

Electric Bikes adoption: A study to evaluate the purchase intention of electric bikes through TRI 2.0 model

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ABSTRACT

With Indian Auto Manufacturing competing to launch their electric bikes in 2024, the Indian consumer electric vehicle (EV) landscape is transforming. These e-bikes or slow-speed scooters are attracting consumers and are competing with the petrol-burning bikes in the market. Driven by the ever-increasing fuel prices and the shift towards sustainability, Indian consumers are becoming more interested towards electric bikes. Though they show keen interest, the acceptance of the EV is still in the nascent stages in India. This study aims to understand the purchase intention of these consumers through the Technology Readiness Index (TRI) 2.0 model. Further, it examines whether these intentions are influenced by consumers' perceptions of green products and their trust in auto brands. The research model was analysed using Partial Least Squares (PLS) technique. The findings indicate that brand trust, mediated by technology readiness, positively affects purchase intention, whereas green perceived value does not significantly impact technology readiness in shaping purchase intentions. These insights are critical for auto manufacturers as they refine their marketing strategies to strengthen brand trust and enhance awareness of the green value proposition of electric bikes.

Keywords: E-bikes, green perceived value, technology readiness, brand trust

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1. INTRODUCTION

As a country, we are striving to achieve the social, economic, and environmental goals of SDG and we have achieved significant improvement in the NITI Aayog SDG India Index published in 2020-21. One of the goals (goal 11) is to develop smarter and more sustainable cities and communities (Economic Survey, 2022). In the pursuit of attaining a cleaner and safer environment, combating environmental concerns is a challenging task. Atmospheric pollution is one of the few environmental concerns, and as a country, we have taken many steps to control and minimize this pollution. Emissions from household combustion devices, vehicles, manufacturing units and chemical plants are 3 major contributors to atmospheric pollution. With the growth of motor vehicle sales in India, so has the emissions from these vehicles. Therefore, India has adopted the BS-6 standards which is the most advanced standard for automobiles. This mandates that the manufacturers should ensure the new

vehicles should minimize the emission of harmful toxic gases to create a pollution-free environment (*BS-6 Norms And Their Impact On The Two-Wheeler Industry - Chola MS*, 2022, p. 6). The entry of electric bikes (e-bikes) has shown a ray of hope in the polluted environment (*Measuring Emissions from Vehicles in the Real World*, 2022). Also, the initiatives of the government such as improving the infrastructure to support e-bikes, providing incentives to consumers to adopt e-bikes, encouraging local manufacturing of e-bikes and the like, are encouraging. According to the report of the Financial Express, they quote that "The Indian automotive market is poised for rapid EV growth, due to the convergence of factors including government incentives, improving cost competitiveness and original equipment manufacturer (OEM) investment in the industry along with increased customer readiness and awareness" ("What Would Be the Opportunities and Challenges for EVs in 2023?", 2022; *India E-Bike Market Growth, Share | Analysis (2022 - 27)*, 2022; *India's Electric Vehicles Industry Revenue Pool Expected to Hit \$100 Billion by 2030, Says Report*, 2022). Still, the market of e-bikes is in the nascent stage, as many consumers choose conventional bikes over e-bikes. There is ample scope for market penetration and expansion in this sector.

Current studies indicated that limited studies have been conducted on the consumer adoption of electric vehicles in the Indian context whereas there were adequate studies in the global context (US, UK, Nordic, Australia) (*S. Gong et al. (2020)*, *D.L. Greene et al. (2014)*, *J. Kester et al. (2018)*, *N. Berkeley et al. (2018)*). These studies were conducted using qualitative approaches and other consumer behaviour models. Apart from the infrastructure challenges, lack of awareness among the consumer is one of the challenges in the Indian market. While Indian consumers show interest in e-bikes, their purchase intentions may be influenced by various factors. Identifying and understanding these factors is essential for auto manufacturers aiming to design effective marketing strategies to increase adoption.

