




“An exploratory study on factors associated with consumers’ post-purchase dissonance of electric vehicles”

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AN EXPLORATORY STUDY ON FACTORS ASSOCIATED WITH CONSUMERS’ POST-PURCHASE DISSONANCE OF ELECTRIC VEHICLES

Abstract

Consumers’ post-purchase dissonance usually instigates after the purchase decisions are considered extremely important for marketers, resulting in severe consequences on consumer satisfaction and switching behavior. The current study aims to investigate the potential effect of consumer knowledge of electric vehicles (EVs), perceived risk, functional characteristics of EVs, attitude towards EVs on consumer post-purchase dissonance. The paper uses a quantitative approach by designing and distributing an online questionnaire to respondents. A total of 268 respondents participated and filled the online questionnaire. The data analysis revealed that functional characteristics emerge to be the leading factor per the consumer’s response, followed by perceived risk. The hypotheses testing results showed that functional characteristics, knowledge, and attitude have a statistically significant effect on post-purchase dissonance while concerning the perceived risk of EV. The results show that it has no statistically significant influence on post-purchase dissonance. Based on the results, it is critical to enhance consumer knowledge about the functional characteristics of electric vehicles to create a positive attitude that contributes to reducing post-purchase dissonance.

Keywords consumer knowledge, perceived risk, functional characteristics, attitude, Jordan

JEL Classification M30, M31

INTRODUCTION

Confusion affects all decision-making stages and rises extensively in the post-purchase stage due to uncertainty and high risk associated with the new technology. Consequently, consumers will experience post-purchase dissonance that has a negative influence on consumer satisfaction and loyalty. Safna and Selvarajan (2018) asserted that one could not deny the significance of post-purchase dissonance in consumer post-purchase behavior. Innovation is considered a critical competitive advantage in the transportation industry. Manufacturers of EVs adopted new technology completely different from traditional vehicles. This type of technology holds a high perceived risk for consumers in the case of the absence of proper information and knowledge of functional characteristics, which cause anxiety and increase the post-purchase dissonance of the consumers. The challenge for marketers is to uncover the role of factors that have a direct influence on consumers’ post-purchase dissonance by focusing on those factors that help in defusing post-purchase dissonance and increasing consumers’ trust and positive attitude. Post-purchase dissonance has various disadvantages on consumers’ trust, attitude, WOM, switching behavior, and loyalty. Identifying and understand factors causing post-purchase

dissonance can minimize the marketer's dilemma and also contribute to boosting consumers' self-confidence in their decision-making.

Most of the research on cognitive dissonance was performed in Western countries (Powers & Jack, 2013; Wilkins & Heffernan, 2018; Hinojosa et al., 2017), while scant studies were conducted in Jordan by A. Al-Adamat and O. Al-Adamat (2019) and Schumacker and Lomax (2010). The benefits of this article are twofold. First, the article will bring to light two essential notions in consumer behavior and emerging technologies, and, second, it will investigate the two concepts practically in the Jordanian market on electric vehicles.

1. LITERATURE REVIEW

Post-purchase dissonance defined as a state of mind that exists when consumers who have made recent purchases have doubts about the insight of their choice (Arthi & Mathi, 2016). Lazim et al. (2020) conceptualized post-purchase dissonance as a consumer's uneasy feeling about their prior action or belief. While Yang et al. (2019) defined post-purchase dissonances as when consumers feel frustrated, regretful, or think they have made the incorrect decision after the purchase.

Consumers' post-purchase dissonance negative consequences range from brand trust decline, loyal customer switching, and in some cases, order cancellations (Bolia et al., 2020). Yang et al. (2019) proposed additional negative consequences for post-purchase dissonance, including spreading negative word of mouth, scanty repurchase intention, and customer dissatisfaction. To avoid such negative results, it is prudent that one understands what may cause this perception of dissonance to reduce it before, during, and after decision making. It is necessary to narrow down the widening gap between customers and the producer's perception of the product (Bolia et al., 2020). Chadha et al. (2018) emphasized that companies must both their marketing efforts to minimize buyers' perception of post-purchase dissonance as low as possible.

