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Fostering Attitudes and Customer Satisfaction for Sustainability by Electric Car-Sharing*

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Abstract

Purpose: The purpose of this paper is to explore factors that affect electric car-sharing by highlighting issues of environmental sustainability and customer attitude and satisfaction. **Research design, data and methodology:** This study examined customers' perception on those issues by using electric car-sharing as usages of both electric car and car-sharing play a key role to improve sustainability. Online survey was applied to collect the data. This study also applied factor and regression analyses for data analysis. **Results:** The results of this study showed that effects of proposed factors including cost efficiency, emotion, safety, health, and sustainability on attitude toward electric car-sharing on attitude were significant. The results also showed that the effects on intention, satisfaction, and loyalty were significant. **Conclusions:** This study provides policy and managerial implications. By dealing with factors of electric car-sharing service, this study offers necessity of better strategies and policies for electric car-sharing service to electric car businesses and policy makers. This study also suggests that businesses should develop appropriate strategies for the improved usage of electric car-sharing by considering sustainability and improving relationships with customers. Further, government should consider to develop proper policies for sustainability by promoting the usages of electric car-sharing.

Keywords : Sustainability, Attitude, Customer Satisfaction, Electric Car-sharing

JEL Classification Code: Q56, M19

1. Introduction

The sharing economy, a platform based business model expedited by the 4th industrial revolution, has been growing rapidly by introducing and integrating diverse forms. Every industrial revolution has presented new waves of the economy and business by addressing different roles of supply and demand. The 1st industrial revolution with an improved manufacturing system by steam engine led to opening of Capitalism 1.0, which is also called as laissez-faire capitalism. (Smith, 1776). When mass production was introduced by Fordism, Capitalism 2.0 (Van Parijs, 1995), known as the 2nd industrial revolution, emphasized government's role in controlling demands to activate economy.

During the development of Internet and Communication Technology (ICT), however, government's heavy intervention rather delayed economic growth in 1980s. As a tool to solve this, Capitalism 3.0 (Barnes, 2006), known as the 3rd industrial revolution, preferred alleviated regulations to promote growth of global markets. As of the 4th industrial revolution, a new form of economy requires a fusion of few regulated markets and many efficiently operated markets with transparency, so called capitalism 4.0 (Kaletsky, 2011).

The 4th industrial revolution has been emphasized with the emergence of Information Communication Technology (ICT) that has paved the way for new business models (Björkdahl, 2009). The sharing economy, coined by Lessig (2008) or crowd-based capitalism, coined by Sundararajan

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(2016) became a significant model in one's life with issues of global sustainability and environment. Botsman and Rogers (2010) argued that collaborative consumptions involving exchanging, redistributing, renting, sharing, and donating information, goods, and talent lead to the improving social cohesion and minimizing usage of resources (Heinrichs, 2013). Sharing economy addressed efficient use of remaining resources by emphasizing sustainability and environmental issues. Since economical usage of goods helps saving scarce resources necessary for production (Böcker & Meelen, 2016), sharing economy contributes to reducing pollutants, emissions, and carbon footprints by preventing massive productions. Although the presumed sustainability benefits of the sharing economy are much more complex than initially expected partly because of value destruction (Frenken & Schor, 2017; Yang, Evans, Vladimirova, & Rana, 2017), still a variety of sharing business models are introduced as a way for realizing sustainable growth in various aspects.

Among sharing economy models highlighting sustainability, this study posited that better usage of electric car-sharing services and promoting them significantly help foster sustainability and improve customer satisfaction and loyalty through relationships. As technology development for electric cars has rapidly grown, electric car-sharing has received attention as one of sustainable business models in the sharing economy. According to Mounce and Nelson (2019), electric vehicle car-sharing services have a considerable potential for sustainability based on synergy effects with air quality imperatives, the rise of the sharing economy, and the proliferation of smartphones. Since car-sharing services and electric car are both closely related to sustainable development, combining them might result in an effective solution to future problems such as pollution, congestion, and shortage of fossil fuels (Brandstätter, Kahr, & Leitner, 2017). Given that transportation tremendously accounts for greenhouse gas emissions, it might be very important to encourage customers' experience of electric cars and pinpoint the factors that attract their intentions.