This gap was addressed by seeking the explanation for the following research questions, (a) "How does the technology readiness influence the purchase intention of Indian consumers for e-bikes, and (b) What is the role of brand trust and green perceived value in enhancing the likelihood of purchase?". Based on these research questions, it was hypothesized that brand trust and green perceived value positively impacts technology readiness which in turn positively impacts the adoption of e-bikes.

2. LITERATURE REVIEW

2.1. E-bikes Adoption

The literature on e-bike or electric vehicles highlights the influence of consumer perceptions, urban planning, technological advancements and government policy on the consumer adoption. However, these qualitative studies are extensively conducted in markets such as the US, UK, Nordic countries, and Australia and consumer behaviour and adoption models are widely used. Emerging markets like India are also included in a few existing studies. But the challenges in these emerging markets are unique, such as infrastructural limitations and low consumer awareness.

The adoption of e-bikes has gained momentum as a sustainable and innovative mode of transportation, particularly in urban areas, where micromobility is seen as essential for reducing traffic congestion and pollution. A study conducted in Sweden suggests that while e-bikes can contribute to achieving net-zero emissions, their adoption is constrained by insufficient parking infrastructure and electricity networks. The study reveals that limited infrastructure discourages e-bike use beyond short trips between places with safe parking, presenting a challenge for expanding e-bike use beyond commuting (Edberg, 2023). Consumer adoption of e-bikes is strongly influenced by perceptions of innovation and environmental consciousness. A study by Flores and Jansson (2021) focuses on the role of consumer innovativeness (CI) and green perceptions in the adoption of shared e-bikes. The study reveals that users of shared e-bikes in cities like Copenhagen and Stockholm tend to perceive themselves as innovative and view e-bikes as environmentally friendly. Conversely, non-users do not share these perceptions, suggesting a gap in understanding the environmental benefits of e-bikes. CI plays a crucial role in adoption, as consumers who see themselves as innovators are more likely to embrace e-bikes. Additionally, the study highlights the influence of environmental attitudes and knowledge on green perceptions, which further encourages adoption. Interestingly, the research finds that while both CI and green perceptions influence shared e-bike use, CI alone drives e-scooter adoption, emphasizing that consumer motivations may vary across different forms of micro-mobility (Flores & Jansson, 2021)

Other factors influencing the adoption include perceived benefits, barriers, and individual characteristics. Understanding these elements is crucial for promoting e-bike usage effectively. Users cite monetary savings, reduced congestion, and improved last-mile connectivity as significant motivators for adopting e-bikes. On the contrary, the lack of cycling and charging infrastructure is a major deterrent, particularly in developing regions (Zabiulla et al., 2024). E-bikes are recognized for their potential to contribute to sustainable transportation, appealing to environmentally-conscious consumers (Yasir et al., 2022). High purchase costs and perceived risks, such as battery safety, significantly hinder adoption (Lee & Sener, 2023; Murtiningrum et al., 2022). Concerns about social perceptions and the stigma associated with using electric assistance can also impede adoption (Lee & Sener, 2023). While e-bikes present a promising solution for sustainable mobility, addressing the barriers and enhancing the perceived benefits are essential for increasing their adoption across diverse populations. Consumers who perceive e-bikes as an easy, affordable, and enjoyable option are more likely to consider purchasing one (Jayasingh et al., 2021; C.-T. Lin et al., 2022). The transition to e-bikes is seen as a critical step towards sustainable transportation. This adoption is examined using the technology readiness model.

2.2. Technology Readiness Index 2.0 (TRI 2.0)

Technology Readiness Index 2.0 is a scale which measures technology readiness – defined as “people’s propensity to embrace and use new technologies for accomplishing goals in home life and at work”. This tool evaluates the technology readiness score based on four constructs, such as optimism, innovativeness, insecurity and discomfort (Parasuraman,

