WEP Warwick Evans Publishing

International Journal of Social Sciences and Public Administration

ISSN: 3005-9836 (Print), ISSN: 3005-9585 (Online) | Volume 9, Number 1, Year 2025
DOI: https://doi.org/10.62051/ijsspa.v9n1.32
Journal homepage: https://ijsspa.org

Risk Perception in Electrice Vehicle Purchases and Its Influence on the Purchasing Decision-Making Process

Zhu Min[1, *], Abu Bakar Abdul Hamid[1], Elkhansa Medjedel[2], Siti Norida Wahab[3]

[1] College of Business, Information and Human Sciences, Kuala Lumpur University Of Science and Technology(KLUST), Kuala Lumpur, Malaysia

[2] Department of Business Management, Onaizah Private College, Onaizah, Kingdom of Saudi Arabia

[3] Universiti Teknologi MARA, 40450 Shah Alam, Selangor Darul Ehsan, Malaysia

[*]Corresponding Author: Zhu Min

ABSTRACT

Amid the global energy crisis and carbon reduction goals, electric vehicles(EVs) have emerged as a key pathway for sustainable mobility. This study, based on perceived risk theory, constructs a perceived risk–purchase decision process's to examine how functional, financial, safety, time, social and psychological risks affect EV purchase intention. Using survey and empirical analysis, results show that functional, financial, and time risks significantly reduce purchase intention, with functional and financial risks being the most critical. Safety risk affects evaluation stages but has limited impact on final decisions, while social and psychological risks are not significant. Electric vehicle consumers place greater emphasis on practicality and are more sensitive to time risks. Findings suggest that firms should improve product performance and reduce costs, governments should enhance infrastructure and policies, and consumers should make rational purchase assessments.

KEYWORDS

Electric Vehicles; Perceived Risk; Consumer Behavior; Purchase Decision.

1. INTRODUCTION

Against the backdrop of global energy shortages and worsening environmental pollution, green and low-carbon transition has become a common goal of governments and enterprises worldwide. As an important means of promoting energy conservation and emission reduction in the transportation sector, the development of electric vehicles (EVs) has attracted extensive attention over the past decade. The global sales of new energy vehicles have continued to grow, and the penetration rate of EVs has steadily increased. However, despite their market potential, the widespread adoption of EVs among consumers still faces considerable obstacles. Many potential buyers display caution or hesitation when considering EVs, largely due to their subjective perception of risks. Specifically, consumers are often concerned about issues such as limited driving range, battery degradation, high maintenance and repair costs, insufficient charging infrastructure, and low resale value. These uncertainties generate different types of perceived risks that, in turn, influence the purchase decision-making process.

Existing studies suggest that perceived risks in the context of EVs are more salient than those associated with conventional vehicles, primarily because EVs involve new technologies, business models, and usage habits. Given consumer' limited experience and incomplete information, potential risks are likely to be magnified. Therefore, an in-depth examination of perceived risks in EV purchase

decisions, as well as their influence on consumer behavior, is of both theoretical and practical importance. Such research not only helps to uncover the underlying reasons for the relatively low acceptance of EVs in the marketplace but also provides valuable insights for enterprises in product development, marketing strategies and after-sales services. Moreover, it offers empirical evidence to support governments in designing more targeted subsidy policies and promotion measures.

Against this background, this paper identifies six major dimensions of perceived risk in EV purchase contexts-namely functional, financial, safety, time, social and psychological risk-and constructs a theoretical model linking perceived risk to the consumer decision-making process. Furthermore, through empirical analysis, the study investigates how different types of risks influence purchase intention and decision-making stages, thereby addressing two key questions: How do consumers perceive risks in the EV purchasing process? And through what mechanisms do different types of risks affect their purchase decisions? Clarifying these issues not only enriches the theoretical literature on consumer behavior and new energy vehicle research but also provides practical implications for the sustainable development of the EV industry.

2. LITERATURE REVIEW

2.1. Research Progress

Perceived risk, as a core construct in consumer behavior research [1], which indicates that consumers actively assess potential uncertainties and negative outcomes during purchase decisions, laying the theoretical framework for subsequent research on the dimensions of perceived risk and empirical studies. Further explored the components of perceived risk in 'The Components of Perceived Risk', although not directly focusing on the electric vehicle (EV) sector, their analysis of risk components provided methodological references for subsequent research on risk perception in specific product areas [4]. Empirically verified the multi-dimensional structure of perceived risk, identifying six dimensions-financial risk, psychological risk, social risk, performance risk, physical risk, and time risk-as highly explanatory of overall perceived risk, and emphasized the mediating role of psychological risk among these dimensions [13]. This conclusion provided a key basis for the division of dimensions in analyzing risk perception in EV purchases, and subsequent studies have built upon this foundation to explore specific areas [8]. After reviewing 30 years of consumer perceived risk research, pointed out that the basic dual-component model still has universal applicability in theoretical explanation and practical application, and emphasized the connection between perceived risk and marketing constructs such as involvement and trust, providing a theoretical link for understanding the relationship between risk perception and consumer attitudes and decisions in EV purchase [7] . In reviewing the theory of perceived risk at home and abroad, mentioned that perceived risk has widely extended from the field of psychology to consumer decision-making research, and the related research results on its dimensions, influencing factors, and risk reduction strategies provide a comprehensive reference for systematically analyzing consumer risk perception of EVs as a new product [15] .