Based on the consideration, the purpose of this study is to investigate factors that affect electric car-sharing service by addressing customer attitude, satisfaction and sustainability. Electric car-sharing is selected as customers' usage of electric car-sharing might help improve intention to purchase electric cars for their future consumption. This study examined customers' perception on factors of electric car-sharing that affect customer attitude, intention to use, satisfaction, and loyalty. Ultimate goal of this study is to increase electric car usage by addressing policy and managerial issues regarding environment and sustainability. This study also expects to foster the usages of electronic car-sharing that might improve customer satisfaction and resolve sustainability issues practically. Theoretically, this study expands application of satisfaction theories in the field of sustainability with sharing economy. This study proposed factors that affect customers' attitude in the usage of electric car-sharing business model. Proposed factors include cost-efficiency, convenience, emotion, safety, health, and sustainability. In addition, this study investigated how the attitude affects intention to use, satisfaction, and loyalty. Further, by examining the effects on customer attitude, this study provides implication on how users feel toward and react to sharing the renewable-energy automobiles (i.e. electric vehicles). The proposed research questions include the following: i) how does the perception on factors of electric vehicles including cost-efficiency, convenience, emotion, safety, health, and environmental sustainability affect electric car-sharing users' or potential users' attitude?; ii) how does the customer attitude affect intention to use of sharing electric cars?; iii) how does the customer attitude affect satisfaction for sharing electric cars?; and iv) how does user's satisfaction affect customer loyalty?

2. Literature Review

2.1. Sustainability by Sharing

The term, sharing economy is addressed as an opposite concept of commercial economy in terms of non-ownership, temporary access, and redistribution of resource (Lessig, 2008). Previous studies posited different terms of sharing economy with different perspectives such as collaborative consumption, collaborative economy (Botsman & Rogers, 2010), access-based economy (Bardhi & Eckhardt, 2012), on-demand economy (Jaconi, 2014), and hybrid economy (Scaraboto, 2015). In addition to key players of the sharing economy including demands, suppliers, and platform providers, the role of government has paid attention particularly due to sustainable and environment aspects.

According to Heinrichs (2013), sharing economy is a potential new pathway to sustainability. Although the expected sustainability benefits of the sharing economy are much more complex (Frenken & Schor, 2017) because of its linkage to value destruction (Yang, Evans, Vladimirova, & Rana, 2017), many studies expound positive effects of sharing economy on sustainability. Curtis and Lehner (2019) stated that a sharing economy for sustainability is defined as a socio-economic system that leverages technology to mediate two-sided markets, which enable temporary access to goods that are under-used, tangible, and rivalrous. Piscicelli, Cooper, and Fisher (2014) found that 32% of their respondents imply "to be green" as the main reason for joining a sharing platform to lend and borrow each other's goods.

Over the last decades, environmental issues have become mainstream because of an increase in public concern for environmental problems (Kalafatis, Pollard, East, & Tsogas, 1999), which makes environmental protection to be one of the most significant public agendas in Europe and Northern America (Dunlap & Scarce, 1991). Sustainable methods to consume resources have received growing attention because of air pollution, climate change, and resource scarcity. (McDonald, Oates, Young, & Hwang, 2006). Daunoriene, Draksaite, Snieska, and Valodkiene (2015) argued that environmental drivers of sharing economy depend on several conditions such as emphasis on the stability of biological and physical systems, the reduction of the produced goods in order to bring sustainable consumption modes, and customer participation. Car-sharing is considered as one of solutions to migrate greenhouse gas and pollutions. Efthymiou, Antoniou, and Waddell (2013) confirmed that car-sharing reduces in air pollution and traffic congestion by decreasing the vehicle ownership. Car-sharing businesses promote their services as a sustainable driving practice, making efforts to position themselves as a green brand (Bardhi & Eckhardt, 2012). Hertwich and Peters (2009) also addressed that mobility or transportation is one of important areas mainly accounting for greenhouse gas emissions worldwide. Mobility area has been paid more attention by addressing more usage of public transportation (Carrus, Passafaro, & Bonnes, 2008), carpooling (Vanoutrive, Van De Vijver, Van Malderen, Jourquin, Thomas, Verhesel, et al., 2012), and sharing cars (Nobis, 2006).

