Investigating consumers' adoption of electric vehicles: a perceived value-based perspective

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Abstract

Purpose – The current work aims to understand the consumers' adoption of electric vehicles (two-wheelers) from their value perspective by utilizing the value-based adoption model.
Design/methodology/approach – The study considered data from 302 potential electric two-wheeler customers and tested the hypotheses using structural equation modeling.
Findings – The outcomes showed that perceived economic benefits, social image, enjoyable acceleration and enhanced fun and perceived environment (positively) and perceived physical safety risk, perceived cost of ownership and range and charging risk (negatively) influenced the customers' perceived value linked with electric two-wheeler (ETW) adoption. Only low engine noise emission and infrastructure issues did not affect perceived value.
Research limitations/implications – Most of the respondents considered in the study were less than 35 years old. Hence, the model can be tested for other age groups.
Practical implications – The study's outcomes will help ETW marketers, manufacturing companies and governments (state and central) to provide a more convenient environment for electric two-wheelers' adoption and help them curate appropriate strategies.
Originality/value – The current work offers a better understanding of potential customers' ETW adoption by employing a value-based trade-off.

Keywords Electric two-wheeler, Value-based adoption model, Electric vehicles, Indian consumer, Technology adoption

Paper type Research paper

Introduction

Today, the world is witnessing a climate change threat that will affect human civilization. It resulted in an increase in global temperature (1°C in 2020 compared to 1901), shrinking of arctic ice deposits (40% since 1973), rising carbon dioxide levels (40% since the industrial revolution) and rising sea levels (3.3 mm per year since 1993) (National Oceanic and Atmospheric Administration (NOAA), 2021). According to the State Department, it has started affecting and will severely impact water resources, food supplies, human health, the environment and the infrastructure in the future. Furthermore, Trenberth (2018) stated that this climate change is caused by human interventions. And this is happening primarily due to the enormous burning of fossil fuel and deforestation at the same time. Hence, climate change is a concern for numerous countries, and now it is progressing globally. United Nations has also acknowledged its threat to humans and has started working to reduce its impact while consulting with countries around the world by setting a climate goal (SDG 13) to reduce greenhouse gas emissions to 43% by 2030 and net zero by 2050 (United Nations, 2023). Humans primarily use fossil fuels to generate electricity, operate their businesses and transport-related needs. According to the United States Environmental Protection Agency (US EPA), the transportation sector is causing the highest contribution to greenhouse gas emissions (US EPA, 2023). Hence, it is evident that the burning of fossil fuels is a significant contributor to climate change.

The transportation sector is a major contributor to greenhouse gas emissions (US EPA, 2023). This results from burning fossil fuel across various vehicles, including bikes, cars and

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trucks. Center for Climate and Energy Solutions (C2ES) has analyzed the data on CO_2 emission and found a sharp increase in CO_2 emission from 5,000 million metric tons in 1950 to about 34,000 million metric tons in 2020 (C2ES, 2023). It indicates the contribution of greenhouse gas emissions from the world's major economies. Accordingly, the European Union and the US have witnessed a constant reduction in their CO_2 contribution since 2000; however, other developing economies like India reflect a clear and continuous increase in CO_2 emission from 1700 million tons to about 3,600 million tons. And the projection of CO_2 emission is very alarming in India. The Indian transport sector contributes around 13.5% to total CO_2 emissions, and 90% of it comes from road transport (Kumar *et al.*, 2022). The CO_2 emission from transport can be divided into passenger and freight. We will focus on passenger transport as our study aligns with the ETW. In the passenger category, two-wheelers contribute to the topmost CO_2 emission (Kamboj *et al.*, 2022). This is also supported by the fact that India is registering almost 60,000 new two-wheelers (petrol-based) a day. Nearly 61% of petrol sales are consumed by two-wheelers only, significantly contributing to CO_2 emissions (Singh, 2022).

India is ready to reduce its carbon footprint; to achieve that, it has started shifting from carbon-based resources to green resources. In this line, India is pushing electric vehicles across the two-wheeler and four-wheeler segments. As two-wheelers are a major contributor to carbon emissions, pushing more electric two-wheelers and encouraging people to buy these vehicles will be a deciding stone. Furthermore, the Indian government also offers various state and central subsidies to boost the adoption of electric two-wheelers (ETW). Further, it is anticipated that the Indian two-wheeler market will grow at a cumulative average growth rate (CAGR) of 29.07% from 2022 to 2028 (Businesswire, 2022). However, as per one recent survey by the Economic Times (ET), only 1% of Indians want to purchase an electric two-wheeler in the next six months (ET, 2022). This figure is very shocking and not encouraging in any sense. Hence, understanding the consumers' behavior toward electric vehicles, especially two-wheelers, is a need of time. It will help marketers, companies and government understand consumers better and aid in pursuing its goal of a green future.

Given its significance, numerous scholars have conducted research studies on consumers to investigate their adoption behavior toward EVs across varied geographies (Carley *et al.*, 2013; Rezvani *et al.*, 2015). Irrespective of the significant increase in EV-related studies worldwide, not a single study has been conducted concerning Indian consumer adoption until 2019 (Kumar and Alok, 2020). In the past few years, some researchers have conducted a few studies on India as a base by considering different perspectives, such as enabler and inhibitor of EV adoption from the seller perspective (Shankar and Kumari, 2019), EV adoption from consumer and industry perspective (Bhattacharyya and Thakre, 2020), challenges to EV adoption (Kumar *et al.*, 2021) and barriers for EV sales. However, many studies have considered EVs but have not specified whether they have considered two-wheelers or four-wheelers. Along these lines, much of the research conducted was considered a variety of research frameworks such as dual-factor theory (Shankar and Kumari, 2019), the theory of planned behavior (Barbarossa *et al.*, 2015), Decomposed theory of planned behavior (TPB) (Hong *et al.*, 2013), Rational choice theory (Carley *et al.*, 2013), Consumer culture theory. As Indian consumers are very value-conscious (Gupta, 2019), understanding their behavior toward ETW adoption from their value perspective will be crucial. Literature on electric vehicle adoption has majorly neglected the importance of benefits and sacrifices perceived by individuals in ETW adoption, particularly in the case of developing countries like India. The value-based framework (VAM) proposed by Kim *et al.* (2007) includes the dimension of benefits and sacrifices perceived by an individual. It examines adoption based on individuals' evaluation of benefits and sacrifices associated with innovation. Studies have validated the importance of the value-based adoption model paradigm in innovation adoption across varied contexts (Kim *et al.*, 2017; Talawanich and Au, 2020; Vishwakarma *et al.*, 2020).

