

The Factors and Theories on Consumers' Purchase Intention of New Energy Vehicles

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Abstract: In recent years, in order to alleviate the increasingly serious situation of the world's environmental problems and promote the sustainable development of the global economy, the world's major automobile enterprises have been invested in developing and promoting new energy vehicles. By sorting out and analyzing the factors that affect consumers to buy new energy vehicles, this study was based on the consumer-related theory and aims to correctly grasp the consumption behavior and law of the new energy vehicle market. By collation and analysis of the previous studies, this study found that consumer demographics, attitude, perceived behavior control, and social norms are important factors affecting the consumption behavior of new energy vehicles, and explains different effects of each variable on consumer attitudes and behaviors from multiple theoretical perspectives. This study put forward the relevant suggestions to promote the development of new energy vehicles and provided guidelines for promoting the development of sustainable industries.

Keywords: new energy vehicles, consumer behavior, sustainable development, the theory of planned behavior.

1. Introduction

With the continuous expansion of the world's population, the rapid growth of the economy, the excessive use of resources, environmental pollution, and other environmental problems were becoming increasingly severe. The coordinated development of human beings and the environment become one of the global focus issues, and sustainable economic development has become a recognized development strategy in the world. As one of the symbols of modern civilized society, the automobile has changed the way modern people travel, but the traditional fossil energy-driven car not only caused a large consumption of non-renewable energy. Moreover, the exhaust gas emitted from the car seriously pollutes the atmosphere, affects the air quality, and the greenhouse gases such as carbon dioxide released are the main sources of the greenhouse effect, which poses a threat to the living environment and social development of human beings. Existing research has found that the transportation industry is the second-largest emitter of carbon dioxide after the power industry and that carbon dioxide emissions are mainly caused by road traffic [1]. To reduce carbon dioxide emissions and alleviate the climate change caused by carbon emissions, the schedule for banning the sale of fuel vehicles has been established by the world's largest developed countries,

with Germany, the United Kingdom, France, Norway, and other countries announcing that they will stop the sale of fuel vehicles around 2030. In 2020, China has set ambitious targets for carbon peaking in 2030 and carbon neutrality in 2060. Therefore, the development of cleaner, environmentally friendly, and energy-saving automobiles has become the general trend in the development of the automobile industry and has also become an important proposition for the sustainable development of the global economy. Vehicles with unconventional energy, conventional vehicle drive systems, control systems, safety systems, and certain innovative structures and technology are all considered new energy vehicles [2]. With its advantages in energy and environmental friendliness, new energy vehicles have become the priority choice for the development of automobile industries in various countries in the world. In the context of vigorously promoting the development of the new energy automobile industry in the world, it is meaningful to conduct investigation and research on the consumption of new energy vehicles with the times.

