

The Factors Influencing Consumers' Purchase Intention and Behavior of New Energy Vehicles in Beijing

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Abstract: Using Beijing as the research site, this paper is dedicated to exploring the factors influencing consumers' purchase intention in the field of new energy vehicles, collecting data by distributing questionnaires, constructing structural equation models, and using policy influence, perceived usefulness, perceived ease of use, perceived value, and demographic variables as latent variables to explore their effects on purchase intention. The results show that: consumers' prediction of the development prospect of new energy vehicles and their recognition of new energy vehicles in terms of carbon reduction and environmental protection are the most important factors influencing purchase intention; policies affect purchase intention through two direct and indirect paths; women, lower income groups, and older age groups are more likely to be guided by policies and market future expectations. Based on the above findings, this paper proposes corresponding implications for government policies as well as enterprises.

1. Introduction

As far as the domestic and international situation is concerned, more and more national governments are turning "carbon neutrality" into a national strategy and putting forward the vision of a carbon-free future. Therefore, as one of the main links of energy consumption and carbon emission, the low-carbon development of the transportation industry is imperative. It is important to note that the report "Towards Carbon Neutrality" estimates that, among all emission reduction measures, the promotion and application of new energy vehicles has the greatest potential to reduce GHG emissions from road transport. Secondly, in terms of policy support: In the latest "Two Sessions" held in 2023, various delegates also emphasized the importance of the development of new energy vehicles and power battery industry chain. In summary, the realization of the vision of new energy vehicle development is particularly important in the context of carbon peaking and carbon neutrality goals.

In terms of views published by other scholars: Hooftman, N^[1] conducted an environmental life cycle assessment based on actual emission models of passenger cars and fuel refinery data, which showed that electric vehicles provide an effective solution to urban air quality problems. Shi Xiao-qing^[2] analyzed the factors that influence carbon emission reduction. Combined with Beijing's electric vehicle promotion program, it showed that electric vehicles have significant limiting carbon reduction potential in them. Caulfield, Brian^[3] and other scholars investigated that when purchasing a new vehicle, the highest rated vehicle attributes by respondents were reliability, vehicle safety, fuel cost, and cost price. Lim,

MK^[4] investigated that the two main Maarten^[5] compared eco-friendly vehicles with conventional gasoline and diesel vehicles from a life-cycle perspective. The analysis showed that electric vehicles have lower environmental impact. Yongqing Xiong, Nanxi Shu^[6] studied and analyzed the impact of negative word-of-mouth of new energy vehicles on consumers' purchase intentions and the intrinsic mechanism of intervention of new energy vehicle companies on negative word-of-mouth.

Due to the problems of large population, road congestion, and air quality in China, existing theories need to be closely integrated with the current situation of China's auto industry and new energy vehicle policies in order to more accurately capture the psychology of consumers and to keep abreast of the factors that influence consumer behavior in purchasing new energy vehicles. Therefore, this paper takes Beijing as the main scenario, extends the current model theory, integrates and expands the existing model to form a research model that is more in line with the current situation, and then discusses the factors that affect consumers' intention to purchase, the differences between groups, and the implications for government and enterprises.

2. Research Hypotheses and Theoretical Framework

In this study, we first reviewed classic theories and related research both domestically and abroad. Combining the characteristics of new energy vehicles and drawing from the condensed theoretical models formulated by scholars both nationally and internationally regarding consumer

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behavior, we selected relevant models and integrated them to form the final framework for factors influencing the intention to purchase new energy vehicles.

2.1 Review and Analysis of Classic Theories

Some of the classical theories are shown in **Table 1**.

Table 1. Classic Theories

Theory Name	Theory content
Theory of Planned Behavior	Three aspects of behavioral attitudes, subjective norms, and perceived behavioral control are the main factors influencing individuals' behavioral intentions. ^[7]
Technology Acceptance Model	The model consists of five major elements, namely, usage behavior, behavioral intention, attitude toward usage, perceived usefulness, and perceived ease of use, i.e., the more useful an individual perceives a technology to be and the more convenient it is to use, the clearer the attitude and behavioral intention to adopt the technology, and thus the more likely to adopt the technology. ^[8]
Customer Value Theory	The core of marketing is to help exchange parties perceive the value of a product or service. ^[9]
Howard—Sheath Model	The model examines consumer behavior in terms of four major factors: stimulus or input factors, extrinsic factors, intrinsic factors, and reflective or output factors. ^[10]

2.2 Research Model Construction

Based on the research study of the above theories, this paper identifies four classical models based on the theory of planned behavior, technology acceptance model, customer value theory and Howard-Sheath model, which are fused to form the final research model. Combining the above theories, the influencing factors that affect the purchase intention of new energy vehicles are divided into five parts: perceived usefulness, perceived ease of use, perceived value, policy influence and others' influence.