1.1. Cognitive Dissonance (CD)

Successful transition to innovations is a critical aspect of consumer demand. Lack of knowledge and experience on new technology, such as EVs can lead to confusion among buyers for several years despite the long introduction stage in the market, such as in the case of hybrid vehicles in

North America; results revealed that confusion and lack of awareness could persist long after the commercial introduction of technology (Axsen et al., 2017). Quantitative and qualitative research results confirm that consumers are confused about EVs' nature and functional characteristics (Krause et al., 2013; Axsen et al., 2017). Despite the clear explanation of different vehicle features provided by the interviewers, still, confusion sustains for some participants. Research by Koller and Salzberger (2007), Safna and Selvarajan (2018) asserted that many factors such as several products alternative, various advertising tools, and complexity of information cause overload confusion in all purchase stages, including a post-purchase stage where cognitive dissonance takes place. Festinger (1957), in his revolutionary work, was the pioneer who tried to explain and conceptualize the meaning of cognitive dissonance from a psychological point of view. This seminal work has attracted and inspired many researchers from different backgrounds as psychology and sociology, to implement empirical investigations on this prominent topic (Mao & Oppewal, 2010). Festinger (1957) defined CD as a psychologically uncomfortable state that motivates a person to reduce that dissonance. Additionally, Festinger (1962) asserted that a consumer could experience dissonant status if he felt inconsistency in any two elements of the cognition system that include his knowledge of the world, his knowledge of himself, and his feelings, desires, and behavior. It is important to discern that cognitive dissonance occurs directly after the purchase decision and causes psychological discomfort (Sweeney et al., 2000).

Researchers exerted outstanding effort to measure cognitive dissonance. Montgomery and Barnes (1993) developed a ten items scale to measure cognitive dissonance called POSTDIS and include

two factors, the first is Decision Correctness, and the second is Support. Unfortunately, the scales were not popular, and few researchers use it. A more comprehensive measurement was designed by Sweeney et al. (2000) and contained a 22-item scale for assessing post-purchase cognitive dissonance. The new measurement scales by Sweeney et al. (2000) suggested that dissonance includes cognitive and emotional components. The three-dimension scale includes Emotional, Wisdom of Purchase, and Concern over the Deal. Sweeney and Soutar (2006) considered the scale as unbalanced since they have 15 items measuring the emotions dimension, while three and four items are used to measure the two subscales of the cognitive dimensions. To balance the scales, they investigate the likelihood of reducing the emotional scale without losing the original scale's meaning and strength. They reduced the emotion scale to five items that yield equally good measurement properties to the original scale. The results obtained for these new short scales showed that they were reliable and valid. For this study, the new short scale will be used. Finally, Smyczek (2002) summarized the factors that raise the occurrence of post-purchase dissonance. These factors include the level of decision importance to the consumer, whether this decision is unchangeable, degree of complexity, high price, time-consuming, number of positive and negative features in the product. Marketers started to incorporate the theory of cognitive dissonance created by Festinger (1957) to investigate the dissonance experienced by customers' post-purchase of various products and service categories (Seger-Guttmann et al., 2018; Wilkins et al., 2018).

1.2. Electric Vehicle (EV)

The Electric Vehicle (EV) was inaugurated and put in use starting in the early years of the last century, as noted by Daziano and Chiew (2012). It was only starting from this current century where a massive spread of EVs in the USA and the Japanese market took place. The rapid advancement in technology has led to different types of cars that use various and mixed sources of energy. EVs technologies have introduced various vehicles that include Battery Electric Vehicle (BEV), which run only on electricity. While the Hybrid Electric Vehicle (HEV) can run on both electricity and fuel with a self-charging system, and the third type is Plug-in

Hybrid Electric Vehicle (PHEV), which is similar to the previous category. However, in this type, you can charge the car battery from an external source, and finally, Fuel Cell Electric Vehicle (FCEV). The new technology used in these cars is deemed new to consumers and leads to new implications on decision-making, raising the need for further research to understand consumer purchase behavior. Some researchers, such as Schuitema et al. (2013) and Rezvani et al. (2015), pointed out that research treated the different types mentioned now as EVs. The truth is the HEVs depends mainly on fuel and hence does not require any drastic change in the consumers' behavior. In this current research, the main focus will be on Battery Electric Vehicle (BEV), which one can charge it from an electric outlet. This new technology represents a new challenge for marketing researchers and practitioners to cope with disrupting innovations in EVs technology and consumers' different behavioral demands (White & Sintov, 2017). The rationale for that is a consumer need to change his mind drastically since BEVs hold some technology bound features. For example, consumers habituate to regular recharging for the car battery by plugging the cable to the electricity source while the car is not in use (Axsen et al., 2012). Another example of new anxiety is experiencing distance ambiguity by comparing the possible driving range of an electric vehicle with the actual range needed in daily car use and the time required to charge the battery to enable you to reach your destination (Sovacool & Hirsh, 2009).