2000; Parasuraman & Colby, 2015). Optimism and innovativeness act as motivators for technology adoption where optimism indicates a positive view of technology's benefits while innovativeness reflects a person's tendency to be a technology pioneer. Discomfort and Insecurity acts as inhibitors. Discomfort refers to a feeling of being overwhelmed by technology, and insecurity involves concerns about technology's reliability. Studies show that these factors significantly influence readiness in contexts like smart city development and internet banking [1] [2]. Studies in the past describe that while adopting and implementing new technology, the impact of these four constructs are different for different technology products. While some studies reveal that few constructs are significant, others reveal that the constructs are not (Andaleeb et al., 2010; Hao & Chon, 2021; Parasuraman, 2000; Parasuraman & Colby, 2015; Rodrigues & Ponchio, 1 C.E.; Victorino et al., 2009; Walczuch et al., 2007; Yosser et al., 2020). This study hypothesizes and examines the positive impact on purchase intention

2.3. Green Perceived Value (GPV)

Chen and Chang (2012) proposed a novel construct. "green perceived value", as they observed the inclination of consumers towards environment-friendly services. The construct is defined as "a consumer's overall appraisal of the net benefit of a product or service between what is received and what is given based on the consumer's environmental desires, sustainable expectations, and green needs". Several studies in the past have explored the influence, moderating and mediating roles of GPV on purchase intention (S.-Y. Chen, 2016; Y. Chen & Chang, 2012; Y.-S. Chen, 2013; Danish et al., 2019; Rahardjo, 2015; Roh et al., 2022; Wim & Leen, 2016). Auto manufacturers market their e-bikes as environmentally friendly and sustainable alternatives. Hence in this study, the positive impact of green perceived value on technology readiness is hypothesised and examined. A high GPV could foster optimism and innovativeness towards sustainable transportation, thereby enhancing readiness to adopt it.

2.4. Brand Trust (BT)

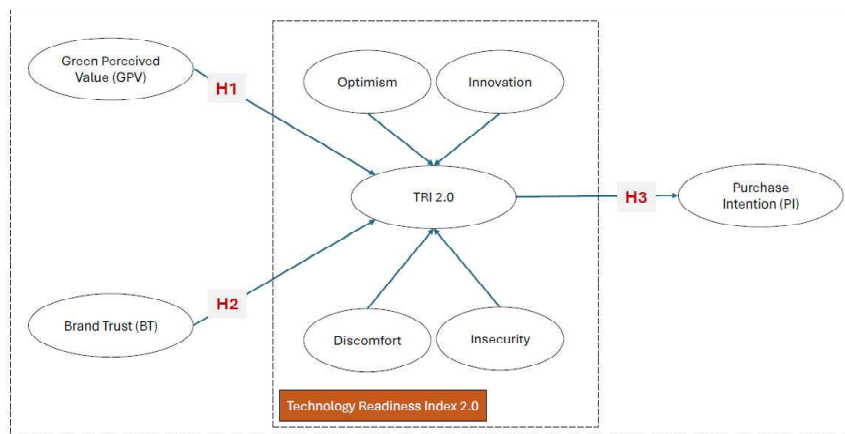
Brand Trust is explained as "to trust a brand implicitly means that there is a high probability or expectancy that the brand will result in positive outcomes for the consumer" by the author, (Delgado Ballester & Luis Munuera Alemán, 2005). Consumer's belief that brand has unique characteristics that make it reliable, competent and consistent has been explored in several studies and especially with respect to green products (Alamsyah & Febriani, 2020; Guerreiro & Pacheco, 2021; Lam et al., 2016; J. Lin & Zhou, 2022; Song et al., 2012). When consumers trust a brand, they are more comfortable and feel less insecure about engaging with its technology (Morgan & Hunt, 1994). In this paper, it is hypothesised that trusted brands are mitigate discomfort and insecurity, therefore fostering the readiness to adopt sustainable transportation.

2.5. Relationship between GPV, BT, TRI 2.0 and PI

In this paper, we investigate whether the green perceived value (GPV) (Y. Chen & Chang, 2012; Y.-S. Chen, 2013; Rahardjo, 2015) of consumers (through 5 items) regulates the

readiness (TRI) (Rodrigues & Ponchio, 1 C.E.) (through 4 dimensions each with 4 items) of the consumers to adopt new technology. When adopting new technology, trust in the brand plays a vital role in the adoption, especially when purchasing a E-BIKES. This paper explores whether brand trust (BT) (Ar et al., 2014; GültekiN & KiLiC, 2022; Rodrigues & Ponchio, 1 C.E.) (through 7 items) influences the readiness (TRI) of consumers to adopt new technology. Further, we aim to study whether the readiness of the consumer to adopt new technology directs the consumer towards the purchase (PI) (through 2 items) of the e-bikes. Based on the above discussion the following framework is proposed, and the hypotheses are stated below.