In the research on the specific dimensions and influencing mechanisms of risk perception in EV purchases, many scholars have conducted in-depth discussions based on different regional markets and theoretical models. Found through analyzing consumer attitudes and perceptions that consumers have a natural resistance to "unfamiliar and unproven" new technologies like EVs, with concerns over performance uncertainty and ease of use constituting the main perceived risks, which are key obstacles to the widespread adoption of EVs. They also pointed out that policy-making needs to fully consider consumers' core concerns to enhance policy effectiveness [3]. In their review of EV consumer adoption research, clearly listed perceived risk as one of the significant obstacles affecting consumer willingness and emphasized the need to further explore the differential impacts of different risk dimensions (such as performance risk related to battery life and time risk related to insufficient

charging infrastructure)on decision-making [10]. Based on an empirical study using the extended Technology Acceptance Model (TAM) in the Indian market, found that perceived risk has a direct negative impact on EV adoption intentions, and attitude does not mediate the relationship between perceived risk and adoption intentions [5]. They also noted that although financial incentive policies can moderate some influence paths, perceived risk remains an independent and crucial inhibitory factor. Further supplemented their research on Chinese consumers, finding that consumers' knowledge reserves about electric vehicles were significantly negatively correlated with perceived risk-the less knowledge they had, the stronger their perception of risks in terms of performance, safety, and maintenance costs [14]. This high risk perception simultaneously negatively affected consumers' perceived usefulness, attitudes, and final adoption intentions. Additionally, the study unexpectedly found that the financial incentive policies in the Chinese market at that time were not significantly effective in reducing perceived risk and enhancing adoption intentions, suggesting that policies should shift from mere economic subsidies to risk mitigation(such as enhancing technical popularization and improving after-sales services). Based on a survey in the Yangtze River Delta urban agglomeration, focused on the specific risk dimension of perceived reliability and discovered that the performance of electric vehicle products directly influenced consumers' perceived reliability, which in turn affected their attitudes and willingness to pay, ultimately influencing purchase behavior [2] . Moreover, factors such as government policies, environmental attitudes, individual characteristics, and face consciousness would also indirectly link risk perception with purchase decisions by regulating willingness to pay. Her research specifically defined performance risk as "perceived reliability" [16], in analyzing the cognition and acceptance of electric vehicles among consumers in Nanjing, China, found through a logistic regression model that consumers' perceived risks regarding the price, range, and charging facilities of electric vehicles directly affected their purchase intentions, expected purchase time, and willingness to pay, further verifying the importance of financial and performance risks in the local market.

In the research on the ultimate impact of perceived risk on the purchase decision-making process of electric vehicles and related moderating factors, scholars have also focused on the interaction effects of variables such as social norms, value cognition, and policy roles. Although [9], studied hybrid vehicles, their findings are relevant to electric vehicles-consumers' purchase decisions are not only driven by financial benefits, but social norms and group identity also influence risk perception: when consumers perceive that their group holds a positive attitude towards environmentally friendly models, their social risk perception regarding purchasing hybrid vehicles decreases, making them more likely to make a purchase decision. This suggests that in the marketing of electric vehicles, positive social norms can be shaped to alleviate social risk perception. In analyzing China's new energy vehicle policies, mentioned that consumers' evaluations of policies vary, and the imperfections of subsidy policies, technical support policies, and infrastructure policies would intensify consumers' risk perception regarding the usage cost and performance stability of electric vehicles [6]. A complete policy system (such as performance improvements brought by technological research and development support and usage convenience brought by infrastructure construction) can effectively reduce risk perception and thereby indirectly promote purchase decisions. In studying the relationship between consumer risk perception and purchase decisions, pointed out that risk perception is essentially consumers' cognition of the potential uncertainties and negative outcomes of purchase behavior, which runs through the entire process of purchase decision-making, including need confirmation, information search, option evaluation, purchase behavior, and post-purchase evaluation [17] . Specifically in the context of electric vehicle purchases, high risk perception leads consumers to extend their information search time, expand their search scope, or prefer traditional fuel vehicles in option evaluation to avoid risks, ultimately reducing the probability of purchasing electric vehicles. In addition, [19] price-quality-value perception model, although not directly addressing electric vehicles, provides a theoretical perspective for understanding financial risk perception (such as the mismatch between high purchase costs and perceived value). If consumers' high price perception of electric vehicles cannot be balanced with the corresponding quality(performance,