2.2. Sustainability by Electric Car-Sharing

Electric automobiles are considered to be one of essential ways for sustainability, especially in the perspective of environment. Jeon (2017) found that costs of environmental damage from electric cars are lower than those from non-electric cars. Yi (2020) also proved that greenhouse gas reduction rates are much more efficient by using electric cars rather than conventional ones. Previous researches have also expounded that electric cars are not only lower air pollution but also reduce traffic noise (Brady & O'Mahony, 2011; Hawkins, Singh, Majeau-Bettez, & Strømman, 2012). Apart from environmental sustainability, electric vehicles also have less expensive charging and maintenance fees, which results in reducing overall operating costs (Gärling & Thøgersen, 2001). Dupont, Hubert, Guidat, and Camargo (2019) argued that electric cars are potential elements of any smart city in that electric cars support smart city as future urban mobility. Park and Kim (2020) argued that transformation to electric vehicle turns out to be effective in reducing greenhouse gas and fine dust emissions.

Previous studies in the field of sharing economy mainly focused on the issues of car-sharing rather than electronic car-sharing. This study posits that expanded usage of electric car-sharing might be the one of solutions to migrate pollution and improve quality of living life. Various electric car-sharing services have been introduced to resolve environmental pollution. According to Brandstätter, Kahr, and Leitner (2017), electric car-sharing have potential to solve future problems such as pollution, congestion, and shortage of fossil fuels by combining the individual advantages of electric vehicles and car-sharing system. Electric car-sharing is plausible way to boost people's perception on electric cars, which possibly leads to more purchases of electric cars and sustainability. Given that mobility-sharing itself possibly reduces traffic and pollution along with the usage of public transport in cities (Cocca, Giordano, Mellia, & Vassio, 2018), electric car-sharing can be much effective option for less traffic, noise, and emission compared to an internal combustion engine car.

3. Hypothesis Development

This study examined the effects of electric car-sharing factors on customer attitudes. Proposed factors include cost-efficiency, convenience, emotion, safety, health, and sustainability. This study also measured relationships of attitude, intention to use, satisfaction, and loyalty.

3.1. Effects of Factors on Customer Attitude

3.1.1. Effects of Cost-efficiency on Attitudes of Electric Car-sharing

Car-sharing has been referred to as a "missing link" (Britton, 2000; Millard-Ball, Murray, Ter Schure, Fox, & Burkhardt, 2005; Shaheen & Cohen, 2007) in that car-sharing can fill the gap in mobility needs that can only be satisfied by private automobile, not public transportation, taxis, cycling, and walking (Cooper, Howe, & Mye, 2000). While car-sharing relates to other transportation modes, it is the most fit for "mid-distance trips where flexibility is required" option, and that is to say, car-sharing is the most cost effective for intermediate-lengthy trips (Millard-Ball et al., 2005). According to U.S. Department of Energy (2020a), charging costs for hybrid and electric vehicles (only about $0.11 per kilowatt-hours) are lower than fuel costs for conventional vehicles. In addition, distance-based fare of electric car is much lower than that of a conventional car. Therefore, cost-efficiency is amplified by using electric car-sharing services, and the following hypothesis was developed.

H1: The customer perception on cost-efficiency positively affects customer attitude of sharing electric vehicles.