Judging from the current promotion effect of new energy vehicles, in addition to making efforts from the level of technological upgrading and policy incentives, consumer acceptance largely determines the adoption of new energy vehicles, so research and exploration affect consumers' willingness to buy has a positive effect on the market for opening new energy vehicles [3]. Academic research on new energy vehicles has been deepening with the gradual promotion of new energy vehicles. In the Web of Science search using the consumption of new energy vehicles as the subject word, from 1999 to 2022, the number of publications in this category has climbed year after year, and the upward speed has shown a significant acceleration trend in the past 10 years. The main perspective of research on new energy vehicles focuses on three aspects: namely, policy, market, and technology. Among them, the market-level research was mainly based on the prediction of new energy vehicle sales and consumer acceptance, as well as the innovation of business models. For the factors that affect consumers' willingness to accept the purchase of new energy vehicles, different scholars focus on different points and the conclusions obtained were inconsistent. The research perspective of western scholars on the consumption of new energy vehicles mainly focused on the consumer purchase process and consumer value acquisition [4]. Consumer acceptability of new energy vehicles is influenced by demographic, situational, and psychological aspects, according to Wenbo Li, Ruyin Long, and colleagues [5]. Bradley W. Lanea, Jerome Dumortier et al. conducted quantitative studies of the factors influencing potential car buyers to consider plug-in and pure electric vehicles [6]. Carley S, Krause R M et al. studied the impact of income levels and environmental awareness on the purchase intentions of new energy vehicle consumers [7]. Through questionnaires, Yew-Ngin Sang and Hussain Ali Bekhet investigated the impact of social factors, environmental factors, product economic benefits, demographics, infrastructure readiness, and government intervention on the acceptance and willingness of Malaysians to purchase new energy vehicles [8]. Chinese researchers' research on consumer behavior focused on descriptive research on group consumers or consumer behavior. Zhao performed research on the factors that influence BYD's new energy car consumption and elaborated on consumer behavior theory. Xu divided the factors influencing the purchase decision of new energy vehicles into after-sales service factors, purchase cost factors, vehicle quality factors, energy consumption factors, and surrounding influencing factors, designed a questionnaire variable with clear classification, and analyzed the influencing factors of new energy vehicle purchase decisions [9]. Zhou and Li and Wang studied the effects of consumer subject variables and new energy vehicle guest variables on the consumption of new energy vehicles. Zhao and Liu studied consumer behavior in the whole process of consumer purchasing decisions based on consumer perceived risk. Zhang et al. conducted an in-depth study on the demographic characteristics of the new energy vehicle consumer group [10]. However, the existing literature or theoretical perspective was relatively single, or the subjective and objective attitudes and social norms of new energy vehicle consumers to new energy vehicles were not

comprehensively analyzed in the empirical research model, or the analysis of consumer perception behavior control was not involved, or the interpretation of consumer behavior theory is not broad enough. Therefore, this paper referred to the existing literature, based on the theory of consumer behavior, focusing on the attitude and behavior of the main body (consumer) of consumption influencing factors. This paper conducted a comprehensive analysis of the four major factors of consumers' comprehensive statistical characteristics, car purchase attitudes, perceived behavior control, and social norms.

2. Factors

2.1. Consumer Demographics

From the existing research, the demographic variables involved in the study of the demographic characteristics of new energy vehicle consumers were mainly gender, age, income, education level, occupation or work status, family fertility status, residence, and marital status [10]. A study of the demographic characteristics of green consumers found that green consumers are mostly young, mostly women, highly educated, come from higher-income families, and have higher professional status [11]. However, Robers' research showed that the relationship between demographic variables and green purchases was rather confusing, and many of the findings were contradictory. Therefore, given the specific green consumption behavior of new energy vehicle consumption, Zhang and Zhou and other Chinese scholars have conducted quantitative research on the variables of age, gender, income, and education level of new energy vehicle consumers through questionnaire surveys. The results of the study by Zhang et al. showed that female consumers have a higher attitude toward new energy vehicles than female consumers over male consumers [11]. Other demographic characteristics of the new energy vehicle consumer group, such as income and cultural level, do not have a significant impact on their car-buying attitudes and behaviors [11]. This conclusion coincided with the findings of Carley S, Krause R M et al. [7]. In addition, through empirical analysis, Zhou et al. concluded that consumers aged 18-30 are the main buyers of new energy vehicles.

The existing empirical research results confirmed that the consumer group of new energy vehicles has certain demographic characteristics. Based on this research conclusion, the product marketing of new energy vehicles should be combined with the characteristics of different consumers and targeted marketing plans should be formulated. At the same time, the publicity and promotion of female consumers should be strengthened to promote the transformation of their positive consumption attitudes into positive consumption intentions, which in turn evolved into consumption behaviors [11]. Prioritizing young consumers also helps reduce unnecessary costs in the promotion and sales process [4]. Therefore, product design can be appropriately inclined to young consumers, and product positioning should be slightly avant-garde.