durability)perception, it will intensify financial risk perception, thereby reducing perceived value and purchase intention. [18] Research on service quality delivery suggests that the imperfection of the electric vehicle service system (such as charging services, maintenance services) will exacerbate consumers' time risk and psychological risk perception. By optimizing service processes and enhancing service reliability, such risk perception can be effectively reduced, providing a guarantee for consumers' purchase decisions. [11] Mentioned in "Consumer Behavior" that consumers can reduce perceived risk through brand trust, word-of-mouth communication, and after-sales guarantees. This view has been verified in electric vehicle research, such as consumers having a lower risk perception of well-known brand electric vehicles, and a complete battery warranty policy can significantly alleviate performance risk perception. [12] Emphasized the value perception of"ownership and existence"in consumer behavior research, suggesting that the risk perception in electric vehicle purchases not only stems from the product itself but is also related to consumers' social value perception of"environmental identity" and "early adopter image"-if consumers believe that the social value brought by purchasing electric vehicles can offset part of the performance risk perception, they may be more inclined to make a purchase decision. Although risk perception evaluation factors were not directly applied to electric vehicles, dimensions such as"economic rationality" and "social benefits" provide a reference for analyzing consumers' risk-benefit trade-offs in electric vehicle purchases-consumers will comprehensively evaluate the economic cost risks (such as purchase and usage costs) and social benefits (such as environmental contributions) of purchasing electric vehicles, thereby forming an overall risk perception and influencing decision-making [6] .

Overall, existing research has clearly identified perceived risk as a core factor influencing electric vehicle purchase decisions, with dimensions covering finance, performance, time, psychology, and society, among others. Moreover, the focus of consumer risk perception varies in different regional markets (such as China, India, Europe, and the United States). At the same time, factors such as consumer knowledge reserves, policy support, service systems, and social norms indirectly affect purchase decisions by regulating risk perception. However, existing research still has some deficiencies, such as insufficient comparative studies on the weights of different risk dimensions (such as battery safety risks and financial risks related to residual value), and insufficient dynamic research on how emerging technologies (such as solid-state batteries) affect risk perception. Future research can further focus on these directions to provide more precise theoretical support and practical guidance for reducing consumers' risk perception of electric vehicles and promoting market adoption.

2.2. Theoretical Model Construction

Based on the above analysis, this study proposes the following theoretical model: Perceived Risk (six dimensions)→Consumer Purchase Decision Process (five stages)→Purchase Intention.

Here, the six dimensions of perceived risk serve as independent variables, the five stages of the decision-making process act as mediators, and purchase intention functions as the dependent variable. The model assumes that perceived risk not only exerts a direct influence on purchase intention but also indirectly affects it through different stages of the decision-making process.

2.3. Research Hypotheses

Based on theoretical derivation and prior studies, this paper proposes the following research hypotheses, summarized in Table 1.

Table 1. Summary of Research Hypotheses

Risk Type	Decision Stage	Hypothesis	Specific Hypothesis Description
Functional Risk	Evaluation of Alternatives	H1a	Functional risk has a significant negative effect on consumers'evaluation of alternatives.
	Purchase Intention	H1b	Functional risk significantly reduces consumers' final purchase intention.
Financial Risk	Information Search	H2a	Financial risk negatively affects consumers'motivation to search for information.
	Purchase Intention	H2b	Financial risk has a significant negative impact on final purchase intention.
Safety Risk	Evaluation of Alternatives	H3a	Safety risk negatively influences consumers'trust during the evaluation stage.
	Post-Purchase Behavior	H3b	Safety risk affects post-purchase behavior by reducing consumer satisfaction.
Time Risk	Information Search&Evaluation	H4a	Time risk negatively affects consumers'willingness during information search and evaluation stages.
	Purchase Intention	H4b	Time risk significantly reduces purchase intention.
Social Risk	Information Search	H5a	Social risk significantly influences consumer behavior during the information search stage.
	Purchase Decision	H5b	Social risk indirectly affects purchase decisions through social identity.
Psychological Risk	Purchase Decision	H6a	Psychological risk negatively affects consumers' purchase decisions.
	Post-Purchase Behavior	H6b	Psychological risk indirectly reduces repurchase intention by lowering post-purchase satisfaction.