The perceived usefulness and perceived ease of use modules in this research model are based on the perceived usefulness and perceived ease of use in the technology acceptance model. The perceived usefulness focuses on the respondents' perception of the contribution of new energy vehicles to low carbon emission reduction and their functional performance, while the perceived ease of use focuses on the respondents' acceptance of new energy vehicles and their perception of their advantages. The perceived value module is designed according to the

customer value theory, and focuses on the respondents' perceptions of new energy vehicle models, service value, safety and price value. Based on the subjective norms in the theory of planned behavior, the external variables in the technology acceptance model, and the stimulus or input factors in the Howard-Sheath model, the policy influence module in this study's model were integrated, which mainly focus on the influence of society on the respondents' willingness to purchase new energy vehicles. Finally, demographic variables are added.

The research model of this study is shown in **Fig.1**.

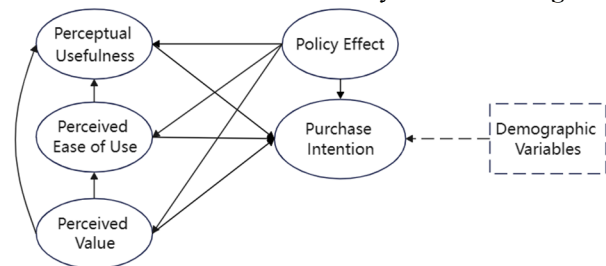


Fig.1. Research Model Construction

2.3 Research Design

2.3.1 Scale Assumptions

This paper uses empirical analysis in the research process, which is based on questionnaires. In this study, a five-point Likert scale is used to design the questionnaire, and each description can be divided into "Strongly disagree", "A little disagree", "Neutral", "A little agree" and "Strongly Agree" scoring with "1", "2", "3", "4", "5", and finally the scores of the different items were summed up and finally the values were processed using equality statistics. The values are then processed using equality statistics to obtain the respondents' attitudes toward the issues in question.

2.3.2 Variable Settings

The variable settings are described in **Table 2**.

Table 2. Variable Settings

Potential Variables	Measurement problem items	
Buying Willingness (BW)	I will buy new energy vehicles in the future	BW1
	I think the advantages of using new energy vehicles outweigh the disadvantages	BW2
	I will recommend my friends and relatives to buy new energy vehicles	BW3
	I give priority to buying new energy vehicles when purchasing cars in the future	BW4
Policy Effect (PE)	When you buy a new energy vehicle, you will consider policies that increase the probability of lottery	PE1
	When you buy a new energy vehicle, you will consider the policy of unlimited traffic for minibuses	PE2
	You will consider tax breaks when buying new energy vehicles	PE3
Perceived usefulness (PU)	How effective do you think new energy vehicles are in reducing carbon emissions	PU1
	Do you think the possibility of new energy vehicles generally replacing diesel vehicles in the future is	PU2
	What do you think is the level of public acceptance of new energy vehicles in the future	PU3
Perceived ease of use (PEU)	You see the extent of the feature of low noise of re-energy vehicles	PEU1
	You see the extent of the fast start characteristics of re-energy vehicles	PEU2
	You regard the extent of cheapness as important	PEU3
Perceived	The extent to which reports of brand safety accidents influence your choice when shopping for	PV1

value (PV)	(new energy) vehicles	
	The extent to which safety influences your choice when shopping for (new) energy vehicles	PV2
	The degree of influence of after-sales service on your choice when buying (new energy) vehicles	PV3

It's worth noting that perceived usefulness indicates consumers' prediction of the development prospect of new energy vehicles and their recognition of new energy vehicles in terms of carbon reduction and environmental protection; perceived ease of use mainly includes some advantages of new energy vehicles' performance.

3. Structural Equation Model Design and Analysis

3.1 Model Assumptions

The model assumptions are described in Table3.