2.2. Attitude

Attitude is one of the variables in the Theory of Planned Behavior (TPB) theory that determines the intent of behavior. The degree to which a person has positive or negative feelings about the conduct of interest is referred to as attitude toward behavior. [12]. It requires thinking about the consequences of executing the behavior. [12]. Generally, the more positive an individual's attitude toward an act is, the stronger the individual's intention to act, and vice versa [12]. Therefore, studying consumers' attitudes towards new energy vehicles can help predict consumers' purchase intentions.

Attitude is composed of affective attitude and cognitive attitude. The affective component comprises a person's feelings concerning the attitude object. The cognitive component involves a

person's belief/knowledge regarding an attitude object. According to Liu, attitude is a function of individual relative interests, relative social interests [13]. Among them, personal relative interests mainly refer to personal interests, such as personal satisfaction, personal economic interests, physical health, conservation, etc., personal satisfaction may stem from the implementation of acts beneficial to society; social relative interests refer to the degree to which an innovation is superior to existing products, including environmental improvement, sustainable development, etc. Thus, from the point of view of interest, the purchase of new energy vehicles is driven by expected material and/or spiritual interests [12]. Before taking action, the individual evaluates the expected rewards and costs, sums the material benefits (e.g., money or goods) with the social rewards (e.g., approval), subtracts the costs (e.g., loss of time, energy, money), and then correlates the difference with the required investment [13]. As these relative interests rise, consumers' attitudes toward car purchases should be more positive.

In addition, through questionnaire surveys, Zhang et al. empirically found that consumers with positive attitude evaluation and consumption intentions for new energy vehicles are mostly opinion leaders, who attach importance to verbal communication with others and are willing to try new products but not impulsive consumers [9]. Therefore, the segmentation market of new energy vehicles should combine the consumption habits and the choice of information media of such consumers, to formulate targeted marketing plans.

2.3. Perceived Behavior Control

Perceptual behavior control (PBC) is another variable in TPB theory that determines the intent of behavior. This refers to a person's perception of how difficult it is to perform an act of interest [12]. PBC fluctuates according to the situation and activity, resulting in a person's impression of behavioral control changing depending on the situation [12]. PBC is an indicator of behavioral control jointly determined by convenience conditions and self-efficacy [12]. PBC rises when individuals perceive they have more resources, confidence, and fewer obstacles expected, while the weaker the reverse [12].

Convenience conditions include factors that promote or hinder behavior, such as the compatibility of behavior with someone's lifestyle and the ability to access resources needed to implement a behavior. When controlling for other variables, if the level of barriers increases, those with behavioral intention and those become less likely to adopt green consumption behavior. It is important to note that, on the one hand, the lack of convenience represents a barrier to behavior and may limit the formation of intention; on the other hand, even if convenience is available, it may not necessarily mean that green consumption behavior is encouraged. This is because the consumer's perception of convenience conditions also affects the consumer's perceived behavior control, which in turn affects the behavioral intention. In order to clarify the definition and division of perceptual conditions, this paper introduced two variables, perceived usefulness and perceived ease of use in the Technology Acceptance Model (TAM). Perceptual usefulness refers to the degree to which an individual perceives an object useful to himself; perceptual ease of use refers to the degree of familiarity with the operation of an object that the individual perceives [14]. Under the influence of the external environment, consumers can produce perceptual usefulness and ease of use for a situational object through internal perception, memory, personality, and emotion. Through research, Cui found that optimism and innovative spirit are positively affecting consumers' perceived ease of use and perceived usefulness of new energy vehicles [15]. The study also found that perceptual ease of use has a positive and significant effect on perceptual usefulness, which is a direct factor in consumer attitudes [15].