3. METHOD

3.1. Research Design

To empirically test the proposed theoretical model and hypotheses, this study employs a quantitative research approach. Data on consumer' perceived risk and purchase decision-making were collected via questionnaire surveys and analyzed using statistical tools. The research design consists of three steps:

Developing a scale for EV perceived risk based on the theoretical framework.

Collecting consumer sample data through surveys.

Testing the research hypotheses using reliability and validity analysis, regression analysis, and structural equation modeling (SEM).

3.2. Variable Measurement

3.2.1. Independent Variable-Perceived Risk

Perceived risk is categorized into six dimensions:functional, financial, safety, time, social, and psychological risk[4]. For example, functional risk items include 'I am concerned that the EV's driving range may not meet my daily travel needs' and 'I am worried that the battery life is too

short'[13]. Financial risk items include 'I consider the purchase cost of an EV too high' and 'I am concerned about the high cost of battery replacement'. All items are measured using a 5-point Likert scale (1=strongly disagree, 5=strongly agree).

3.2.2. Mediator Variable-Purchase Decision Process

The purchase decision process is measured across five stages: problem recognition, information search, evaluation of alternatives, purchase decision, and post-purchase behavior. Typical items include 'When considering buying a car, I first recognize the environmental issues associated with fuel vehicles' (problem recognition) and 'I actively search for information about EVs (information search)' .

3.2.3. Dependent Variable-Purchase Intention

Purchase intention is measured following [18]. Example items include 'I am willing to purchase an EV within the next three years' and 'I would prioritize an EV over a conventional vehicle'.

3.3. Sample Selection and Data Collection

To ensure representativeness, the study focused on first-and new first-tier cities (e. g. , Beijing, Shanghai, Guangzhou, Shenzhen, Hangzhou, Chengdu), where EV ownership is relatively high, charging infrastructure is well-developed, and consumer awareness is mature.

Questionnaires were distributed both online (via survey platforms and social media)and offline (at auto exhibitions, 4S dealerships, and EV experience stores). A pilot test was conducted before the formal survey to refine the items. In total, 620 questionnaires were collected, of which 582 were valid, yielding an effective response rate of 93. 9%. The sample includes a diverse range of age, gender, occupation, and income levels, ensuring representativeness.

3.4. Data Analysis Methods

Reliability and Validity Testing: Cronbach'sαwas used to assess internal consistency;exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were employed to evaluate structural validity.

Descriptive Statistics: Basic characteristics of the sample (gender, age, income, prior car ownership) were analyzed to provide context.

Correlation and Regression Analysis: Correlation analysis explored preliminary relationships among variables, followed by multiple regression to examine the direction and strength of perceived risk effects on purchase intention.

Structural Equation Modeling (SEM): AMOS or SmartPLS was used to construct SEM models, testing both direct and indirect effects of perceived risk on purchase intention through the decision-making process, thereby comprehensively evaluating the hypotheses.

4. FINDINGS AND ANALYSIS

4.1. Description of the Sample

In this study, a total of 582 valid questionnaires were collected. The descriptive statistical results of the sample's demographic characteristics are shown in Table 2. The sample structure is consistent with the typical profile of potential electric vehicle (EV) consumers, thus demonstrating representativeness.

Gender Distribution: There were 308 males (accounting for 52.9%) and 274 females (accounting for 47.1%) , indicating a basically balanced gender ratio.

Age Distribution: The 26-35 age group had the highest proportion (41.2%, 240 respondents), followed by the 36-45 age group (28.7%, 167 respondents). The combined proportion of these two groups was nearly 70%, which indicates that potential EV consumers are mainly middle-aged and young people.

Education Level: Respondents with a bachelor's degree or above accounted for 70.5% (48.3% held a bachelor's degree and 22.2% held a master's degree or above), while only 29.5% had an education level of college or below. This reflects that potential consumers generally have a high level of education and possess strong abilities in information acquisition and decision-making analysis.

Income Level: The group with a monthly income of 8,000-15,000 RMB had the highest proportion (39.4%, 229 respondents) , and the group with a monthly income of more than 15,000 RMB accounted for 21.6% (126 respondents) .The combined proportion of these two groups exceeded 60% and their income levels are compatible with the consumption capacity required for the current EV price range (mostly 100,000-300,000 RMB).

Vehicle Ownership Status: Among the samples, 56.8% (331 respondents) already owned a vehicle, mainly for secondary purchase or replacement needs. 43.2% (251 respondents) were non-vehicle owners, belonging to the group with first-time car purchase needs.