Car marketers are anxious about increasing customer confidence after purchase decision-making, such as familiarity with vehicle characteristics, range anxiety, charging knowledge, car dependability, and resale value. Reducing consumer uncertainty by increasing consumer knowledge, confidence, and trust may boost the likelihood to influence EV purchase by any given consumer (Taylor & Fujita, 2017). It is persistent to increase the buyer's confidence in the purchase and decrease post-purchase dissonance (Aaker & McLoughlin, 2009).

1.3. Knowledge of EVs

Product knowledge is considered one of the most decisive factors affecting consumers during the decision-making process that causes consum-

ers to exhibit disparity in purchasing behavior (Chéron & Hayashi, 2011). According to Axsen et al. (2017), for new technology such as EVs, knowledge is likely to be inadequate or unavailable among consumers for quite a few years after its introduction to the market, and perhaps even longer. Axsen et al. (2017) found that most survey respondents have incorrect knowledge of the central cost and operating features of EVs. To lower the chance of consumers' post-purchase dissonances, one needs to increase their product knowledge (Guo et al., 2018). Rezvani et al. (2015) found that product knowledge of EVs is an essential factor in shaping consumer attitudes. Product knowledge may influence the patterns of consumers' behavior like product performance expectations, quality level, and characteristics, which can determine consumer satisfaction level from using the product (Soderlund & Gunnarsson, 2000). Gobczyński and Leroux (2011) classified consumers based on innovativeness/knowledge level. They found that consumers who exhibit high innovativeness/high knowledge levels are the easiest to convince with the EVs.

1.4. Perceived risk

Perceived risk is a very well-known psychological concept and has a very dominant role in marketing, sociology, and psychology research. Dunn et al. (1986) defined perceived risk as to the predictable negative usefulness and value that consumers relate to the purchase of any product or service. Perceived purchase risk is a possible cause for cognitive dissonance when customers buy for the first time and do not have enough information about the product. Uncertainty arises from the feeling that there will be a potential problem with the product after buying it. Perceived purchase risk can evolve due to many factors related to anything, such as the product functions, company, delivery, installation, post-purchase services, and product price and value (Joshi & Singh, 2017). The higher the problems that the customers think he will face when he purchases the product, the higher the tendency that this customer will regret buying this product. Therefore, as past literature indicates, the higher the perceived purchase risks, the higher will be the perception of CD (Sweeney & Soutar, 2006). Many researchers as-

serted that companies should act proactively before the purchase stage to minimize the possible sources for CD by enhancing and empowering the consumer decision-making and not to wait after the post-purchase stage and occurrence of dissonance to act (Gan & Ding, 2014).

1.5. Functional characteristics of EVs

Functional characteristics are a significant source of product value that reflects technical and augmented features. EVs technical features are considered extremely important and reflect the quality and endurance and include many aspects such as speed, battery replacement cost, charging time, distance range per charge, zero-emission, engine power, and consumption. Augmented features consist of design, country of origin, safety, size, uncertainty about the residual value, and post-purchase services (Bigerna & Micheli, 2018). Awareness and knowledge of such technical and augmented features concerning EVS performance, efficiency, and value will diminish the gap between consumers' expectations and real product value (Sirgy et al., 1991). Many researchers were concerned with the influence of functional attributes of EVs on consumers and assessed how consumers perceive both instrumental and functional attributes of EVs (Krupa et al., 2014). Rasouli and Timmermans (2016) asserted that the technical characteristics profoundly influence consumer adoption decisions of EVs. Additional characteristics that can persuade the adoption of EVs may include costs and performance.

1.6. Attitude towards EVs

The concept of EVs depends on new technology and utility for consumers that are different from traditional vehicles. EVs provide several positive features that contribute positively to environmental enhancement by reducing fuel consumption and contribute to sustainable mobility. Conventional vehicles with internal combustion engine vehicles are different from EVs with new technology-specific characteristics (Morton et al., 2016). Modern technology used in EVs requires consumers to think differently and change their attitude toward transportation. The change in mentality is critical since the new technology used

in EVs will increase the price of EVs by average approximately 15-30% of conventional vehicles. While Reiner and Haas (2015) conclude that when people have more familiarity driving EVs, they show more positive attitudes towards e-mobility. Another issue consumers need to consider very critically is the driving range. For EVs, the average distance covered depends on car size, model, and year of manufacture, but it can reach 200 km on average. New models can do more than that, but the price will go up. The consumer needs to customize himself with everyday battery charging for daily use mainly from a private charging station since public charging stations are rare. Using EVs requires careful trip planning and exact charging time required based on battery capacity and electricity output charging power. Finally, consumers who are ready to drive EVs must regulate the maximum speed of their driving habits; since most EVs are limited to 130-140 km/h. In line with these facts, if consumers are willing to change their attitude towards EVs, this will reduce the consumers' CD for EVs. While if attitude persists without change, surely this will increase consumers' CD for EVs.