3.1.2. Effects of Convenience on Attitudes of Electric Car-sharing

This study posits the convenience factor to investigate how customers perceive sharing electric cars in aspects of ease to use and comfortableness. This study considered that customers perceive negative aspects on the usage of electric cars due to lack of battery charging stations. Guo, Yang, and Lu (2018) stated that customers are hesitant when driving an electric vehicle, or even when acquiring one due to the lack of electric cars' charging infrastructure and the inability to fuel up almost anywhere. This hesitancy indicated range anxiety, which became the worry that the driving range of renewable-energy cars such as electric vehicles may not be sufficient to reach its destination, and can be one of major psychological barriers to customers' purchasing intentions (Eberle & Von Helmolt, 2010). Insufficient number of such stations possibly make electric car drivers roam around everywhere to look for chargers, which offers awful experiences. Therefore, this leads to the following hypothesis.

H2: The customer perception on convenience negatively affects customer attitude of sharing electric vehicles.

3.1.3. Effects of Emotion on Attitudes of Electric Car-sharing

Numerous advertisements appeal emotions to customers to improve in selling brands and to differentiate themselves among other competitors (Agres, Edell, & Dubitsky, 1990). For example, BMW promotes joy of driving though Stories of Joy as a customer-participated global communication campaign while Coca-Cola implemented Open Happiness campaign to encourage customers to enjoy small break with others (Mogilner, Aaker, & Kamvar, 2012). Electric car-sharing is not an exception. Given that it is relatively new for people to use or share electric vehicles, riding electric automobiles can offer both experience and feelings to them. There appears to be support for the idea of including emotional factors in predicting the behavior toward relatively environmentally friendly products or issues (Moons & De Pelsmacker, 2012). This study posits that customers will form positive perceived emotion by using electric car-sharing with the consideration of sustainability. This leads to following hypothesis.

H3: The customer perception on emotion positively affects customer attitude of sharing electric vehicles.

3.1.4. Effects of Safety on Attitudes of Electric Car-sharing

Battery stability is a major safety issue regarding electric vehicles which can significantly affect customer attitude. Battery safety has massive consequences on systems' functionality and market acceptance in that customers would like to have worry-free devices or electric vehicles to run (Levy, 1997). With regard the issue, Larsson, Andersson, and Mellander (2017) mentioned that current Lithium-ion batteries for automotive can be controlled by Battery Management System (BMS) and have proved an enhanced safety related to fires. Compared to cars operated by gasoline and diesel fuel, it seems to be clear that battery-based electric vehicles have advantageous for absence of large fire. Beyond battery safety, there are other incidental issues regarding safety of electric cars as well. According to U.S. Department of Energy (2020b), electric vehicles must meet the rigorous safety standards and tend to have a lower center of gravity compared to conventional vehicles, making them less likely to roll over and often improving ride quality. Since safety is very essential for electric car-sharing program, the following hypothesis can be developed.

H4: The customer perception on safety positively affects customer attitude of sharing electric vehicles.

3.1.5. Effects of Health on Attitudes of Electric Car-sharing

Various types of air pollutions from different reasons have become one of serious problems worldwide because the pollutions destroy environment and human health. Among the causes of pollutions, the current fossil fuel–based transportation system accounts for large part of air pollutions (U.S. Environmental Protection Agency, 2018) and negatively affects human health (Grabow, Spak, Holloway, Stone Jr., Mednick, Patz, et al. 2012). Therefore, electric car-sharing which lowers resource-usages and reduces intakes of polluted air in daily life has potential to improve human health. Apart from lowering the emissions, some researches argued that electric cars can also reduce traffic noise (Brady & O'Mahony, 2011; Hawkins, Singh, Majeau-Bettez, & Strømman, 2012). The absence of mechanical noise by electric vehicles significantly decreases noise levels in urban areas, having a positive effect on noise maps (Campbello-Vincent, Peral-Orts, Campillo-Davo, & Velasco-Sanchez, 2017). Thus, electric car-sharing is expected to lower the traffic noise and potentially have positive influences on human health by eliminating stress and unstableness.