Table 2. Demographic Characteristics of the Sample (N=582)

Characteristic	Category	Frequency	Percentage(%)
Gender	Male	308	52.9
	Female	274	47.1
Age	≤25	76	13.1
	26–35	240	41.2
	36–45	167	28.7
	≥46	99	17
Education Level	College or below	172	29.5
	Bachelor	281	48.3
	Master or above	129	22.2
Income Level	≤8, 000 RMB/month	226	38.8
	8, 000–15, 000 RMB	229	39.4
	≥15, 000 RMB	126	21.6
Car Ownership	Own a car	331	56.8
	No car	251	43.2

4.2. Reliability and Validity Analysis

To verify the scientificity and validity of the research scales, reliability and validity tests were conducted on each dimension of perceived risk, the purchase decision-making process, and purchase intention. The results are presented in Table 3, and all indicators meet the requirements of academic research.

Reliability Test: Cronbach’sαcoefficient was used to assess the internal consistency of the scales. The Cronbach’sαcoefficients for the six dimensions of perceived risk were all greater than 0.78, while the Cronbac’sαcoefficients for the purchase decision-making process (0.833) and purchase intention

(0.862) also exceeded 0.8.These results indicate that all scales have good internal consistency and high data reliability.

Validity Test: Kaiser-Meyer-Olkin (KMO) test and factor analysis were used to evaluate construct validity. The KMO values of all variables were greater than 0.79, which meets the prerequisite for factor analysis. The results of Exploratory Factor Analysis (EFA) showed that the items of the six dimensions of perceived risk all had significant loadings on the preset factors, with the cumulative variance explained ranging from 63.8% to 67.9%.The cumulative variance explained for the purchase decision-making process and purchase intention was 68.2% and 69.4%, respectively, indicating a clear scale structure.The results of Confirmatory Factor Analysis (CFA) showed that the model had a good fit ($\chi^2/df=2.11$, CFI=0.921, RMSEA=0.047) , which further confirms that the construct validity of the scales meets the standard.

Table 3. Reliability and Validity Results

Variable	Cronbach'sα	KMO	Cumulative Variance Explained(%)
Functional Risk	0.812	0.846	65.7
Financial Risk	0.861	0.872	67.9
Safety Risk	0.784	0.801	64.3
Time Risk	0.796	0.817	66.1
Social Risk	0.781	0.795	63.8
Psychological Risk	0.804	0.827	64.9
Purchase Decision Process	0.833	0.852	68.2
Purchase Intention	0.862	0.874	69.4

Analysis of the Relationship between Perceived Risk and Purchase Decision

To preliminarily explore the degree of association between each dimension of perceived risk and purchase intention, a Pearson correlation analysis was conducted. The results are presented in Table 4, and the key findings are as follows:

Differences in Perceived Risk Intensity: Financial risk had the highest mean value(3.92), followed by functional risk (3.74), indicating that these two dimensions are the most strongly perceived risks by consumers.Time risk (3.56) and safety risk (3.45) were at a moderate level, while social risk (3.12) and psychological risk (3.25) had the lowest mean values, suggesting that consumers pay relatively less attention to these two types of risks.

Direction and Intensity of Correlation: All dimensions of perceived risk were significantly negatively correlated with purchase intention ($p<0.01$), but there were obvious differences in the correlation coefficients.Financial risk had the largest negative correlation coefficient with purchase intention (r=-0.523), followed by functional risk (r=-0.463), which indicates that these two types of risks have the strongest inhibitory effect on purchase intention.The negative correlation coefficients of time risk (r=-0.372) and safety risk (r=-0.327) were at a moderate level. Social risk (r=-0.184) and psychological risk (r=-0.176) had the smallest negative correlation coefficients, exerting a weak impact on purchase intention.

Table 4. Correlation Analysis between Perceived Risk and Purchase Intention

Variable	1	2	3	4	5	6	7
1.Functional Risk	1						
2.Financial Risk	0.412**	1					
3.Safety Risk	0.368**	0.427**	1				
4.Time Risk	0.391**	0.406**	0.352**	1			
5.Social Risk	0.254**	0.278**	0.266**	0.231**	1		
6.Psychological Risk	0.261**	0.247**	0.239**	0.258**	0.289**	1	
7.Purchase Intention	-0.463**	-0.523**	-0.327**	-0.372**	-0.184	-0.176	1

Note: **p<0.01

4.3. Regression Analysis

Taking purchase intention as the dependent variable and the six dimensions of perceived risk as independent variables, a multiple linear regression analysis was conducted to clarify the independent impact of each risk dimension on purchase intention.The results are presented in Table 5:

Dimensions with Significant Impacts: Functional risk(β=-0.24, p<0.01), financial risk(β=-0.29, p<0.001), and time risk(β=-0.18, p<0.05) all exerted a significant negative impact on purchase intention.Among them, financial risk had the largest impact coefficient, followed by functional risk, while time risk had the smallest impact coefficient.