2. AIM AND HYPOTHESES

This research aims to explore the Jordanian consumer decision-making patterns concerning EVs as an emergent technology. More precisely, this research will analyze and identify the factors that influence Jordanian consumers' post-purchase dissonance of EVs. Based on the literature review and research model, the following hypotheses were proposed:

- H1: *There is a statistically significant effect of knowledge of EVs on post-purchase dissonance.*
- H2: *There is a statistically significant effect of perceived risk on post-purchase dissonance.*
- H3: *There is a statistically significant effect of the functional characteristics of EVs on post-purchase dissonance.*
- H4: *There is a statistically significant effect of attitude towards EVs on post-purchase dissonance.*

3. METHODOLOGY

3.1. Model

After conducting thorough research in the literature review on EVs, one managed to identify several personal and psychological antecedents affecting the consumers' post-purchase dissonance for EVs as an emergent technology. Consequently, the model design reflects the most vital factors that influence the consumers' post-purchase dissonance shown in Figure 1.

3.2. Survey design

The present study will adopt an explanatory method approach to achieve its goals. A quantitative survey is used to explore the effects of independent variables on consumers' post-purchase dissonance as the dependent variable. A convenience sample method was used by post-

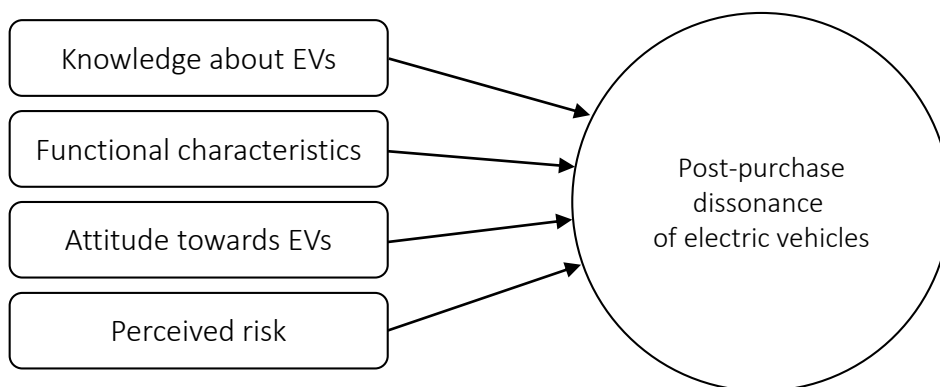


Figure 1. Research model

ing the questionnaire on two Facebook sites related to EVs users and focus on EVs issues with more than 4,500 followers in Jordan. The sites are Jordan Electric Cars Club and Electric Cars – Jordan. In the first round, about 188 respondents completed the questionnaire and submitted it. After two weeks, the questionnaire was posted once again, and one managed to get back another 80 questionnaires, to have a total of 268 questionnaires entered in the data analysis.

3.3. Tools of the study

A questionnaire was developed to measure the respondent's answers using a quantitative technique with a five Likert scale from 1 = Strongly Disagree to 5 = Strongly Agree. Items measuring perceived risk and knowledge concerning EVs were adopted from Wang et al. (2018). Items measuring functional characteristics were adopted from Rasouli and Timmermans (2016). Items measuring attitude towards EVs adopted from Morton et al. (2016) and Bennett and Vijaygopal (2018). Items measuring post-purchase dissonance were adopted from Sweeney and Soutar (2006).

4. RESULTS

4.1. The demographic profile

Table 1 summarizes the sample demographics, about 82.8% of respondents are male, and only 17.2% were female. More than half of respondents were less than 30 years old with, 50.4%. The age category between 31 and 40 years was 23.1%, and the lowest percentage goes to more than the 51-year category with 18.6% only. These numbers show that the young generation deals more with EVs than the old generation. More than half of the respondents have an undergraduate degree, with 61.9% and 21.6% of them being at the postgraduate level. Monthly household income shows that middle-class consumers with a salary between 801 and 1,500 JD received the highest percentage with 43.7%, and the high middle class with income ranging from 1,501 to 2,000 JD ranked second with 33.2%. About 59.0% of respondents at least bought 1 EV, while 36.9% bought from two to three EVs, and only 4.1% bought more than 4 EVs.

