

It has been confirmed that higher owner satisfaction with EVs correlates with a more positive effect on intentions for repurchase and recommendation. A high level of consumer satisfaction has advantages for the market such as preventing existing customers from purchasing other internal combustion engines and reducing marketing failure cost. This is consistent with previous research findings indicating that highly satisfied consumers are likely to repurchase in the future [5, 6]. In addition, there is a positive relationship between satisfaction and recommendation intention. Increasing customer satisfaction can appeal to potential EV consumers who are sensitive to word-of-mouth encouragement to buy EVs.

This study could discover relationship among EV owners' satisfaction, repurchase intention, and recommendation intention. Information about how to improve EV owners' perspectives would be helpful in establishing a strategy for expanding EV market. In addition, the results of this study could be used to improve the satisfaction of EV owners.

Table 1: Quality Figures Regarding the Measurement Model.

Constructs and operationalisation	Mean	SD.
<b>EV Satisfaction</b> (NOI:1; AVE:1.00; CR:1.00; CRA:1.00)		
I am satisfied with the purchase and use of an Electric Vehicle(EV).	3.36	1.18
<b>Repurchase Intention</b> (NOI:1; AVE:1.00; CR:1.00; CRA:1.00)		
I will buy EVs again in the future. (Scales: 0=no, 1=yes)	0.32	0.47
<b>Reliability</b> (NOI:1; AVE:1.00; CR:1.00; CRA:1.00)		
How many times did EV failures occur? (Scales: Failures number/year)	1.10	1.60
<b>Range Satisfaction</b> (NOI:3; AVE:0.732; CR:0.891; CRA:0.819)		
I am worried about the short driving distance of an EV. (reverse)	2.04	1.08
The mileage available from one charge mileage is sufficient at the current level.	1.82	1.10
I need higher EV mileage than is available now. (reverse)	1.90	1.12
<b>Purchase Inconvenience</b> (NOI:3; AVE:0.708; CR:0.879; CRA:0.794)		
I was uncomfortable with complicated and cumbersome procedures.	2.80	1.21
I was inconvenienced with the lack of information on the EV and chargers.	2.78	1.10
The lack of a test drive for the EV was inconvenient.	3.04	1.14
<b>Positive EV Expectation</b> (NOI:3; AVE:0.725; CR:0.887; CRA:0.811)		
EVs are the general trend and their future market will continue to grow.	3.47	1.27
In the future, the safety of EVs will be fully considered and they will be safe to use.	3.11	1.09
The battery will be stable and its replacement cost will be low.	2.76	1.15
<b>Regional Development Expectation</b> (NOI:3; AVE:0.639; CR:0.840; CRA:0.744)		
The environment in which I live is a valuable asset and must be protected.	4.49	0.82
The community in which I live needs jobs created through the EV industry.	4.29	0.90
As the supply of EVs increases, the economic development potential of the region will increase.	3.83	0.96
<b>Battery Warranty Period</b> (NOI:1; AVE:1.00; CR:1.00; CRA:1.00)		
What is the warranty period of EV battery that you currently own? (10000km)	14.35	1.97
<b>Recommendation Intention</b> (NOI:2; AVE:0.788; CR:0.881; CRA:0.737)		
I am willing to encourage people to buy EVs	3.09	1.33
I talk to people around me about the advantages of EVs	3.10	1.24

\* AVE=average variance extracted from the construct; CR=composite reliability; CRA=Cronbach's Alpha; Scales: -5=totally disagree to 5=totally agree.

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