Dimensions with Non-Significant Impacts: The regression coefficient of safety risk was-0.12(p<0.1). Although it showed a negative trend, it did not reach a significant level(p<0.05). The regression coefficients of social risk(β=-0.08, p>0.1) and psychological risk(β=-0.07, p>0.1) were both non-significant, indicating that these two types of risks had no statistically significant independent impact on purchase intention.

Model Fitting Effect: The adjusted R^2 of the regression model was 0.39, and the F-value was 37.46(p<0.001). This indicates that the six dimensions of perceived risk collectively explained 39% of the variation in purchase intention, and the overall fitting effect of the model was good, which is statistically significant.

Table 5. Multiple Regression Analysis Results

Independent Variable	β	t	Significance
Functional Risk	-0.24	-3.67	p<0.01
Financial Risk	-0.29	-4.52	p<0.001
Safety Risk	-0.12	-1.85	p<0.1
Time Risk	-0.18	-2.97	p<0.05
Social Risk	-0.08	-1.21	Not significant
Psychological Risk	-0.07	-1.09	Not significant
R^2=0.41, R^2=0.39, F=37.46(p<0.001)			

4.4. Structural Equation Modeling (SEM) Analysis

To further reveal the indirect influence mechanism of perceived risk on purchase intention through various stages of the purchase decision-making process, a structural equation model (SEM) was constructed using AMOS, and path testing was conducted.The results are presented in Table 6. The model showed a good overall fit (χ^2/df=2.36, CFI=0.915, TLI=0.903, RMSEA=0.052) and the path relationships are as follows:

Path Effect of Functional Risk: Functional risk had a significant negative impact on the"alternative evaluation 'stage (path coefficient=-0.32, p<0.01), while the 'alternative evaluation' stage had a significant positive impact on purchase intention (path coefficient=0.41, p<0.01). This indicates that functional risk indirectly reduces purchase intention by inhibiting consumers' evaluation of electric vehicle (EV) alternatives.

Path Effect of Financial Risk: Financial risk had a significant negative impact on the 'information search' stage (path coefficient=-0.27, p<0.01), and the 'information search' stage had a significant positive impact on purchase intention(path coefficient=0.38, p<0.01). This suggests that financial risk weakens consumers' motivation to actively search for EV-related information, thereby indirectly reducing purchase intention.

Path Effect of Time Risk: Time risk had a significant negative impact on the 'alternative evaluation' stage(path coefficient=-0.21, p<0.05) , and the 'alternative evaluation' stage had a significant positive impact on the 'purchase decision' (path coefficient=0.36, p<0.01). This shows that time risk indirectly affects the final purchase decision by reducing consumers' recognition of EV alternatives.

Path Effect of Safety Risk: The path coefficient of safety risk on 'post-purchase behavior' was-0.12 (p<0.1). Although it showed a negative trend, it did not reach a significant level, and there was no significant impact on other decision-making stages.This indicates that safety risk has a limited effect on the purchase decision-making process.

Path Effects of Social Risk and Psychological Risk: The path coefficient of social risk on the 'information search' stage was-0.09 (p>0.1), and the path coefficient of psychological risk on 'post-purchase behavior' was-0.08 (p>0.1). Both were non-significant, suggesting that these two types of risks did not have a substantial impact on the purchase decision-making process.

Table 6. SEM Path Analysis Results

Path Relationship	Path Coefficient	Significance
Functional Risk→Evaluation	-0.32	p<0.01
Evaluation→Purchase Intention	0.41	p<0.01
Financial Risk→Information Search	-0.27	p<0.01
Information Search→Purchase Intention	0.38	p<0.01
Time Risk→Evaluation	-0.21	p<0.05
Evaluation→Purchase Decision	0.36	p<0.01
Safety Risk→Post-Purchase Behavior	-0.15	p<0.1
Social Risk→Information Search	-0.09	Not significant
Psychological Risk→Post-Purchase Behavior	-0.08	Not significant

4.5. Hypothesis Testing Results

Based on the empirical analyses above, the results of hypothesis testing are summarized in Table 7.

Table 7. Summary of Hypothesis Testing Results

Hypothesis	Path Relationship	Hypothesis Description	Test Result
H1a	Functional Risk→Evaluation	Functional risk has a significant negative effect on evaluation	Supported
H1b	Functional Risk→Purchase Intention	Functional risk negatively affects purchase intention	Supported
H2a	Financial Risk→Information Search	Financial risk negatively affects information search	Supported
H2b	Financial Risk→Purchase Intention	Financial risk negatively affects purchase intention	Supported
H3a	Safety Risk→Evaluation	Safety risk negatively affects evaluation	Partially supported
H3b	Safety Risk→Post-Purchase Behavior	Safety risk negatively affects post-purchase behavior	Not supported
H4a	Time Risk→Evaluation	Time risk negatively affects evaluation	Supported
H4b	Time Risk→Purchase Intention	Time risk negatively affects purchase intention	Supported
H5a	Social Risk→Information Search	Social risk negatively affects information search	Not supported
H5b	Social Risk→Purchase Intention	Social risk negatively affects purchase intention	Not supported
H6a	Psychological Risk→Purchase Intention	Psychological risk negatively affects purchase intention	Not supported
H6b	Psychological Risk→Post-Purchase Behavior	Psychological risk negatively affects post-purchase behavior	Not supported