Compared to the other behavioral frameworks (TAM, unified theory of acceptance and use of technology (UTAUT), TPB, etc.), VAM explains more variance in explaining adoption intention (Sohn and Kwon, 2020). Hence, the present study examines the factors influencing the individuals' intention to adopt an electric two-wheeler from the value viewpoint of Indian consumers.

The current study investigates the effect of benefits (perceived economic benefits, social image, enjoyable acceleration, enhanced fun, low engine noise emission and perceived environment) and sacrifices (perceived physical safety risk, perceived cost of ownership, range and charging risk, and infrastructure issues) on the perceived value of ETW which later translates into ETW adoption intention. Hence, the present research work aims to answer two research objectives:

RQ1. What are the potential benefits and sacrifices associated with EV adoption in the context of ETW?

RQ2. Is perceived value an influential driver of EV adoption intention in the context of ETW?

Literature review

Electric vehicles adoption

Since 2010, the introduction of electric vehicles (EVs) has started. Electric vehicles belong to the family of alternative fuel vehicles (AFVs). AFV is commonly referred to "all types of cars that can be fueled fully or in part by alternative fuels, such as biofuels (ethanol, biogas) and electricity" (Jansson *et al.*, 2011). Furthermore, EVs include various kinds of technologies like plug-in-hybrid vehicles (PHEVs), extended-range battery electric vehicles (E-REVs), hybrid electric vehicles (HEVs) and battery electric vehicles (BEVs) (Rezvani *et al.*, 2015). Scholars have examined the adoption of various kinds of electric vehicles, such as PHEV (Carley *et al.*, 2013), EV and BEV (Schuitema *et al.*, 2013; Kim *et al.*, 2017). However, most studies have been conducted in the context of developed nations (e.g. the UK, USA, Netherlands, Norway, Canada, etc.) (Rezvani *et al.*, 2015; Kumar and Alok, 2020). It also indicates a dearth of research related to EV adoption from a developing countries' viewpoint.

Researchers have attempted to investigate consumers' behavior toward the adoption of EVs. For instance, studies have identified various drivers, benefits and risks involved in EV adoption, along with the consequences (Rezvani *et al.*, 2015; Kumar and Alok, 2020). These studies conducted a literature review on electric vehicle adoption. However, there are some key differences between both studies. The study by Rezvani *et al.* (2015) summarized the literature on EVs (including all types of EVs), where the authors encapsulated the various theories adopted in conducting research for EV adoption across the globe. Most adopted theories include the theory of planned behavior, rational-choice theory and innovation diffusion model. However, Kumar and Alok (2020) have studied the evolution of EV adoption research, and the paper focused more on the various elements that were considered in the past literature on EV adoption in various capacities. The study's other objective was to categorize the factors and propose a general framework for EV adoption, including antecedents and consequences. In conclusion, both studies show a significant gap in assessing EV adoption through the consumers' value perspective. Also, almost all the research conducted in the past was focused on EVs (mainly cars). None of the summarized work even mentioned two-wheelers as a base for the study. As per the data, two-wheelers are the major contributors to pollution; hence, the purpose of the current research is relevant and different from the previous research work.

Furthermore, Peters and Dütschke (2014) have adopted the innovation of diffusion framework to examine EV adoption drivers. Later, Adnan *et al.* (2017) beautifully

summarized the use of theories (TPB, normative theories, environmental attitude, etc.) in the adoption of EVs. Further, Han *et al.* (2017) have considered the component of value (functional and non-functional) and examined its influences on EV adoption intention among Chinese consumers. The results reveal a significant direct and indirect impact of functional values on intention; however, non-functional values indirectly influence EV adoption intention. Another study conceptualized the impact of instrumental, hedonic and symbolic elements in the adoption of EVs among UK residents. The outcomes of the study supported the proposed hypotheses (Schuitema *et al.*, 2013). Furthermore, Hidrue *et al.* (2011) stated the importance of the perceived economic benefits and their effect on EV adoption intention. However, Vassileva and Campillo (2017) stated that emotional and environmental benefits are valuable in EV acceptance.

Studies argue that perceived risk is one of the inhibitors of EV adoption. A study conducted on consumers in the USA revealed that perceived risk is a reason for the limited use of EVs (Egbue and Long, 2012). She *et al.* (2017) conceptualized risk in terms of financial, infrastructure and performance and found a negative influence on Chinese consumers in EV acceptance. Further, Kumar and Alok (2020) have stated the role of perceived risk and categorized it as an essential antecedent of EV adoption. They also summarized the antecedents and presented a comprehensive framework for EV adoption. However, Kim *et al.* (2018) studied Korean experience drivers from a value perspective and proposed the influence of benefits and sacrifices on perceived value, which later influenced adoption intention. The outcomes revealed value as a significant predictor of adoption intention. However, it ignores dimensions like physical safety risk, infrastructural issues, low engine noise emission and social image involved in EV adoption. Also, the aspect of ETWs, which are people utilized mostly daily, has never been examined. As India is the fastest-growing economy in the world, many Indian cities are suffering from severe pollution caused mainly by two-wheeler vehicles. Researchers have conducted various studies on EV adoption among Indian consumers. For Instance, Kumar *et al.* (2021) used secondary data research and stated the high cost of EVs, poor purchasing power and lack of infrastructure as challenges in EV adoption. Later, the extended Technology acceptance model (TAM) was used in EV adoption (Jaiswal *et al.*, 2022). The outcomes revealed that knowledge about EVs has a greater influence on EV adoption intention. Table 1 provides a comprehensive understanding of the literature on EVs.

However, none of the past studies have considered the ETW as a core of their research. Also, researchers have argued that Indian consumers are value-conscious (Gupta, 2019; Vishwakarma *et al.*, 2020) and always look for alternatives that offer them a higher value. A recent article published in Business Standard has revealed low penetration of electric vehicles (both cars and two-wheelers) in India (Gupta, 2023). And stated a need for a boost if India wants to achieve its aggressive green target. However, the previous works ignored the dimension of perceived value-based adoption based on the value-based paradigm. Therefore, it will be fascinating to investigate ETW adoption from consumers' value viewpoint.