Figure 1: Proposed Framework based on TRI 2.0



H1: Green perceived value (GPV) positively impacts the technology readiness index 2.0 (TRI 2.0)

H2: Brand trust (BT) positively impacts the technology readiness index 2.0 (TRI 2.0)

H3: Technology readiness index 2.0 (TRI 2.0) positively impacts purchase intention (PI)

3. RESEARCH METHODOLOGY

In this study, a casual explanatory research method was used to explore the relationship between variables involved in the study. For the study, primary data was collected by distributing the online survey to 400 respondents by email and other social platforms. The sampling unit considered for this survey was young adults and above, in India. The respondents were identified through the convenience and purposive sampling method. The questionnaire included two sections, where the first section had basic demographic questions about the consumer's characteristics and lifestyle, and the second section included questions related to the variables under consideration for the study. The questions in the second part are a 5-point Likert scale capturing the agreeability of the consumers

for the questions related to each variable. The data was analyzed using basic Excel and SmartPLS4. Since online surveys have a low response rate, the usable responses was lower (32%). The hypothesis was tested using the Partial Least Squares (PLS) modelling technique. PLS is a powerful structural equation modelling (SEM) technique widely used for customer satisfaction research. Smart PLS is suitable when the sample size is small (Khoi & Van Tuan, 2018). It supports exploratory and confirmatory research. The following key metrics will be used to analyse results; (i) the outer loadings and latent variable correlation to check the Indicator reliability, Internal consistency reliability, and Convergent validity (ii) the average variance explained (AVE) of each construct to check the discriminant validity. (iii) Cronbach's alpha, (iv) R-square and adjusted R-square (v) SRMR, Chi-square, rms Theta, NFI and others. Based on the t-statistics and p-value the significance of the hypothesis will be concluded and findings will be documented.

Table 1: Questionnaire Source

Sl. No.	Construct	No of items	Sources
1	TRI 2.0 Motivators (Optimism, Innovativeness) Inhibitors (Discomfort, Insecurity)	16	Parasuraman and Colby, (2015)
2	Green Perceived Value	5	Chen and Chang (2012)
3	Brand Trust	8	Aret al., (2014)
4	Purchase Intention	3	Maxham and Netemeyer (2002)

The questionnaire for the research comprises four key constructs sourced from established studies: Technology Motivators and Inhibitors, drawn from Parasuraman and Colby (2015), with 16 items exploring factors influencing technology adoption including optimism, innovativeness, discomfort, and insecurity; Green Perceived Value, derived from Chen and Chang (2012), with 5 items evaluating consumers' perceptions of a product's environmental friendliness; Brand Trust, adapted from a study by Ar et al. (2014) with 8 items assessing consumers' confidence and reliability in a brand; and Purchase Intention, based on research by Maxham and Netemeyer (2002), featuring 3 items gauging consumers' likelihood to purchase a product or service.

4. FINDINGS AND RESULTS

4.1. Demography of Respondents

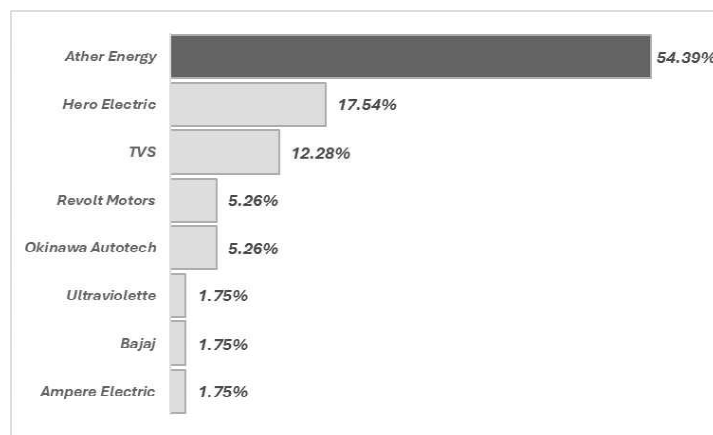
The demographic details of the respondents are listed in the table below