Table 1. Demographic profile of respondents

Respondents	Frequency	100%
Gender		
Male	222	82.8
Female	46	17.2
Age		
20-30 years	135	50.4
31-40 years	62	23.1
41-50 years	50	18.6
More than 51 years	21	7.9
Education		
High school	44	16.4
Bachelor degree	166	62.0
Postgraduate	58	21.6
Monthly household income		
Less than 800 JD	46	17.2
From 801 to 1,500 JD	117	43.7
From 1,501 to 2,000 JD	89	33.1
More than 2,001 JD	16	6.0
Number of EVs bought		
1 EV	158	59.0
2-3 EVs	99	36.9
More than 4 EVs	11	4.1
Total	268	100%

To analyze the data collected for this study, the Structural Equation Modeling (SEM) method is used to assess the proposed research model, as suggested by Ringle et al. (2005), using PLS 2.0 software application. The advantage of this software is its ability to deal efficiently with few items in the constructs, as noted by Hair et al. (2016).

4.2. Measurement model

The measurement model's role is to assess the reliability and validity of the constructs (Henseler et al., 2009). For individual item reliability, and as noted by Hair et al. (2016), the minimum accepted factor loading threshold is 0.70. As shown in Table 2, all items loading were above the 0.70 level. For the generated factors, one tests the reliability using Cronbach's alpha. The result shows that all factors were reliable and meets the 0.70 criterion, as recommended by Hair et al. (2016). To assess construct validity, researchers usually use both convergent and discriminant validity. For convergent validity, all the item's standardized factor loadings must be more than 0.70. Table 2 shows that all items achieved a standardized factor loading higher than 0.70, indicating accepted convergent va-

Table 2. Mean, loadings, composite reliability, and average variance extracted

Construct	Item	Mean	Loadings	Cronbach's α	Composite reliability	AVE
Perceived risk	PR1	3.83	0.74	0.75	0.80	.652
	PR2	4.01	0.80			
	PR3	4.03	0.71			
	PR4	4.18	0.77			
Functional characteristics	FC1	4.15	0.78	0.73	0.81	.638
	FC2	4.03	0.83			
	FC3	4.16	0.74			
	FC4	3.96	0.83			
	FC5	4.09	0.79			
	FC6	3.76	0.75			
	FC7	3.95	0.70			
Knowledge about EVs	KN1	3.78	0.80	0.78	0.84	.687
	KN2	3.68	0.84			
	KN3	3.97	0.83			
	KN4	4.14	0.85			
Attitude towards EVs	ATEV1	3.67	0.85	0.74	0.79	.712
	ATEV2	4.37	0.76			
	ATEV3	3.96	0.87			
	ATEV4	3.76	0.78			
	ATEV5	3.80	0.93			
	ATEV6	3.81	0.75			
Post-Purchase Dissonance – Emotional	PPDE1	3.69	0.86	0.75	0.82	.694
	PPDE2	3.77	0.82			
	PPDE3	3.79	0.77			
	PPDE4	3.80	0.74			
	PPDE5	3.88	0.80			
Post-Purchase Dissonance – Wisdom of Purchase	PPDW1	3.79	0.72	0.71	0.76	.615
	PPDW2	3.82	0.76			
	PPDW3	3.89	0.79			
	PPDW4	3.88	0.82			
Post-Purchase Dissonance – Concern over Deal	PPDCD1	3.95	0.87	0.78	0.83	.588
	PPDCD2	3.79	0.81			
	PPDCD3	3.80	0.93			

lidity. To ensure convergent validity, the average variance extracted (AVE) of each construct should go above 50% of the variance, as noted by Bagozzi and Yi (1988). The results in Table 2 confirm that all items are above the benchmark value of 0.50 and hence meet this requirement. While concerning discriminant validity, it is assessed by comparing the inter-construct correlations with the square root of AVE.

To achieve discriminant validity, AVE square roots need to be higher than correlations among the constructs (Hair et al., 2016). As shown in Table 3, this requirement achieved since all square root of AVE for each construct is higher than its correlations with other constructs, and by that, it fulfills the discriminant validity. Based on these results, one can assume that the measurement model holds the required reliability and validity level.