Value-based adoption model

The notion of a value-based adoption model (VAM) is linked with the concept of perceived value. Zeithaml (1988, p. 14) defined perceived as "the consumer's overall assessment of the utility of a product (or service) based on perceptions of what is received and what is given." Building on perceived value, Kim *et al.* (2007) proposed the value-based adoption model while investigating mobile Internet adoption intention. According to VAM, individuals' adoption of a behavior/technology/innovation is driven by the evaluation of the benefits and sacrifices involved in adoption. They will adopt a behavior/technology/innovation once they perceive higher value (i.e. more benefits than sacrifices). Researchers have verified the importance of

#	Authors/year	Theory/framework used	Context (country)	Type of vehicle (EV)	Research gap
1	Lane and Potter (2007)	Theory of Planned Behavior, Innovation Diffusion model	United Kingdom (UK)	EV (BEV)	The extant literature on Electric vehicle adoption in various contexts has
2	Lieven *et al.* (2011)	Rational Choice Theory	Germany	EV	primarily used the TPB, Rational
3	Skippon and Garwood (2011)	Signalling Theory	UK	EV (BEV)	Choice Theory, Innovation Diffusion Modeletc.
4	Zhang *et al.* (2011)	Rational Choice Theory	Chine	EV	None of the studies mentioned here
5	Axsen *et al.* (2012)	Lifestyle Practice Theory	USA	EV	have addressed the adoption of electric
6	Caperello and Kurani (2012)	Grounded Theory	United States of America (USA)	EV (PHEV)	two-wheeler vehicles from the consumer's value perspective
7	Egbue and Long (2012)	Theory of Planned Behvaior	USA	EV (BEV, PHEV)	This study is of its kind where the two-wheeler EV adoption has been
8	Graham-Rowe *et al.* (2012)	Grounded Theory	UK	EV (BEV, PHEV)	examined due to its impact on the environment
9	Moons and De Pelsmacker (2012)	Theory of Planned Behvaior	Belgium	EV	
10	Burgess *et al.* (2013)	Model of Sign	UK	EV (BEV)	
11	Carley *et al.* (2013)	Rational Choice Theory	USA	EV (BEV, PHEV)	
12	Jensen *et al.* (2013)	Rational Choice Theory	Denmark	EV	
13	Schuitema *et al.* (2013)	Self-image Congruency Theory	UK	EV (BEV, PHEV)	
14	Krupa *et al.* (2014)	Rational Choice Theory	USA	EV (PHEV)	
15	Noppers *et al.* (2014)	Theory of Planned Behvaior	Netherlands	EV	
16	Peters and Dütschke (2014)	Diffusion of innovation	Germany	EV	
17	Sang and Bekhet (2015)	Theory of Planned Behvaior	Malaysia	EV	
18	Afroz *et al.* (2015)	Theory of Reasoned Action	Malaysia	EV	
19	Mohamed *et al.* (2016)	Theory of Planned Behvaior	Canada	EV	
20	Kaplan *et al.* (2016)	Theory of Planned Behvaior	Austria, Denmark and Germany	EV	
21	Adnan *et al.* (2017a)	Theory of Planned Behvaior	Malaysia	EV	
22	Adnan *et al.* (2017b)	Theory of Planned Behvaior	Malaysia	EV (PHEV)	
23	Zhang *et al.* (2017)	Theory of Planned Behvaior	China	EV	
24	He and Zhan (2018)	Norm Activation Model	China	EV	
25	Zhang *et al.* (2018)	Theory of Planned Behvaior	China	EV	
26	Haustein and Jensen (2018)	Theory of Planned Behvaior	Denmark and Sweden	EV (BEV)	
27	Kim *et al.* (2018)	Perceived value-based adoption	Korea	EV	
28	Jin *et al.* (2020)	Hybrid Choice model	China	EV (BEV)	
29	Jaiswal *et al.* (2021)	Theory of Planned Behvaior	India	EV	
30	Asadi *et al.* (2021)	Theory of Planned Behaviour, Norm Activation Model	Malaysia	EV	
31	Featherman *et al.* (2021)	Theory of Reasoned Action, Risk-Benefit Theory	USA	EV	
32	Murtiningrum *et al.* (2022)	Theory of Planned Behvaior	Indonesia	EV	
33	Deka *et al.* (2023)	Theory of Planned Behvaior	India	EV	
34	Hull *et al.* (2023)	Theory of Planned Behvaior, Norm Activation Model, Technology Acceptance Model	South Africa	EV	

Source(s): Created by author

Table 1.
The list of studies examining the adoption of EVs

perceived value and adopted the VAM framework for their study across varied domains. For instance, virtual reality adoption among travelers (Vishwakarma *et al.*, 2020) and the adoption of Internet of Things services (Hsu and Lin, 2018). All studies have found perceived value to be an essential predictor of intention. Sohn and Kwon (2020) conducted a comparative study using the three most prominent theories (UTAUT, TPB, TAM and VAM) for AI-based products. It revealed that VAM is the best framework and explained higher variance in adoption intention; however, TAM explained the least. Additionally, Indian consumers are said to be more value-conscious (Gupta, 2019). Hence, VAM is the most appropriate model for our study.

Proposed model and hypotheses formulation

Utilizing the notion of a value-based adoption model (Kim *et al.*, 2007; Hsu and Lin, 2018; Yang *et al.*, 2016; Vishwakarma *et al.*, 2020; Zhong and Chen, 2023), the research framework is shown in Figure 1, examines how consumers' perception of benefits (i.e. perceived economic benefits, social image, enjoyable acceleration and enhanced fun, low engine noise emission and perceived environment) and sacrifices (i.e. perceived physical risk, the perceived cost of ownership, range and charging risk and infrastructure issues) associated with the adoption of electric two-wheelers (ETW) will affect consumers' value perceptions. The proposed research framework also tests the effect of individuals' perceived value on consumers' ETW adoption intention. The further sections provide an underlying theoretical background of the proposed hypotheses.

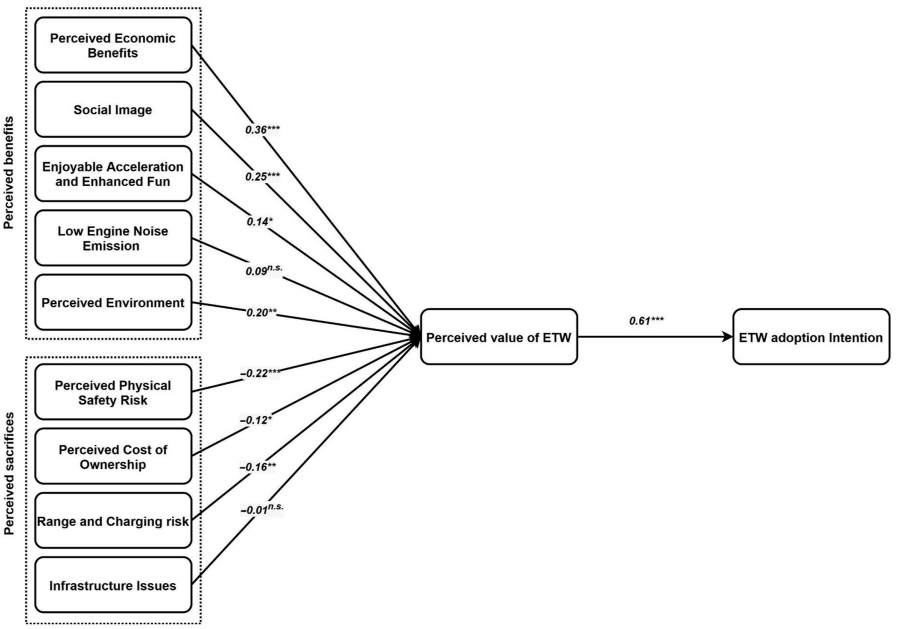

Figure 1.
Research framework and results of hypothesis testing

Note(s): ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$
n.s = not significant