The results are presented in Table 7, among which 7 hypotheses are supported, and 5 hypotheses are either not supported or only partially supported.Hypotheses H1a, H1b, H2a, H2b, H4a, and H4b are fully supported.This indicates that the impacts of functional risk, financial risk, and time risk on the purchase decision-making process and purchase intention are consistent with the research expectations.Hypothesis H3a does not reach a significant level. Only the 'negative trend' of H3a is verified, but it fails to meet the significance requirement.Hypothesis H3b is not supported. Hypotheses H5a, H5b, H6a, and H6b all do not reach a significant level, and thus these hypotheses are not valid.

5. CONCLUSION

5.1. Research Conclusion

Based on the perceived risk theory, this study collected 582 valid samples through questionnaire surveys and systematically examined the impact of each dimension of perceived risk on electric vehicle (EV) consumers' purchase decisions using quantitative research methods, including reliability and validity analysis, correlation analysis, multiple linear regression analysis, and structural equation modeling (SEM) .The core conclusions are as follows:

5.1.1. Clear Core Impact Dimensions of Perceived Risk on Purchase Intention

Results of quantitative analysis show that functional risk, financial risk, and time risk are the main factors affecting consumers' EV purchase intention.Multiple linear regression analysis indicates that all three exert a significant negative impact on purchase intention: functional risk (β=-0.24, $p<0.01$), financial risk (β=-0.29, $p<0.001$), and time risk (β=-0.18, $p<0.05$). Among them, financial risk has the largest impact coefficient, followed by functional risk, and time risk has the smallest. Correlation analysis further verifies that the absolute values of the negative correlation coefficients between these three types of risks and purchase intention are all greater than 0.37: financial risk (r=-0.523), functional risk (r=-0.463), and time risk (r=-0.372). These values are significantly higher than those of other risk dimensions, confirming that these three types of risks have the strongest inhibitory effect on purchase intention.

5.1.2. Differences in the Influence Paths of Different Risk Dimensions on the Purchase Decision-Making Process

The model fit indices of the structural equation model (SEM) are as follows: χ^2/df=2.36, CFI=0.915, TLI=0.903, and RMSEA=0.052. Path analysis reveals:

Functional risk indirectly reduces purchase intention by exerting a significant negative impact on the 'alternative evaluation' stage (path coefficient=-0.32, $p<0.01$) , where the path from 'alternative evaluation' to 'purchase intention' is positively significant (path coefficient=0.41, $p<0.01$).

Financial risk indirectly weakens purchase intention by exerting a significant negative impact on the 'information search' stage(path coefficient=-0.27, $p<0.01$), where the path from 'information search' to 'purchase intention' is positively significant(path coefficient=0.38, $p<0.01$).

Time risk indirectly affects the final 'purchase decision' by exerting a significant negative impact on the 'alternative evaluation' stage (path coefficient=-0.21, $p<0.05$) , where the path from 'alternative evaluation' to 'purchase decision' is positively significant (path coefficient=0.36, $p<0.01$).

5.1.3. Insignificant Impacts of Safety, Social, and Psychological Risks

Results of quantitative tests show that safety risk only presents an insignificant negative trend in the 'alternative evaluation' stage (regression analysis:β=-0.12, $p<0.1$.path coefficient of safety risk on 'post-purchase behavior' in SEM:-0.15, $p<0.1$) and has no significant independent impact on purchase intention. For social risk (regression analysis:β=-0.08, $p>0.1$.path coefficient of social risk on 'information search' in SEM: -0.09, $p>0.1$) and psychological risk (regression analysis:β=-0.07, $p>0.1$.path coefficient of psychological risk on 'post-purchase behavior' in SEM: -0.08, $p>0.1$) , their regression coefficients and path coefficients all fail to reach the statistical significance level.Additionally, the absolute values of their correlation coefficients with purchase intention are less than 0.19 (social risk:r=-0.184. psychological risk:r=-0.176). These findings indicate that these three types of risks have limited impacts on EV purchase decisions and intention and do not constitute key restrictive factors.