H5: The customer perception on health positively affects customer attitude of sharing electric vehicles.

3.1.6. Effects of Environmental Sustainability on Attitudes of Electric Car-sharing

The factor of environmental sustainability may be one of the most compelling reasons why people are willing to

use electric car-sharing platforms. Martin and Shaheen (2011) argued that the environmental benefit of car-sharing has been proved especially in the perspective of number of car parked and circulating in cities. Böcker and Meelen (2017) also mentioned that most apparent environmental benefits are expected from car-sharing given the negative environmental impacts of car production and car ownership. Meanwhile, a renewable energy automobile itself can be environmental friendly in many aspects. According to Karplus, Paltsev, and Reilly (2010), electric vehicles can potentially lower substantial amount of CO2, especially in markets that possess low carbon intensity of electricity generation. From the environmental comparison, Granovskii, Dincer, and Rosen (2006) proved that electric cars have advantages over other types of cars conventional vehicles although it depends on energy sources. Also, the environmental benefits can positively affect preference for electric vehicles (Jensen, Cherchi, & Mabit, 2013). Previous studies (Choi, Kim, & Kim, 2019; Islam, Ahmed, Saifullah, Huda, & Al-Islam, 2017; Nguyen, Duong, Tran, Ha, & Phung, 2020) also addressed the impacts of the environment and the quality of life. Thus, sharing electric vehicle programs have potential to significantly improve environmental sustainability, which leads to the following hypothesis.

H6: The customer perception on environmental sustainability positively affects customer attitude of sharing electric vehicles.

3.2. Effects of Attitude on Intention, Satisfaction, and Loyalty

Fishbein and Ajzen (1975) posited that attitude is the most antecedent of behavioral intention. According to Abdul-Muhmin (2011), pre-purchase attitudes must be a precursor of overall satisfaction which is always a post-experience construct such as a purchase. In addition, customer loyalty is the commitment of one to rebuy or reuse the product or service in the future (Oliver, 1997), which seems to be closely related with satisfaction and attitude. Therefore, this study examines how customer attitude affect Customers' intention and satisfaction, which will also have the chain effect on loyalty.

H7: Positive attitude toward sharing electric vehicles positively affects higher level of customer satisfaction.
H8: Higher level of customer satisfaction on sharing electric vehicles positively affects higher level of loyalty in sharing electric cars.
H9: Positive attitude toward sharing electric vehicles positively affects higher level of intention to use electric car-sharing.

4. Methodology

4.1. Data Collection

This study investigates how the attitude affects intention to use, satisfaction, and loyalty by measuring proposed factors of electric car-sharing which might improve sustainability. Data was collected by online survey. Survey was distributed via various platforms including online community, messenger, social network, blog, and others. The questionnaire items were developed for this survey and some items were modified from previous studies (Hennig-Thurau, Henning, & Sattler, 2007; Lamberton & Rose, 2012; Rochelandet & Le Guel, 2005). This study applied 5-point Likert scale from 1 = strongly disagree and 5 = strongly agree for major variables. The total of 138 respondents completed the survey. Table 1 summarized the demographics of respondents. As shown in Table 1, 47.8% of male and 52.2% of female responded the survey. 71.5% of respondents hold bachelor's degree and 21.2% of respondents hold master's degree. 39.4% of respondents reside in Seoul, 20.4% reside in Gyeonggi province, 20.4% reside in Chungcheong province, etc.