Source(s): Created by author

Potential benefits of ETW adoption

In the past literature on VAM, numerous scholars have advocated the imperativeness of the benefits of adopting a behavior/technology (Zeithaml, 1988; Kim *et al.*, 2007; Rajkumar *et al.*, 2021). There are a sufficient number of studies that have established a positive relationship between the benefits and perceived value across multiple contexts, such as web-enabled wireless technology adoption (Setterstrom *et al.*, 2013), IoT services adoption (Hsu and Lin, 2018) and showrooming behavior (Rajkumar *et al.*, 2021). Vishwakarma *et al.* (2020) reiterated the importance of perceived benefits and established a positive relationship with perceived value in the context of VR adoption. Also, the literature suggests that the perceived benefits associated can vary as per the context of the study and can be different for different behaviors/technologies (Kim *et al.*, 2007; Rajkumar *et al.*, 2021). For instance, Hsu and Lin (2018) considered usefulness and enjoyment as benefits of using IoT services; however, facilitating conditions, sanctions, usefulness and enjoyment were considered benefits in adopting blockchain technology (Ronaghi, 2022). Accordingly, many researchers have incorporated various benefits elements as per their research contexts (Kim *et al.*, 2007; Setterstrom *et al.*, 2013; Lin *et al.*, 2020; Zhong and Chen, 2023).

As individuals perceive benefits from adopting a particular behavior or technology, they will also perceive benefits if they adopt electric two-wheelers over fossil fuel-based two-wheelers. Individual consumers always look to maximize the perceived benefits of using a product or technology (Hsu and Lin, 2018; Vishwakarma *et al.*, 2020). Further, these perceived benefits from a product or technology can be divided into economic and non-economic benefits (Yang *et al.*, 2016). In the current study, economic benefits refer to the consumers' perception of economic savings from using electric two-wheelers. It includes savings in terms of fuel and other maintenance of the vehicles as it involves few mechanical components (Kumar and Alok, 2020). It also includes the government incentive and tax-related benefits in buying an electric two-wheeler (He *et al.*, 2018). As electric two-wheelers have higher fuel efficiency (cost per kilometer), it is one of the components an individual considers while adopting the ETW. Hence, higher fuel efficiency, low maintenance cost and incentive and tax benefits can be termed as economic benefits, and one can avail of these benefits only if one uses ETW. Further, an enhanced social image can act as a motivator to adopt a new product or technology (Yang *et al.*, 2016). It refers to "the degree to which the use of an innovation is perceived as an enhancement of one's status in a social system" (Moore and Benbasat, 1991, p. 195). Hence, when a consumer perceives that adopting an electric two-wheeler will result in an enhanced image among their peer group and the social community, they will perceive the technology as more valuable. Hence, the enhanced social image can only be achieved if a person uses ETW. As the electric two-wheeler is a technological innovation, an enhanced social image can be considered a benefit of adopting ETW. Hence, we proposed:

H1-H2. Perceived economic benefits (*H1*) and social image (*H2*) are positively related to perceived value.

Further, Schmalfuß *et al.* (2017) have mentioned enjoyable acceleration, enhanced fun in driving, and low engine noise as some of the most important attributes in the context of battery-operated vehicles. Since an electric two-wheeler involves fewer mechanical parts (Onat *et al.*, 2017), it produces very low noise due to the motor rotation and provides a smooth riding experience to its user. Furthermore, electric two-wheelers are more powerful, resulting in quicker acceleration (achieving a certain speed in less time) than petrol-based vehicles (Electric Vehicle Info, 2022). This together creates a powerful, fun driving experience with low engine noise to its user and can be termed as benefits of using ETW, which a person can only feel once will drive the ETW. Further, fossil fuel-based vehicles are having a negative impact on our environment. Hence, one of the reasons to adopt an electric vehicle is that it has significantly less impact on the environment. In other words, the outcome of driving an ETW

positively affects the environment. Further, Dembkowski and Hanmer-Lloyd (2010) stated that Indian consumers are becoming more environmentally conscious and willing to purchase an environment-friendly product. The perceived environment is defined as "consumer perception of the positive outcomes of driving EVs for the environment" (He *et al.*, 2018). As driving ETW is environmentally friendly (benefit from using ETW), it will encourage people to adopt ETW. As per the notion of value-based taxonomy, consumers' perceived benefits from a product or technology are directly linked with their evaluation of perceived value. Hence, when people perceive that adopting an ETW will positively influence the environment without compromising driving fun and performance (benefits from the technology), they will perceive the ETW as more valuable. Therefore, we proposed:

H3-H5. Enjoyable acceleration and enhanced fun (*H3*), low engine noise emission (*H4*) and perceived environment (*H5*) are positively related to ETW's perceived value.

Potential sacrifices of ETW adoption

It is evident that the benefits an individual perceives are essential, but the sacrifice elements also keep equal importance in decision-making. Numerous scholars have already proved the importance of sacrifices along with benefits in the past (Hsu and Lin, 2018; Vishwakarma *et al.*, 2020; Rajkumar *et al.*, 2021). Many researchers considered sacrifices and benefits and stated the importance of both in an individual's value formation, which later turns into a behavioral intention (Kim *et al.*, 2007; Ronaghi, 2022). These sacrifices negatively influence individuals' perceived value, and they have to overcome these sacrifices to adopt certain behaviors. Further, scholars have also stated perceived risk as a part of sacrifices (from the consumer viewpoint) in adopting any product/behavior/technology (Hsu and Lin, 2018; Lian, 2020; Talawanich and Au, 2020). According to Schiffman and Kanuk (2004), perceived physical risk refers to "the likelihood that the product may physically harm the consumer and others close to him/her". These sacrifices can be different for different products/technologies. For instance, Vishwakarma *et al.* (2020) considered cost, physical risk and complexity as sacrifices in the adoption of virtual reality technology. However, Zhong and Chen (2023) considered the perceived risk and perceived cost as sacrifices in the context of mobile payment. In line with this, the consumers may perceive physical risk involved in using ETW since there are numerous incidents of ETW catching fire reported in the past (Choudhary, 2022). Hence, consumers' who perceive the use of ETW as risky will be less likely to adopt the vehicle.