5.2. Managerial and Policy Implications

5.2.1. Enterprise Level

Enhance product performance to reduce functional risk: Companies should accelerate research and development in battery range and powertrain systems to improve vehicle stability and reliability.Optimize cost structure to reduce financial risk: Scale production, streamline supply chains, and adopt innovative business models (e.g., battery leasing) to lower consumers'economic burden.Improve user experience to reduce time risk: Collaborate with infrastructure providers to expand fast-charging and battery-swapping networks, shortening charging times.

5.2.2. Government Level

Improve charging infrastructure to enhance convenience and address ‘charging anxiety’. Provide more targeted policy incentives, shifting from purchase subsidies to support in the usage stage (e.g., electricity discounts, preferential parking). Promote battery recycling and establish safety supervision systems to alleviate consumer concerns regarding safety risk.

5.2.3. Consumer Level

Base purchase decisions on rational analysis rather than trend-following, carefully weighing costs and usage value.Gather information from multiple channels to reduce risk perception caused by information asymmetry. Enhance environmental responsibility awareness, considering EVs as an important choice for sustainable mobility.

REFERENCES

[1] Bauer, R. A. Consumer behavior as risk taking. Proceedings of the 43rd Conference of the American Marketing Association, pp.389–398, 1960.

[2] Cai, A. L. A study on the relationship between consumers'perceived reliability and their purchase intention of electric vehicles:Based on a survey of consumers in the Yangtze River Delta urban agglomeration. Journal of Taizhou Polytechnic College, Vol. 21(2), pp. 46–50, 2021.

[3] Egbue, O. , &Long, S. Barriers to widespread adoption of electric vehicles:An analysis of consumer attitudes and perceptions. Energy Policy, Vol. 48, pp. 717–729, 2012.

[4] Jacoby, J. , &Kaplan, L. B. The components of perceived risk. Advances in Consumer Research, Vol.3(3), 1972.

[5] Jaiswal, D. , Kaushal, V. , Kant, R. , &Kumar Singh, P. Consumer adoption intention for electric vehicles:Insights and evidence from Indian sustainable transportation. Technological Forecasting&Social Change, Vol. 173, pp. 1–12, 2021.

[6] Li, W. , Long, R. , &Chen, H. Consumers' evaluation of national new energy vehicle policy in China:An analysis based on a four paradigm model. Energy Policy, Vol. 99, pp.33–41, 2016.

[7] Mitchell, V. W. Consumer perceived risk:Conceptualisations and models. European Journal of Marketing, Vol. 33(1/2), pp. 163–195, 1999.

[8] Mullet, E. , Duquesnoy, C. , Raiff, P. , et al. The evaluative factor of risk perception. Journal of Applied Social Psychology, Vol. 23(19), pp. 1594–1605, 1993.

[9] Ozaki, R. , &Sevastyanova, K. Going hybrid:An analysis of consumer purchase motivations. Energy Policy, Vol. 39(5), pp. 2217–2227, 2011.

[10] Rezvani, Z. , Jansson, J. , &Bodin, J. Advances in consumer electric vehicle adoption research:A review and research agenda. Transportation Research Part D, Vol. 34, pp. 122–136, 2015.

[11] Schiffman, L. G. , Kanuk, L. L. , &Xifuman. Consumer behavior(7th ed.). Tsinghua University Press, 2001.

[12] Solomon, M. R. Consumer behavior(8th ed.). China Renmin University Press, 2010.

[13] Stone, R. N. , &Grønhaug, K. Perceived risk:Further considerations for the marketing discipline. European Journal of Marketing, Vol. 27(3), pp. 39–50, 1993.

[14] Wang, S. , Wang, J. , Li, J. , Wang, J. , &Liang, L. Policy implications for promoting the adoption of electric vehicles:Do consumer’s knowledge, perceived risk and financial incentive policy matter?Transportation Research Part A, Vol. 117, pp. 58–69, 2018.

[15] Zhang, T. H. , &Cheng, Y. J. A literature review on consumer perceived risk theory. China Marketing, Vol. 4, pp. 38–42, 2008.

[16] Zhang, Y. , Yu, Y. , &Zou, B. Analyzing public awareness and acceptance of alternative fuel vehicles in China:The case of EV. Energy Policy, Vol. 39(11), pp. 7015–7024, 2011.

[17] Zhang, Z. Q. A study on the relationship between consumers'risk perception and purchase decision-making. Industrial Innovation Research, Vol. 3, pp. 56–58, 2024.

[18] Zeithaml, V. A. Consumer perceptions of price, quality, and value:A means-end model and synthesis of evidence. Journal of Marketing, Vol. 52(3), pp. 2–22, 1988.

[19] Zeithaml, V. A. , Berry, L. L. , &Parasuraman, A. (1988). Communication and control processes in the delivery of service quality. Journal of Marketing, Vol.52(2), pp. 35–48, 198