Table 2: Demography variables summary

Demography Variable	Percentage of respondents
Gender	69.4% of the respondents were male

Age	Majority of the respondents were 24 years old
Occupation & Qualification	Majority of the respondents were PG students
Owning e-bikes	88.7% of the respondents do not own e-bikes
Preferred e-bike brand	Ather Energy

Figure 2: Preferred E-Bike Brand



4.2. Measurement Model Assessment

Firstly, the items loading, reliability and validity of the constructs are tabulated in Table 3, which measures the internal consistency of measurement instruments and the degree to which different items measuring the same construct produce similar results.

Table 3: Item loadings, reliability and validity

	λ	α	CR (rho_a)	AVE
Brand Trust		0.936	0.940	0.692
BT1	0.867			
BT2	0.828			
BT3	0.756			
BT4	0.799			
BT5	0.868			

BT6	0.855			
BT7	0.855			
BT8	0.821			
Green Perceived Value	0.917	0.923	0.753	
GPV1	0.790			
GPV2	0.808			
GPV3	0.914			
GPV4	0.903			
GPV5	0.916			
Purchase Intention		0.914	0.917	0.853
PI1	0.940			
PI2	0.910			
PI3	0.920			
Technology Readiness		0.658	0.929	0.442
<i>Innovativeness</i>				
INN1	0.738			
INN2	0.717			
INN3	0.514			
INN4	0.685			
<i>Optimism</i>				
OPT1	0.745			
OPT2	0.759			
OPT3	0.769			
OPT4	0.709			
<i>Discomfort*</i>				
RDIS1	-0.598			

RDIS2	-0.584
RDIS3	-0.680
RDIS4	-0.523
<i>Insecurity*</i>	
RINS1	-0.649
RINS2	-0.650
RINS3	-0.574
RINS4	-0.673

The measurement model assessment results provide insights into the reliability and validity of the constructs. Constructs such as Brand Trust, Green Perceived Value, and Purchase Intention demonstrate high internal consistency, with Composite Reliability (CR) values surpassing 0.9. This indicates that the items within these constructs consistently measure their intended concepts. Moreover, the Average Variance Extracted (AVE) values, assessing convergent validity, exceed 0.9 for Brand Trust and Green Perceived Value, and 0.85 for Purchase Intention, indicating that a significant portion of the observed variance is attributable to these constructs, confirming their validity. However, for Technology Readiness construct the AVE value is only 0.442, while the CR is 0.929, suggesting effective measurement, and the Cronbach value is adequate (0.658). Studies suggest that AVE should be higher than 0.5. However, the value of 0.4 is acceptable due to the condition that if AVE value is less than 0.5, but composite reliability is higher than 0.6, the convergent validity of the construct is acceptable (Fornell and David, 1981).

Overall, the reliability and convergent validity are achieved for all the constructs in the instruments.

Table 4: Discriminant validity using HTMT and FLC

	BT	GPV	PI	TRI
BT	0.832	0.846	0.743	0.654
GPV	0.778	0.868	0.842	0.566
PI	0.685	0.790	0.924	0.558
TRI	0.652	0.589	0.567	0.665

Table 4 shows the discriminant validity of the constructs—Brand Trust (BT), Green Perceived Value (GPV), Purchase Intention (PI), and Technology Readiness Index (TRI). The Heterotrait-Monotraits (HTMT) value should be below 0.85. All the constructs have

HTMT values below the threshold, except for BT-GPV (0.846) and GPV-PI (0.842), which are slightly close to the threshold. Fornell-Larcker Criterion (FLC) states that diagonal values should be more than all values in columns, which is satisfied in our findings. Discriminant validity is established for all constructs, as the square roots of AVE are higher than the correlations (FLC) between constructs. This confirms that each construct is distinct from the others, indicating a well-constructed model for further analysis. The measurement model is robust and qualify for further structural analysis to examine the relationship between the variables.