Furthermore, researchers have also stated that the perceived fee/monetary value/cost of adopting/using innovation/technology is one of the sacrifices and adversely affects individuals' perceived value in varied contexts (Setterstrom *et al.*, 2013; Zhong and Chen, 2023). Machogu and Okiko (2012) define perceived cost as "the cost incurred in the adoption of technology and consider it to be a barrier in the adoption of innovation". For example, Ronaghi (2022) postulated an inverse relationship between the perceived cost and perceived value of adopting blockchain technology and found a significant negative relationship between cost and value. So, if consumers feel adopting and maintaining ETW technology is costly, they perceive the ETW technology as less valuable. In an ETW, charging the vehicle and range per charge are also matters of concern and an imperative element in EVs (Schmalfuß *et al.*, 2017). Kim *et al.* (2018) stated the relevance of charging risk and found it to be a barrier to electric vehicle adoption. Indian consumers are concerned about the range of an ETW per charge (IANS, 2022). A few studies related this issue to range anxiety (Schmalfuß *et al.*, 2017). Further, the charging time of ETW is also a matter of concern for its potential users. Schmalfuß *et al.* (2017) stated the importance of battery charging time is a major issue among users and cited it as a barrier to using ETW. Therefore, once the consumer perceives that the charging time of ETW is significantly higher and the range of the ETW per charge

does not match their daily need, they will be less likely to adopt the ETW. Further, as most electronics and machines require some support infrastructure, ETW also requires support infrastructure (charging facility at work, repair services over highways and in semi-urban and rural areas, etc.). A survey conducted in China revealed that infrastructure issues are one of the barriers to using electric vehicles and found a negative relationship with public acceptance of EVs (She *et al.*, 2017). Hence, when consumers perceive insufficient infrastructure (at work, public places, highways) available, they will show unfavorable behavior towards ETW and perceive the ETW as less valuable. Hence, we proposed:

H6-H9. Perceived physical safety risk (*H6*), perceived cost of ownership (*H7*), range and charging risk (*H8*) and infrastructure issues (*H9*) are negatively related to ETW's perceived value.

Perceived value and adoption intention

Perceived value is defined as "the result of an overall evaluation of the relative perceived benefits and sacrifices associated with the offering" (Kim *et al.*, 2007, p. 115). Scholars argue that the perceived value of a product is an essential driver for its acceptance (Kim *et al.*, 2007; Vishwakarma *et al.*, 2020). And it is based on the evaluation of the benefits and sacrifices (Kim *et al.*, 2007). For instance, Kim *et al.* (2018) have noted the benefits and sacrifices involved in using battery-operated vehicles and stated that it is an imperative predictor of adoption intention. Later on, the same is established in the case of AI-based products (Sohn and Kwon, 2020). Hence, when people perceive that using ETW offers more benefits than the sacrifices involved, they will perceive the ETW as more valuable. Therefore:

H10. Perceived value is positively related to ETW adoption intention.

Methodology

Measurement instruments

To attain the research objectives of the present work, the instruments were adopted from the past literature and were modified to reflect the present context of ETW. The measurement instruments were measured on a Likert scale of 1–5, shown in Table 2.

Data collection

Data were collected using an offline survey and conducted in the Delhi-NCR (National Capital Region) region. Delhi-NCR region is where many companies and institutions (government and private) operate and have their head offices. Also, the Delhi-NCR region has witnessed the worst pollution levels in the last few years, making this study very relevant. Hence, people in this region belong to various backgrounds and represent various Indian states. The data collection took place in public places in the Delhi-NCR region. The present study utilizes a purposive sampling for the purpose of the study, aligning with the prior studies (Jaiswal *et al.*, 2021; Wang *et al.*, 2022). Before proceeding to data collection, the people were asked for their availability, interest and consent for research. If they were unwilling to participate, I looked for the next person available. If the person said yes, then the screening questions (1. Are you aware of electric two-wheelers? and 2. Do you have/own any electric two-wheelers?) were asked. As the current work is understanding the people's intention to adopt ETW, it only considers those potential buyers who are aware of ETW but did not have an ETW. We reached out to around 550 people, of which 410 were found suitable. However, only 335 agreed to support this research. Further, only 302 data points were utilized for further analysis. The respondents' profile is shown in Table 3.

Construct	Items	FL
Perceived Value of ETW (PV)	*(AVE: 0.574, CR: 0.843)* (Kim *et al.*, 2007; Hsu and Lin, 2018)	
	PVETW1: Compared to the money that I need to invest, electric two-wheeler (ETW) offer value for money	0.81
	PVETW2: Electric two-wheeler (ETW) are considered to be a good buy	0.76
	PVETW3: Taking all the pros and cons into consideration, the use of electric two-wheeler (ETW) is beneficial to me	0.75
	PVETW4: Overall, electric two-wheeler (ETW) delivers me good value	0.71
ETW Adoption Intention (INT)	*(AVE: 0.720, CR: 0.885)* (Kim *et al.*, 2007)	
	INT1: I intend to buy an electric two-wheeler (ETW) in the near future	0.81
	INT2: If I replace my two-wheeler, I will consider an electric two-wheeler (ETW) first	0.90
	INT3: I predict, I will use electric two-wheeler (ETW) in the future	0.84
Benefits		
Perceived Economic Benefits (PEB)	*(AVE: 0.692, CR: 0.870)* (Khurana *et al.*, 2020)	
	PEB1: I will save on fuel expenses, as running cost should be lower in case of an electric two-wheeler (ETW)	0.87
	PEB2: The maintenance cost for an electric two-wheeler (ETW) will be less	0.78
	PEB3: Overall cost of owning an electric two-wheeler (ETW) will be low due to government incentives (lower road tax/less insurance premium/cheaper loan)	0.84
Social Image (SIMG)	*(AVE: 0.603, CR: 0.820)* (Moore and Benbasat, 1991; Sweeney and Soutar 2001)	
	SIMG1: The fact that using electric two-wheeler (ETW) makes a good impression on other people	0.73
	SIMG2: I expect that using electric two-wheeler (ETW) will add to my personal uniqueness	0.78
	SIMG3: Using electric two-wheeler (ETW) improves my image within the social group	0.82
Enjoyable Acceleration and Enhanced Fun (EAEF)	*(AVE: 0.701, CR: 0.876)* (Schmalfuß *et al.*, 2017)	
	EAEF1: I would perceive the fast acceleration of electric two-wheeler (ETW) as pleasant	0.84
	EAEF2: The immediate acceleration increases the driving comfort of electric two-wheeler (ETW)	0.83
	EAEF3: I would be thrilled by the driving fun of the electric two-wheeler (ETW)	0.84
Low Engine Noise Emission (LENE)	*(AVE: 0.701, CR: 0.875)* (Schmalfuß *et al.*, 2017)	
	LENE1: The lack of engine noise of electric two-wheeler (ETW) decreases the driving pleasure. *	0.81
	LENE2: I would not like the low soundscape of electric two-wheeler. *	0.85
	LENE3: I would perceive the low soundscape of electric two-wheeler (ETW) as pleasant	0.85
Perceived Environment (PENV)	*(AVE: 0.563, CR: 0.794)* (Ozaki and Sevastyanova, 2011)	
	PENV1: Driving an electric two-wheeler (ETW) reduces the carbon footprint	0.70
	PENV2: Driving an electric two-wheeler (ETW) reduces the effects of climate change	0.79
	PENV3: Driving an electric two-wheeler (ETW) reduces pollution level and consumption of natural resources	0.76