Table 3. Discriminant validity for the measurement model

Variables	PPD	P risk	Function	Knowledge	Attitude
PPD	0.713	–	–	–	–
P risk	0.231	0.751	–	–	–
Function	0.259	0.571	0.810	–	–
Knowledge	0.192	0.719	0.500	0.817	–
Attitude	0.401	0.108	0.061	0.078	0.772

Table 4. Results of structural model analysis

Hypothesized paths	Path coefficient	T-value	Result
Knowledge → PPD	0.32	2.25	Supported
P risk → PPD	0.20	.813	Not supported
FC → PPD	0.35	2.77	Supported
Attitude → PPD	0.38	6.95	Supported

4.3. Structural model analysis

To test the research hypotheses, AMOS software was employed to conduct the structural model analysis. Schumacker and Lomax (2010) and Kline (2011) proposed several criteria to establish the fit of a structural model. Among those different criteria, the following procedure was proposed to set the model fit; χ^2 , χ^2/df ratio, GFI, AGFI, RMSEA, SRMR, CFI, and TLI. The model demonstrated an overall satisfactory model fit. The Chi-square ratio to the degree of freedom (χ^2/df) was 2.11, smaller than the threshold value of 3.0 (Schumacker & Lomax, 2010). GFI, CFI, IFI, NFI, and TLI values were 0.92, 0.91, 0.93, 0.94, and 0.93, respectively, meeting the acceptable criteria of 0.90 as a minimum (Schumacker & Lomax, 2010).

Also, the model fit indexes such as RMSEA = 0.07 and SRMR = 0.06 were smaller than 0.08.

Table 4 shows the results of hypotheses testing. The results show that *H1*, *H3*, and *H4* are supported at the significance levels of 0.05. Functional characteristics have a positive and significant effect on post-purchase dissonance ($\beta = 0.35, p < 0.05$). Attitude towards EVs is also positively and significantly related to post-purchase dissonance ($\beta = 0.38, p < 0.05$). Knowledge about EVs have positively and significantly effects on post-purchase dissonance ($\beta = 0.32, p < 0.05$). Therefore, *H1*, *H3*, and *H4* were all supported. Simultaneously, perceived risk has no significant effect on post-purchase dissonance ($\beta = 0.20, p < 0.05$); hence, *H2* was not supported.

CONCLUSION

This paper explores the different factors that affect consumers' post-purchase dissonance. Post-purchase dissonance influences consumers' satisfaction, loyalty, WOM, and future preferences. The SEM results show that functional characteristics, knowledge, and attitude towards EVs are positively and significantly related to post-purchase dissonance at $p < 0.05$. Hence, one accepts the three hypotheses. Perceived risk was not significant at $p < 0.01$, and hence one rejects the hypothesis. This result is in line with Wang et al. (2018).

The results show that functional characteristics have a significant effect on post-purchase dissonance, and this result is in line with Morton et al. (2016) and Wang et al. (2018). When consumers are about to buy a new product with emerging technology such as EVs, consumer familiarity with functional characteristics such as charging time and maintenance cost, battery replacement cost, driving range, and vehicle price can be very decisive in consumer decision-making helps in reducing post-purchase dissonance. Simplifying some of the complicated functions and technical features makes it easier for consumers to understand, compare, and evaluate to enhance consumers' confidence and trust in their decision-making. The second significant result was for knowledge, and this result is in line with Wang et al. (2018) and Degirmenci and Breitner (2017). Knowledge about new products and technology, in general, can play a pivotal role for consumers to adopt new products. Marketers need to devote special attention to raising consumers' knowledge of EVs and their features by educating the consumers with appropriate information and practical experience on vehicle performance and advantages. Reducing uncertainty is extremely necessary to minimize post-purchase dissonance by providing detailed information to boost consumers' knowledge. The result of this study is in line with Bigerna and Micheli (2018). Future research recommends replicating this study on other new technological products to ensure if the same variables will have the same results concerning consumers' post-purchase dissonance.

AUTHOR CONTRIBUTIONS

Conceptualization: Hamza Khraim.
 Data curation: Hamza Khraim.
 Formal analysis: Hamza Khraim.
 Investigation: Hamza Khraim.
 Methodology: Hamza Khraim.
 Resources: Hamza Khraim.
 Software: Hamza Khraim.
 Validation: Hamza Khraim.
 Writing – original draft: Hamza Khraim.
 Writing – review & editing: Hamza Khraim.

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