Table 3. Model Assumptions

	Assumption
H1	The impact of policy on individuals positively influences their willingness to purchase new energy vehicles
H2	The impact of the policy on individuals positively affects their perceived usefulness of new energy vehicles
H3	The impact of the policy on individuals positively affects their perceived ease of use of new energy vehicles
H4	The impact of the policy on individuals positively affects their perceived value of new energy vehicles
H5	Perceived value positively influences an individual's willingness to purchase a new energy vehicle
H6	Perceived value positively affects individuals' perceived usefulness of new energy vehicles
H7	Perceived value positively affects the perceived ease of use of new energy vehicles
H8	Perceived ease of use positively influences individuals' willingness to purchase new energy vehicles
H9	Perceived ease of use positively influences perceived usefulness of new energy vehicles
H10	Perceived usefulness of new energy vehicles positively influences individuals' willingness to purchase

3.2 Questionnaire Collection

The subject of this academic paper is the entire population of Beijing. The questionnaire on the purchasing intention of new energy vehicles is divided into five parts: basic information, attitude towards new energy vehicles, attitude towards internal factors of new energy vehicles, attitude towards external influences, and purchasing intention. According to the data from the seventh national population census, Beijing is divided into three layers: the central urban area, the near suburban area, and the far suburban area. Sample size allocation was conducted based on the proportion of the resident population in each layer, and convenient sampling was conducted within each layer. During the formal survey, questionnaires were distributed through a combination of online and offline methods. A total of 482 questionnaires were distributed, of which 430 were valid, yielding a questionnaire validity

rate of 89.21%.

3.3 Confidence and Validity Analysis

In this study, the main factors were measured in the form of scales, so testing the data quality of the measurement results is an important prerequisite to ensure that the subsequent analysis is meaningful.

The results of the reliability test using the Cronbach's α showed that the reliability coefficients of all the dimensions in this study were above 0.7 and most of them were greater than 0.8, thus indicating that all the scales used in this study had good internal consistency and good reliability. The KMO test and Bartlett's sphericity test were used for validity analysis, and the KMO values of all dimensions were greater than 0.7, which had good validity. Bartlett's test for each dimension, the significance is less than 0.05, which is suitable for factor analysis.

3.4 Structural Equation Modeling

In the model testing results, CMIN / DF (cardinality freedom ratio) = 2.873, in the range of 1-3, and RMSEA (root mean square error) = 0.072, in the good range of <0.1. The other tests of IFI, TLI, and CFI all reached a good level of 0.8 or more. Therefore, the combined results of this analysis can indicate that the SEM model has good fitness.

Table 4. SEM Path Relationship Test Results

	Path Relationship	Estimate	S.E.	C.R.	P	PASS/NOT
PV	<--- PE	0.524	0.063	6.621	***	P
PE U	<--- PV	0.026	0.089	0.353	0.724	N
PE U	<--- PE	0.555	0.093	5.857	***	P
PU	<--- PE	0.239	0.087	2.573	0.01	P
PU	<--- PEU	0.485	0.085	5.504	***	P
PU	<--- PV	0.072	0.083	1.03	0.303	N
B W	<--- PV	0.096	0.1	1.533	0.125	N
B W	<--- PE	0.218	0.107	2.597	0.009	P
B W	<--- PU	0.565	0.129	5.91	***	P
B W	<--- PEU	0.026	0.109	0.311	0.755	N

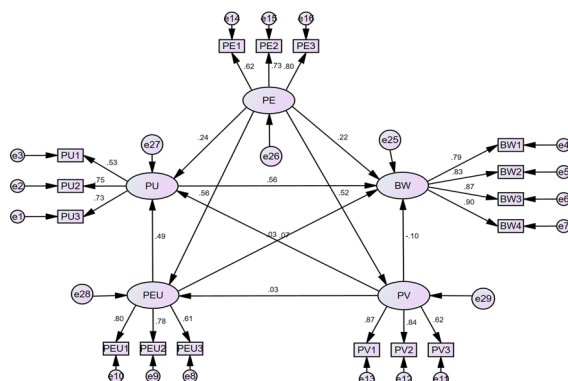


Fig.2. Structural Equation Model of This Research

According to the test results of the hypothesis model which are shown in **Table 4** and **Fig.2**, it can be found that among these paths, the paths H1, H2, H3, H10, H9, and H7 are significantly related. In terms of the positive and negative magnitudes of the standardized coefficients, the effect of perceived usefulness on purchase intention is relatively large, with a coefficient of 0.565, while perceived ease of use affects purchase intention by affecting perceived usefulness, with a coefficient of 0.485. The indirect effect of policy is: by affecting ease of use, which affects usefulness, which affects purchase intention, with an effect coefficient of $0.555 \times 0.485 \times 0.565 = 0.152$. Policy can also directly affect perceived value and purchase intention with coefficients of 0.524 and 0.218, respectively.