Table 2. Results of confirmatory factor analysis

(*continued*)

Construct	Items	FL
Sacrifices		
Perceived Physical Safety Risk (PPSR)	*(AVE: 0.727, CR: 0.889)* (Jiang, 2016)	
	PPSR1: I am worried about spontaneous combustion while driving an electric two-wheeler (ETW)	0.82
	PPSR2: Electric two-wheeler (ETW) take a long time to charge and I am worried about a fire	0.91
	PPSR3: I am worried about the safety of driving electric two-wheeler (ETW)	0.84
Perceived Cost of Ownership (PCO)	*(AVE: 0.610, CR: 0.825)* (Luarn and Lin, 2005)	
	PCO1: It would cost (cost of vehicle + battery cost) a lot to use an electric two-wheeler (ETW)	0.79
	PCO2: There are financial barriers (cost of vehicle + battery cost) to me in using an electric two-wheeler (ETW)	0.77
	PCO3: I am not pleased with the cost (cost of vehicle + battery cost) of electric two-wheeler (ETW)	0.78
Range and Charging Risk (RCR)	*(AVE: 0.791, CR: 0.919)* (Schmalfuß *et al.*, 2017)	
	RCR1: The driving range of an electric two-wheeler (ETW) is not satisfying	0.88
	RCR2: I could not integrate the charging of the accumulators in my everyday life without any problems	0.91
	RCR3: I do mind that it takes longer to charge battery cells than refueling a petrol tank	0.88
Infrastructure Issues (INIS)	*(AVE: 0.785, CR: 0.916)* (She *et al.*, 2017)	
	INIS1: The public infrastructure for electric two-wheeler (ETW) is available	0.89
	INIS2: The electric two-wheeler (ETW) infrastructure at work is available	0.88
	INIS3: The electric two-wheeler (ETW) infrastructure on highway is available	0.90

Note(s): FL: Factor loadings, *Reverse questions
Source(s): Created by author

Table 2.

Data analysis and results

We have adopted a two-step approach as suggested by Anderson and Gerbing (1988). This involves the analysis of the measurement model, followed by the structural model. The study has utilized the AMOS for hypothesis testing.

Preliminary test

Initially, the collected data were tested for missing, invalid values and the presence of outliers. The descriptive analysis results showed an absence of missing and invalid values in the collected dataset. It also revealed that the dataset did not have any outliers. As per the normality assumption of the SEM, the skewness and kurtosis values were examined. The values of skewness and kurtosis were found below 3.0 and 10.0, respectively (Kline, 2005). Further, the study also examines the possibility of common method bias by performing Harman's single-factor test (Podsakoff *et al.*, 2003). The test result revealed that single factors account for 19.85% variance, which is way below 50%. Hence, there is no issue of common method bias.

Reliability and validity measures

In the two-step approach, the first step is to perform the measurement model analysis to check the reliability and validity of the scale. It showed that the data fitted the model well with the

Characteristics	*n*	%
Gender		
Male	233	77.15
Female	69	22.85
Age (years)		
18–24	67	22.18
25–30	190	62.91
31–35	35	11.58
Above 35	10	3.33
Education		
Undergraduate	132	43.70
Post Graduate	156	51.65
PhD	14	4.65
Income (per month)		
25,000–30000	102	33.77
30,001–35000	67	22.18
35,001 and above	133	44.05
Daily run		
<30 kms	34	11.25
30–50 kms	213	70.52
51–70 kms	49	16.22
Above 70 kms	6	2.01

Note(s): $n = 302$
Source(s): Created by author

Table 3. Respondents' characteristics

indices χ^2/df = 1.271, CFI = 0.98, TLI = 0.97 and RMSEA = 0.03 (Hair *et al.*, 2010). Further, the factor loadings of the items were examined (see Table 2). The factor loadings of all the items were found to be above 0.70 (Hair *et al.*, 2010). Next, we examined the composite reliability (CR) and average variance extracted (AVE), and the values were reported above 0.70 and 0.50, respectively (Hair *et al.*, 2010), confirming the convergent validity of the scale. Further, the square root of AVE for each construct was greater than the inter-construct correlation value, ensuring the discriminant validity (Hair *et al.*, 2010) (see Table 4). After that, the study also checked for multicollinearity among the independent variables. Variance inflation factor (VIF) values were used to do so. All the VIF values were below 10.0, confirming the absence of multicollinearity (see Table 5).

Structural model and hypothesis testing

In the second step, the structural model was performed. Here, we have analyzed structural path coefficients and the explanatory power of the overall model.

SEM results revealed the data fitted the model well (see Table 6). Further, path coefficients between the hypothesized path (variables) were calculated. Benefits and sacrifices explained 68% ($R^2 = 0.68$) variance in the perceived value of ETW. Further, the perceived value of ETW is found as the sole predictor of ETW adoption intention and explains the 38% ($R^2 = 0.38$) variance in adoption intention. Regarding hypotheses testing, all proposed hypotheses were supported except *H4* and *H9* (see Figure 1). The outcomes of the hypotheses testing are shown in Table 7.