Table 1: Sample Demographics

	Total	
(N =138)	*%*	*N*
Gender		
Male	47.8%	(66)
Female	52.2%	(72)
Marital Status		
Age		
20-24 years old	7.2%	(10)
25-29 years old	60.1%	(83)
30-34 years old	14.5%	(20)
35-39 years old	0.7%	(1)
40-44 years old	3.6%	(5)
45-49 years old	3.6%	(5)
50-54 years old	4.3%	(6)
55-59 years old	2.2%	(3)
60-64 years old	3.6%	(5)
Education		
High school or below	7.3%	(10)
Bachelor degree (2 or 4 years)	71.5%	(99)
Master degree or higher	21.2%	(29)
Area of Residence		
Seoul	39.4%	(54)
Gyeonggi	20.4%	(28)
Chungcheong	20.4%	(28)
Geongsang	4.4%	(6)
Jeolla	11.7%	(16)
Jeju	0.7%	(1)
Other	2.9%	(4)

order to check reliability, this study first conducted Cronbach's alpha tests in Table 2.

Table 2: Cronbach's Alpha Test for the Factors in Electric Car-sharing

Factors	Data items
Cost-efficiency	0.692
Convenience	0.643
Emotion	0.768
Safety	0.777
Health	0.647
Environmental Sustainability	0.901
Intention to Use	0.790
Satisfaction	0.780
Loyalty	0.819

4.2. Data Analysis

By using extraction method with a varimax rotation of Kaiser, this study applied factor analysis for the factors of electric car-sharing to check validity. To filter out significant factors, the analyzing procedure was repeated for the six factor which are cost-efficiency, convenience, emotion, safety, health, and environmental sustainability. Table 3 and 4 summarized the results of factor analyses for proposed variables for electric car-sharing. Correlation coefficients between proposed independent variables and dependent variables were greater than 0.60 excluding convenience factor. This study checked multicollinearity and confirmed that VIF results does not show multicollinearity.

Table 1: Component Matrix: Factors of Electric Car-sharing

	Components					
Factors	**1**	**2**	**3**	**4**	**5**	**6**
CE1	0.714					
CE3	0.693					
CE2	0.680					
CON2		0.811				
CON1		0.807				
CON3		0.669				
EMO2			0.903			
EMO1			0.818			
EMO3			0.774			
S3				0.869		
S2				0.823		
S1				0.807		
H3					0.787	
H1					0.763	
H2					0.762	
ES1						0.918
ES3						0.913
ES2						0.912
Eigen value	3.453	2.962	2.351	1.962	1.574	1.357

Note: CE - Cost-efficiency, CON - Convenience, EMO - Emotion, S - Safety, H - Health, ES - Environmental Sustainability

Table 4: Component Matrix: Attitude, Satisfaction, and Loyalty

	Components			
Factors	**1**	**2**	**3**	**4**
ATTITUDE 3	0.915			
ATTITUDE 2	0.865			
ATTITUDE 1	0.821			
INTENTION2		0.714		
INTENTION1		0.680		
SATISFACTION2			0.811	
SATISFACTION1			0.807	
SATISFACTION3			0.669	
LOYALTY2				0.903
LOYALTY1				0.818
LOYALTY3				0.774
Eigen value	2.532	2.240	1.980	1.875

This study applied factor scores for multiple regression analysis. The results showed that the model is significant at 0.01 level with F = 21.892 (*R-square* = 0.549; Adjusted *R-square* = 0.524). As shown in Table 5, this study found that effects of all proposed factors excluding convenience factor on attitude were significant at 0.01%. Therefore, H1, 3, 4, 5, and 6 were accepted.

Table 5: Effects of Factors on Attitudes

Variable (Independent → dependent)	Standardized Coefficient (*t*-value-Sig)
Cost-efficiency → Attitude (H1)	0.258 (3.048***)
Convenience → Attitude (H2)	0.069 (0.800)
Emotion → Attitude (H3)	0.578 (8.130***)
Safety → Attitude (H4)	0.428 (5.399***)
Health → Attitude (H5)	0.594 (8.377***)
Environmental Sustainability → Attitude (H6)	0.533 (7.174***)