This paper assumed that self-efficacy affects perceptual behavioral control. According to the definition from Bandura, self-efficacy refers to the belief that someone can successfully perform a

particular behavior, representing a self-awareness of someone's ability to perform the process of green consumption behavior [16]. This article referred to the experience or ability of consumers to purchase new energy vehicles, and if they are more confident with the product, the more likely they are that they think it is useful and are willing to buy it. Self-efficacy is associated with perceptual potency and knowledge variables [16]. The knowledge variable reflects the knowledge of the possible consequences of a certain behavior, if people know very little about what new energy vehicles are and how to buy new energy vehicles, there is only a low level of self-efficacy. In general, high levels of self-efficacy lead to greater perceptual behavioral control and subsequent consumption behavior. Therefore, appropriate knowledge popularization publicity should be carried out on new energy vehicles to deepen consumers' understanding of new energy vehicles, so as to enhance consumers' sense of self-efficacy and stimulate consumers' intention to buy cars.

2.4. Social Norms

Subjective norms, in combination with the above two variables, determine behavior intent, according to TPB. It is a belief regarding whether the majority of people agree or disapprove of particular conduct. It has to do with a person's ideas regarding whether or not peers and important individuals in his or her life think he or she should partake in the conduct. While TPB does not include environmental or economic elements that may impact a person's intentions to act in certain behavior. Therefore, this article introduced two factors of the focus theory of normative conduct to supplement: descriptive norms and injunctive norms [17]. Descriptive norms refer to the perceived prevalence of the focal behavior, for instance, people often show some behavior to adapt to the surrounding situation. Injunctive norms refer to perceived pressures to conform to avoid social sanctions. Since people have a clear agreement or against attitude toward certain behavior, this attitude becomes a standard to regulate people's behavior. Therefore, to obtain a good social evaluation or recognition, people show the behavior in line with norms, so when people are exposed to mandatory Injunctive norms, they think more about social evaluation and others' opinions.

The application of social norms in the field of environmental protection consumption has increased in recent years. Zhang Guangling et al. used heuristic-systematic models to explain the impact of social norms on customer behavior. They believed that when people are exposed to descriptive normative information, people only need less cognitive effort and cognitive resources to make decisions, and the processing speed is fast, so the heuristic information processing mode is more likely to be stimulated by descriptive norms; and when people are exposed to injunctive normative information since people invest more effort and need to carefully consider all relevant information, then they make decisions [18]. Therefore, the imperative specification is more about starting the system-based processing mode [18]. Empirical research conducted by Li et al. using experimental methods explained the internal psychological mechanism of social norms influencing green consumption behavior, and the results showed that both descriptive norms and injunctive norms can positively promote the willingness to buy green products by stimulating consumers' environmental self-responsibility [19]. And compared with general environmental protection information, social norms information can achieve better improvement in the purchase willingness of green products [19]. The experiments of Li et al. also led to a counterintuitive finding that when presented to consumers with imperative norms, the emphasis on altruism at this time is more conducive to the purchase of their green products [19]. Therefore, social norms combined with advertising appeal marketing strategies can effectively promote the willingness to purchase new energy vehicles.

3. Theory

3.1. The Theory of Planned Behavior

Over the past decade, most of the research in sustainable consumption pays particular attention to TPB. TPB proposed by Ajzen in 1991 was developed based on the theory of Reasoned Action (TRA) from Fishbein, which has a wide influence and recognition in the field of human behavior [20]. During the research, Ajzen found that human behavior was not voluntary, but under control, he expanded the TRA and added a new concept of “Perceived Behavior Control”, thus developing the TRA into a new behavior theory research model, TPB [19]. In the TPB, Ajzen believed that all factors that may influence behavior are indirectly influenced by behavioral intentions, and behavioral intention depends on the three conceptual independent factors: behavioral attitude, subjective norms, and perceptual behavior control [20]. They ultimately affect the actual behavior [20]. Behavior attitude is the degree to which an individual supports or does not evaluate a particular behavior [20]. The subjective norms are the social pressure perceived by the individual to take a particular behavior or not, which usually comes from an important person or group [20]. PBC refers to the individual’s perception of the extent to which performance of the behavior is easy or difficult [12]. As for the breakdown of PBC, Ajzen argued that PBC is determined by convenience and self-efficacy [12]. Given that in the right opportunity, people translate this intention into actual behavior [21].