3.5 Analysis of Moderating Effects

Moderating effects examine how the strength of the causal relationship changes with some realistic conditions. Based on the results of the path analyzed in the model above, we attempted to analyze the moderating effects of demographic variables on the model and conducted a multi-cluster analysis using AMOS. In which gender, income, household car ownership, age, education, and job are used as moderators to analyze their effects on the above significant four paths, and the results are shown in **Table 5**.

Table 5. Moderating Effect Path Relationships

		PE --> PEU	PEU --> PU	PU --> BW	PE--> PV
Gender	Male	0.494	0.491	0.535	0.431
	Female	0.684	0.81	0.697	0.551
Income	Student	0.623	0.619	0.653	0.597
	Below 6k	0.793	0.781	0.78	0.684
	6k-10k	0.654	0.71	0.703	0.476
	10k-30k	0.666	0.719	0.686	0.366
Number of cars owned	0	0.66	0.763	0.63	0.633
	1	0.63	0.739	0.701	0.506
	2 or more	0.574	0.515	0.699	0.461
Age	18-25	0.579	0.614	0.607	0.577
	26-40	0.637	0.747	0.709	0.592
	41-65	0.668	0.762	0.726	0.485
	Student	0.636	0.65	0.714	0.617

Occupation	Private enterprise employees	0.696	0.793	0.757	0.556
	State-owned enterprise employees	0.705	0.711	0.825	0.269

The table reveals several findings: From the gender aspect, the path coefficients for females are generally higher than those for males. From the income aspect, the path coefficients are more pronounced for the group earning 6k or less, while the coefficients for students (representing those without income) are relatively small. From the number of car aspect, the coefficients generally decrease as the number of cars increases. From the age aspect, the coefficients for age are in line with the common pattern that older age corresponds to higher coefficients. From the occupation aspect, students have smaller path coefficients compared to employees.

4. Conclusion and Policy Implications

4.1 Conclusion

The respondents have an overall positive attitude towards the future development of new energy vehicles, but most people do not know much about the policies related to new energy vehicles in their daily life. Among the extrinsic factors, safety is the primary consideration, followed by after-sales service, discount and brand effect, among the intrinsic factors, respondents more value economy factors of cheap charging.

Consumers' prediction of new energy vehicles' development prospect and their recognition of new energy vehicles in terms of carbon reduction and environmental protection are the most important factors influencing consumers' purchase decision in this model. The public's optimism about the prospects of new energy vehicles is largely driven by a consideration of superior performance.

The policy directly leads to a stronger willingness to buy by creating account and convenience for new energy vehicle purchases; and the policy itself represents the will of the state, which influences people's judgment of new energy prospects (due to experience and the credibility of the state) and thus indirectly influences purchases.

Women, lower income groups, and older age groups are more likely to be guided by policy and market expectations of the future. Perhaps this is because women are generally more emotional; lower income represents graduates who have just entered the workforce and have a stronger demand for cars; and the older they are, the more experience they have accumulated and the more in-depth understanding of policy they have.

4.2 Policy Implications

For the government: it should not only monitor the implementation of the policy, but also increase the strength of the policy for the purchase of new energy vehicles. It is suggested that the government can regularly use new media and offline lectures to popularize the

combination of national strategic guidelines and environmental science knowledge through lectures, emphasizing the urgency and necessity of carbon reduction and the great role of new energy vehicles in carbon reduction. Encourage car companies to produce inclusive new energy vehicles, lowering the threshold and providing more consumers with the opportunity to choose.

For new energy vehicle enterprises: Enterprises can make use of the differences in gender and age to conduct targeted publicity, so as to better target potential customers. For example, they can advertise on the "Little Red Book" APP, which has more female users.

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