*** p < 0.01, ** p < 0.05, * p < 0.1 denotes statistical significance

This study conducted regression analyses for effects on intention to use and expected satisfaction. The results showed that the model is significant at 0.01 level with F = 74.420 (*R-square* = 0.401; Adjusted *R-square* = 0.398) in the case of effects on intention to use and F= 185.773 (*R-square* = 0.622; Adjusted *R-square* = 0.614) in the case of the effect on expected satisfaction. As Table 6 showed, the effect of attitude on intention to use was significant at 0.01%. Therefore, hypothesis 7 was accepted. The effect of intention to use on expected satisfaction was also significant at 0.01%. Therefore, hypothesis 8 was also accepted.

Table 6: Effects on Intention and Expected Satisfaction

Variable (Independent → dependent)	Standardized Coefficient (*t*-value-Sig)
Attitude → Intention (H7)	0.634 (8.627***)
Intention → Expected Satisfaction (H8)	0.789 (13.630***)

*** p < 0.01, ** p < 0.05, * p < 0.1 denotes statistical significance

This study conducted another regression analyses for effects on satisfaction and loyalty. The results showed that the model is significant at 0.01 level with F = 31.140 (*R-square* = 0.609; Adjusted *R-square* = 0.598) in the case of effects on satisfaction and F= 21.116 (*R-square* = 0.514; Adjusted *R-square* = 0.510) in the case of the effect on loyalty. As Table 7 showed, the effect of attitude on satisfaction was significant at 0.01%. Therefore, hypothesis 9 was accepted. The effect of satisfaction on loyalty was also significant at 0.01%. Therefore, hypothesis 10 was also accepted.

Table 7: Effects on Satisfaction and Loyalty

Variable (Independent → dependent)	Standardized Coefficient (*t*-value-Sig)
Attitude → Satisfaction (H9)	0.780 (5.580***)
Satisfaction → Loyalty (H10)	0.717 (4.595***)

*** p < 0.01, ** p < 0.05, * p < 0.1 denotes statistical significance

5. Conclusion

5.1. Findings

The results of this study showed that effects of variables including cost efficiency, emotion, safety, health, and sustainability on attitude were significant. This study also found that effect of convenience on attitude was not significant. Regarding the effect size, this study found that health, emotion, and sustainability were stronger factors that affect customer attitude in electric car-sharing rather than cost-efficiency and safety factors. Among effects, the effect of health on attitude was higher than other effects. While this study expected that customers of electric car-sharing negatively feel convenient because of the lack of charging facilities or drive range, the result implied that customers do not seem to perceive lack of convenience of using electric car-sharing. The results of this study on convenience might be caused by some respondents' perceptions on recent increasing number of charging stations, while others might perceive differently. The effects of attitude on intention and satisfaction, effects of intention on expected satisfaction, and effects of satisfaction on loyalty showed significant. Therefore, both potential and existing customers showed that the use of electric car-sharing service meets satisfaction.

5.2. Managerial Implication

The purpose of this study is to explore factors that affect attitude on electric car-sharing by fostering the issue of sustainability and environmental friendliness that are crucial for global warming. This study investigated customers' perception on sustainability issues by using electric car-sharing service as the usage of electric cars and car-sharing services play a pivotal role to improve sustainability. Dealing with factors of electric car-sharing service, this study offers significant implications for electric car-sharing service providers, electric car businesses, and government for sustainability issues. First, this study suggests that businesses should promote their products and services by emphasizing benefits to customers through better relationships. As the result shows, health, emotion, and sustainability factors are stronger effects on attitudes compared to other significant factors. Therefore, marketers of electric car-sharing services and electric car manufacturers should more strategically target customers by building better relationships that also evoke emotional feelings. In particular, it might be important to help customers feel eco-friendlier and more civilized in the context of sustainability. Since electric cars are normally emphasized for making sustainable environment, the strategic approach for customers' emotion should be adopted to improve the level of satisfaction. The result of this study also suggests that today's customers become smarter and consider potential and augmented benefits from products or services. The results of this study showed that customers of electric car-sharing believe that the service can improve health condition by reducing air pollution and noises. Apart from eco-friendliness of vehicle itself, customers begin to think of their health which might be affected by using electric car-sharing service. Therefore, electric car-sharing service and businesses related to electric cars might highlight the perception of health improvement as a marketing tool to enchant more customers, especially who are stressed out from air pollution and noises. Anticipating enhanced health from the usage of electric car-sharing service is also related to environmental sustainability in that customers are looking forward the benefits of eco-friendliness. As stated by Chu, Im, and Song (2017), individual propensity for eco-friendliness and knowledge for electric vehicles have influences on purchase of electric cars. As a result, electric car manufacturers necessarily provide more information about effectiveness of electric vehicles in terms of environmental friendliness and through better Customer Relationship Management (CRM).