Because the theory of planning behavior can help us understand how people change their behavior patterns, TPB is widely used in the past research on consumer consumption behavior, which reflects its applicability and science for the study of consumer behavior. Therefore, this study was based on TPB to explore the factors that affect consumers purchasing new energy vehicles.

3.2. Technology Acceptance Model

PBC is a behavioral control indicator determined by self-efficacy and convenience circumstances in the TPB theoretical framework, whereas perceived power refers to the perceived presence of elements that may help or impede the performance of behavior [20]. Each of those characteristics is affected by a person's perceived behavioral control, which is influenced by perceived power. However, TPB theory does not make a clear division of perceptual conditions, so this paper introduced the TAM to supplement this.

TAM is a theoretical model proposed by Davis when using TRA to study user acceptance of information systems. This model is widely used in the study of issues related to the key factors of user acceptance of a new product or technology and is often used to verify the influencing factors of user behavior. There are two important variables in the TAM model: perceived usefulness and perceived ease of use [14]. Davis believed that perceived usefulness and perceived ease of use affect users' attitudes towards the use of products or technologies to varying degrees, thereby affecting their willingness to use, and thus their behavior [14].

Therefore, this paper introduced perceived usefulness and perceived ease of use in the TAM model as research variables, and analyzed the convenience conditions and useful value perceived by consumers in all aspects of consumer participation in new energy vehicle consumption.

3.3. The Focus Theory of Normative Conduct

In the social sciences, social norms, or the conventional standards that regulate conduct in groups and societies, have been extensively examined. The various stages of consumer behavior are driven by many factors, such as socio-economic, political, and cultural environments. These factors have an impact on the consumption motivation, consumption ability, and consumption concept of

consumers at all levels. Although TPB considers normative variables, it ignores environmental or economic aspects that may impact a person's decision to engage in a behavior. Therefore, in order to comprehensively analyze consumer behavior, this paper introduced the focus theory of normative conduct to investigate the impact of different types of social norms on the car purchase attitude and behavior of new energy vehicle consumers.

4. Conclusion

This paper used consumer-related theories as a research basis, through the collation and analysis of the previous studies, this study found that consumer demographics, consumer attitude, perceived behavior control, and social norms are all important factors affecting the consumption behavior of new energy vehicles, but each of them has different effects on different consumers.

For enterprises related to the new energy vehicle industry, the product development and design and market promotion of new energy vehicles should be analyzed for different consumer groups. The product positioning and market investment should be tilted toward people with positive affective attitudes and cognitive attitudes. The product development stage should pay more attention to the innovation of ease of use and function and improve the ease of use and usefulness of products. In the marketing stage, it is also appropriate to carry out publicity with the nature of knowledge popularization to deepen consumers' understanding of new energy vehicles.

For the government, it should increase publicity and encouragement support for environmental protection consumption behavior, and guide consumers to establish environmental awareness. In terms of policy, on the one hand, relevant departments should improve financial documents, continue to subsidize taxes and financial subsidies for new energy vehicle enterprises, and support the upgrading of core technologies related to vehicle enterprises. On the other hand, while increasing the construction of infrastructure such as charging piles, the government should pay more attention to increasing the implementation of non-subsidy policies for new energy vehicles, so that further expand the comparative advantages of new energy vehicle consumption, and guide more consumers to buy and use new energy vehicles.

Although this paper conducted a review of the influencing elements of new energy vehicle consumption based on the theory of consumer behavior, there was no empirical research on this and no quantifiable structural model was proposed. The lack of quantitative empirical research also reflects that this study did not study the relationship between different influencing factors, nor did it compare the intensity of the impact of different influencing factors on consumer attitudes and behaviors.

In the future, targeted research on the segment market can be conducted to provide further theoretical guidance. And derive the industry development recommendations and public policy implications from the research results.

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