Table 4.
Discriminant validity

	PPSR	PV	PEB	EAEF	INT	RCR	SIMG	INIS	PENV	PCO	LENE
PPSR	*0.853*										
PV	−0.384	*0.757*									
PEB	−0.152	0.590	*0.832*								
EAEF	−0.085	0.291	0.150	*0.837*							
INTS	−0.244	0.580	0.348	0.284	*0.849*						
RCR	0.274	−0.413	−0.153	−0.174	−0.341	*0.890*					
SIMG	−0.070	0.515	0.338	0.044	0.313	−0.213	*0.776*				
INIS	0.311	−0.175	−0.055	−0.065	−0.149	0.181	−0.077	*0.886*			
PENV	−0.062	0.502	0.344	0.213	0.491	−0.308	0.410	−0.078	*0.750*		
PCO	0.181	−0.191	0.004	−0.087	−0.137	0.026	−0.036	0.058	−0.067	*0.781*	
LENE	−0.028	0.187	0.065	0.087	0.199	−0.159	0.103	−0.048	0.123	0.031	*0.837*

Note(s): PPRS = Perceived Physical Safety Risk; PV = perceived value of ETW; PEB = perceived economic benefits; EAEF = enjoyable acceleration and enhanced fun; INT = ETW adoption intention; RCR = range and charging risk; SIMG = social image; INIS = infrastructure issues; PENV = perceived environment; PCO = perceived cost of ownership; LENE = low engine noise emission. The italic values represent the square root of average variance extracted

Source(s): Created by author

Construct	Tolerance	VIF
Dependent variable: Perceived Value of ETW (PV)		
Perceived Economic Benefits *(PEB)*	0.76	1.32
Social Image *(SIMG)*	0.70	1.42
Enjoyable Acceleration and Enhanced Fun *(EAEF)*	0.90	1.12
Low Engine Noise Emission *(LENE)*	0.95	1.05
Perceived Environment *(PENV)*	0.63	1.59
Perceived Physical Safety Risk *(PPSR)*	0.77	1.29
Perceived Cost of Ownership *(PCO)*	0.94	1.07
Range and Charging risk *(RCR)*	0.77	1.30
Infrastructure Issues *(INIS)*	0.87	1.15
Dependent variable: ETW Adoption Intention (INT)		
Perceived Value of ETW (PV)	1.00	1.00

Source(s): Created by author

Table 5. Multicollinearity results

Fit index	Recommended value	Research model
χ^2/df	≤3.00	1.293
GFI	≥0.80	0.899
AGFI	≥0.80	0.875
NFI	≥0.90	0.900
TLI	≥0.90	0.971
CFI	≥0.90	0.975
RMSEA	≤0.08	0.031

Source(s): Hair *et al.* (2010)

Table 6. Model fit summary of the research model

Hypothesis	Path	Standardized coefficient (β)	*t*-value	Result
H1	PEB → PV	0.36	6.44***	Supported
H2	SIMG → PV	0.25	4.30***	Supported
H3	EAEF → PV	0.14	2.80*	Supported
H4	LENE → PV	0.09	$1.87^{n.s}$	Not Supported
H5	PENV → PV	0.20	3.23**	Supported
H6	PPSR → PV	−0.22	−4.24***	Supported
H7	PCO → PV	−0.12	−2.46*	Supported
H8	RCR → PV	−0.16	−3.07**	Supported
H9	INIS → PV	−0.01	$-0.22^{n.s}$	Not Supported
H10	PV → INT	0.61	9.76***	Supported

Note(s): ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; n.s. = not significant

Source(s): Created by author

Table 7. Summary results of hypothesized model testing

Discussion

The current work seeks to understand why consumers will adopt electric two-wheelers based on their value viewpoint. For this, the study utilizes the value-based adoption model. As the climate change issue is keeping pace around the globe, it is necessary to look for a sustainable solution, such as electric two-wheelers, which can help countries reduce their carbon footprints. Further, transport is one of the sectors contributing majorly to carbon emissions in

India, where two-wheelers have a substantially large share (Kamboj *et al.*, 2022). Hence, pushing for electric two-wheeler use is a need of the hour. Given the perspective, cumulative average growth figures of almost 29% from 2022 to 2028, a study by the Economic Times showed that only 1% of Indians want to purchase an electric two-wheeler, which is very surprising. It makes this study very important. Also, Indian consumers are value-conscious; hence, they evaluate the product/service/innovation based on the evaluation of the benefits and sacrifices (costs) (Gupta, 2019). Therefore, exploring their adoption behavior from their value perspective is worthwhile.

Further, the perceived value is a sole and powerful predictor of the ETW adoption intention among Indian consumers. The study's finding aligns with the past work of Kim *et al.* (2018) conducted in the context of electric vehicle adoption among Koreans. The relationship has also been proven numerous times across the domain (Hsu and Lin, 2018; Vishwakarma *et al.*, 2020). Second, the consumers' perceived benefits seem to strongly influence perceived value more than the sacrifices involved in adopting ETW. Third, perceived value strongly depends on perceived economic benefits, social image, enjoyable acceleration and enhanced fun and perceived environment. One reason to adopt ETW is to enhance the social image within the peer group. People with the ETW get more attention and respect in their social groups, positioning them as smart and environmentally conscious individuals. Also, this feeling boosts when people around you ask about the vehicle and praise you for your bold move. Fourth, perceived physical safety risk has a strong negative influence on individuals' perceived value. It may be due to the recent ETW fire incidents in India (Choudhary, 2022). Even a few cases have reported the death of minors and adults due to battery explosions while charging. Fifth, physical safety substantially affects PV over the cost of ownership, indicating consumers prefer their physical safety over the cost of a vehicle. Also, it might be due to government incentives, income tax benefits and long-term monetary savings. Surprisingly, low engine noise emission and infrastructure issues have an insignificant influence on perceived value. It may be because most respondents want to use ETW within the city for local commutes for their work. Also, it may be complemented by the roadside assistance (RSA) services offered by the ETW brands (Bikewale, 2022).

Theoretical contributions and implications for practice

The present work utilizes value-based adoption to examine ETW adoption among Indians from their value perspective. The study supplements the current EV adoption literature by identifying consumers' perceived benefits and sacrifices associated with ETW adoption. The current work is the first of its kind, considering the adoption of ETW based on the individual's evaluation of benefits and sacrifices. As the literature related to electric vehicles (including cars and other vehicles) used multiple theoretical frameworks (TAM, TPB, UTAUT, Innovation Diffusion model) to understand the EV adoption behavior (Sohn and Kwon, 2020), the current work is considered the value-based paradigm to examine the behavior. Studies in the past have acknowledged the dominance of VAM over other theoretical frameworks (TAM, TPB, TRA and UTAUT) in examining consumers' behavior in technology adoption. Additionally, Gupta (2019) also stated that Indian consumers are more value-driven. Therefore, the current study adds value to the VAM literature from the perspective of ETW. Further, given the significance of the topic and its impact on the environment, the study contributes to the literature by considering a value-based approach to electric vehicle adoption.