5.3. Policy Implication

Besides electric car-sharing providers and electric car corporations, government plans need to focus more on electric car-sharing services to improve sustainability. In Korea, government's one of major urban planning for sustainability is smart city. As a solution to the problems from increasing urbanization and growing population (Neirotti, De Macro, Cagliano, Mangano, & Scorrano, 2014), smart city has been paid attention for improving sustainability and constructing much eco-friendlier cities. Activating electric car-sharing services in government level should be recommended in cities as car-sharing mechanism reduces the total number of cars on the roads (Lee, Nah, Park, & Sugumaran, 2011). Beyond solving heavy traffics, electric car-sharing potentially improve sustainability in cities by offering solutions to the problems such as heavy air pollutions and noises. Therefore, electric car-sharing is a worthy of consideration as an important mean for sustainability in a smart city. Supports and proper regulations offered by government are required to improve recognition and increase usage rates of electric car-sharing services in cities, since electric car-sharing still lacks wide recognition. Chu, Im, and Song (2017) argued that individual knowledge for electric vehicles affects purchase intention of electric cars. Park, Kim, and Kim (2019) also found that government support, knowledge of electric vehicles, recognition and experience of electric vehicles are important factors in determining purchasing intention. Therefore, it might be very important to promote electric cars and electric car-sharing with proper information. Given that many governments are trying to improve issues of eco-friendliness by enhancing customer perception on electric cars that can help achieve main purposes of sustainability.

In the case of Korea, recently, 'Green New Deal' is one of such government programs that emphasize transforming to renewable energy sources and sustainability. In this program, the Korean government tries to develop vehicles with renewable energy sources such as electric and hydrogen cars. Especially, the government offers various benefits such as subsidies for purchasing electric cars, tax credits, and installation of infrastructures such as public charging stations. Because of the governmental supports, the number of electric vehicles is expected to increase up to 150,000 (Ministry of Environment, 2020). Still, however, further efforts might be considered such as introduction of electric car-sharing services in particular locations such as major or new cities to offer direct experiences and improve sustainability. Given that purchasing electric cars can be accompanied with high costs, enhancing the public awareness and motivation with electric car-sharing can be a necessary strategy. Further, the government needs to maximize the better effect of Green New Deal program by having business models of electric car-sharing services that help to increase the total number of electric cars by raising awareness of the vehicles. As implied from the results, proper policies and infrastructures need to be activated for electric car-sharing services in various cities where solutions for air pollutions and traffics are urgent.

5.4. Limitations and Opportunities

Although this study offers useful insights for electric car-sharing, still several limitations exist. Further study with more samples can be helpful to verify the effect of electric car-sharing experiences. Further research for exploring other significant factors should be conducted by considering other aspects of customer perception on electric car-sharing. Future study might consider to analyze effects by classifying electric car-sharing business classifying into B2C and P2P. Further research might consider how to foster legal aspects of P2P, carpool, due to sustainability. Lastly, future research for sharing types of other renewable energy-based vehicles such as hydrogen car might be considered to figure out the ways to enhance sustainability more effectively.

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