4.3. Structural Model Assessment

Table 5 presents the results of hypothesis testing. The effect of GPV on TRI is not statistically significant (p -value = 0.105, which is greater than 0.05). This suggests that Green Perceived Value does not have a strong or significant impact on Technology Readiness. Environmental perception alone does not motivate consumers in adopting e-bikes. The relationship between BT and TRI is statistically significant (p -value = 0.034, which is less than 0.05). This means that Brand Trust has a significant positive impact on Technology Readiness. A β value of 0.485 suggests a moderate to strong positive relationship, indicating that higher trust in the brand boosts consumers' readiness to adopt e-bike. The relationship TRI and PI is also statistically significant (p -value = 0.018, which is less than 0.05). Technology Readiness has a significant positive effect on Purchase Intention. The β value is 0.569, this indicates that technology readiness has a substantial positive influence on consumers' purchase intentions for e-bikes.

Table 5: Structural Model Summary

Hypotheses	Relationship	b	SD	t-value	p-value	Decision
H1	GPV -> TRI	0.218	0.174	1.256	0.105	Rejected
H2	BT -> TRI	0.485	0.265	1.831	0.034	Supported
H3	TRI -> PI	0.569	0.272	2.091	0.018	Supported

5. CONCLUSION

Several studies in the past have explored the influence, moderating and mediating roles of GPV on purchase intention (S.-Y. Chen, 2016; Y. Chen & Chang, 2012; Y.-S.Chen, 2013; Danish et al., 2019; Rahardjo, 2015; Rohet al., 2022; Wim & Leen, 2016). However, this study suggests that GPV does not influence the adoption of electric bikes. Thus, being environment-friendly may not be equated to being technology friendly. Consumer's belief that brands have unique characteristics that make them reliable, competent and consistent has been explored in several studies and especially for green products (Alamsyah&Febriani, 2020; Guerreiro& Pacheco, 2021; Lam et al., 2016; Lin & Zhou, 2022; Song et al., 2012). This study confirms the positive impact of the brand of the automobile on adopting or using electric bikes. Studies in the past describe that while adopting and implementing

new technology the impact of the four constructs are different for different technology products. While some studies reveal that few constructs are significant, other studies reveal that the constructs are not significant (Andaleebet al., 2010; Hao & Chon, 2021; Parasuraman, 2000; Parasuraman & Colby, 2015; Rodrigues & Ponchio, 1 C.E.; Victorino et al., 2009; Walczuchet al., 2007; Yosseret al., 2020). In this study technology motivators and inhibitors significantly impact the consumer to adopt electric vehicles and consumers intend to purchase electric bikes, however, the insecurity and discomfort impact the intent.

The study reveals that brand trust significantly enhances technology readiness, which, in turn, strongly drives purchase intentions for electric bikes. However, green perceived value does not significantly impact technology readiness. This implies that while environmental values are important, consumers' trust in the brand and their technology readiness are more influential in shaping their willingness to purchase e-bikes. For manufacturers, this highlights the need to build brand credibility and address consumer concerns around technology to strengthen adoption efforts and its role in shaping consumers' attitudes towards e-bike adoption. By understanding and acting on these drivers, electric bike manufacturers can develop more effective strategies that align with consumer values and promote the adoption of sustainable transportation solutions in India.

However, this study has a few limitations that affect the generalizability of its findings. The sample's demographic and geographic composition may not fully represent the diversity of Indian consumers that affects the applicability across different regions. The other influential factors, such as price, government incentives, and infrastructure availability, could be considered to understand the adoption. Thus, the study gives scope for further expansion of formative factors like hedonic motivation, facilitating conditions, price and self-efficacy to explain technology readiness. The study does not consider potential moderating or mediating effects that might explain relationships.

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