The research also adds a perspective by considering Indian consumers; it will also provide another direction for researchers and add value to the literature of EV literature in developing countries, along with its contribution towards proving the effectiveness of the value-based framework. It also adds a perspective of how consumers from developing countries perceive

EV while planning to adopt them in the near future since it is an integral part of their daily lives. The study also established the importance of physical safety over the cost of the EV, showing consumers are looking for the best value possible for the sacrifices they make but will not compromise their physical safety and security, adding to the knowledge of EVs.

The outcomes of the work will help the ETW companies, marketers and government bodies to curate appropriate strategies to boost ETW adoption, which will ultimately help India achieve its green objective. Although consumers feel adopting ETW is beneficial, only 1% of consumers are interested in buying ETW in the next six months, which is alarming (ET, 2022). Hence, marketers should try to boost the perceived benefits of using ETW; however, at the same time, they should also work on reducing the sacrifices.

Perceived economic benefits and enhanced social image strongly influence ETW's perceived value. Marketers can incorporate these elements in their advertisement campaigns. Although consumers are aware of the economic benefits of using ETW (specifically cost per km), most are unaware of other economic benefits they can avail of (offered by the government, such as subsidies, tax exemption, etc.). Hence, featuring these elements will further enhance their perception of economic benefits. Also, the majority of the ETW (high-speed) prices are on the higher side (starting around 1 lakh Indian Rupees), making it difficult for consumers to buy (HT Auto, 2023). In such cases, a consumer can buy an internal combustion engine (ICE) two-wheeler or seek government subsidies/loans at low-interest rates to buy ETW. However, most of the electric two-wheelers (ETW) do not qualify for subsidy; also, multiple EV showrooms have teamed up with non-financial banking companies (NBFCs), which offer loans for ETW at a higher interest rate (Torgalkar, 2023), making the situation worse. Hence, the government (state and central) should look into updating the list (subsidy) of ETW manufacturers from time to time; along with this, the government should direct the financial and non-financial institutions to disperse the loan at a lower interest rate for ETW consumers. State and central governments should also speed up the distribution of subsidies to beneficiaries and centralize the entire process of granting subsidies. Further, social image emerged as an important benefit, which has a significant influence on value formation. People who own an electric vehicle are perceived as sensitive towards the environment and considered environmentally conscious. Hence, consumers may expect to improve their social image with their peers and society by adopting ETW. Therefore, it is an opportunity for marketers to utilize this in creating advertisements by highlighting enhanced social images. It will provide emotional satisfaction for the consumers in buying ETW. Further, perceived environment, enjoyable acceleration and enhanced fun are also significantly associated with perceived value. Hence, the government can make more people aware of the positive impact of driving ETW and its environmental impact by launching a nationwide campaign similar to "Clean India Green India". Marketers can also play a vital role and advertise the impact of driving ETW on the environment. For this, government and marketers can take the help of celebrities and YouTube opinion leaders to make their followers aware of the positive impact (benefit) of using ETW on the environment.

The perceived physical safety risk has a strong negative association with perceived value. It is evident that potential consumers have physical safety concerns because of reported incidents of ETW catching fire and battery explosions (Choudhary, 2022). As these incidents refrain customers from buying ETW and result in trust dilution, the government should come up with certifications (like the ISI mark issued by the Bureau of Indian Standards in case of consumer products like toys), at the same time making the companies accountable for such incidents. Since there are numerous new players in the ETW market, applying tough rules in manufacturing such vehicles will enhance the quality of ETW. Also, the government should join hands with big automotive companies to provide mentoring for such ETW startups. As ETW is dependent upon the battery, which is made

of a lithium cell, the majority of fire incidents are due to the battery itself. Therefore, the government should issue a strong direction for companies to use good quality lithium ions and instruct companies to design the batteries by considering Indian climatic conditions. The government and marketers should communicate the information related to the certification marks to the general public and inform people to look for certification marks while purchasing any ETW. For this, the consumers can be persuaded through different social media platforms. It will develop a feeling of trust among potential ETW customers, encouraging them to adopt ETW.

Range and charging risk strongly influence perceived value more than the perceived cost of ownership. Hence, ETW companies should work on extending the range per charge or providing fast charging features in ETW. Also, ETW companies should work on the model of subscribing battery (known as battery swapping) rather than owning it. It will significantly bring down the cost of ETW ownership. Further, many people feel the hassle of charging the battery in the apartment where the charging is a concern. For this, the government can direct the real estate companies to include an ETW charging place mandatorily within the society premises, ensuring the residents' safety. Further, the battery-swapping model seems very interesting and will appeal to consumers. However, to make it more convenient for the customer, the marketers should properly plan and establish a network of battery-swapping stations within the city. They should also establish a mechanism to continuously evaluate the battery's health, as many people are using the battery. This model is a hit for ETW companies offering the vehicle with removable and identical batteries. However, in reality, this is not true. Many companies offer a non-removable battery, while a few offer a removable battery in their vehicles. Hence, every ETW buyer faces different challenges. It can be overcome by mandating the use of identical batteries (up to a certain kWh) for ETW companies. It will also result in reduced cost of ownership and peace of mind and help deal with battery waste management. For this, the Ministry of Power (MOP), and the Government of India can provide some sort of funding or grants to boost the capacity of charging stations. The government can also make it mandatory for companies to produce the ETW (with identical removable batteries) by keeping the swapping battery technology in mind. It is interesting to see that infrastructure issues have an insignificant influence on perceived value. It might be because most respondents participated in the study on an average drive of around 30–50 km daily for their daily needs. Also, most ETW offers a 70–120 km range per charge. Also, charging-related guidelines at the workplace will be an advantage, especially when ETW has a non-removable battery.

Limitations and future research directions

The current work also has some limitations. Present work was conducted in the region in and around Delhi, which frequently witnessed higher pollution levels, so people are more aware and cautious of the problem. The study considers India as a case among the developing countries; the model can be tested in other developing nations and can be extended with the context-specific variable. A majority of the respondents in the study were male; therefore, future work can consider a substantial number of female respondents and later compare their behavior using multigroup analysis. Additionally, the majority of the respondents (96%) considered in the study were below the age of 35; because of this, the results of the study cannot be generalized. Hence, future researchers can consider this aspect, and similar studies can be conducted by considering a more comprehensive sample in terms of age. Also, scholars can conduct similar studies on older adults to understand how they perceive ETW adoption. Further, the current work proposed the direct relationships of benefits and sacrifices with the perceived value. Future scholars can also test for their direct and indirect effects on adoption intention, which could provide more understanding of the subject matter.

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