Research Article

Consumer Purchasing Intentions and Marketing Segmentation of Remanufactured New-Energy Auto Parts in China

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This study tests and verifies the main factors influencing consumers' intention to purchase and the marketing strategy of remanufactured new-energy automobile parts in China. The revised model of Theory of Reasoned Action is used to study the factors influencing consumers' intention to purchase. The main factors influencing consumer purchase intention of remanufactured new-energy automobile parts in China are identified through correlation analysis of factors including subjective norms, attitudes, face consciousness, brand extension, and perceived risk. Through market segmentation, consumers in China are divided into three types: passive-accepted, brand-driven, and green-consuming; the marketing strategy is developed accordingly. This study provides theory and decision-making basis for remanufactured new-energy automobile parts markets.

1. Introduction

The remanufacturing of new-energy automobile parts using various advanced technologies (for cleaning, repairing, and surface treatment) enables remanufactured products to reach or exceed the performance of the original manufactured parts. Remanufacturing also extends the parts' service life. Remanufactured automobiles are becoming a critical component of the future of the automobile industry, and remanufacturing auto parts has become a resource-saving and cost-cutting strategy for many automobile manufacturers. In 2017, the Ministry of Industry and Information Technology of China began relevant research into formulating a timetable to eliminate the production and sales of traditional-energy vehicles. In fact, many other countries have already established similar timetables for the suspension of selling fossil fuel-powered vehicles. For example, the United Kingdom plans to implement a comprehensive ban on the sale of traditional diesel and petrol vehicles by 2040, while the Netherlands and Norway will ban the sale of fossil fuel-powered vehicles by 2025. Given these clear commitments to banning traditional fuel-powered vehicles from the roads, new-energy vehicles will become the future of the

auto industry. However, remanufacturing new-energy auto parts is not yet a common practice in the global markets. Introducing remanufactured new-energy auto parts into the market is a strategic move, as this practice makes the best possible use of resources and materials and helps to achieve the sustainable development of both the economy and the environment. In this study, we take the Chinese market as an example.

Remanufacturing used products is not only an important way to protect the environment and reserve resources; it is also a promising business model in the field of waste recycling. For example, Xerox offers to recycle the toner and ink cartridges used in Xerox printers and copiers, and Kodak's recycling programs include a policy of recycling and reusing postconsumer materials. In fact, both companies have achieved economic benefits through their respective recycling programs [1]. What currently sets Chinese consumers apart is that they still misunderstand and mistrust remanufactured products. For example, they see remanufactured products as defective, refurbished, and inferior, and thus, China's market acceptance of remanufactured products is low [2]. Numerous experts and scholars have been studying these existing issues in marketing remanufactured

products, and many empirical research studies have been conducted. However, most of these studies focus on product strategies, pricing strategies, and sales strategies. He and Sun studied the influence of product knowledge on Chinese consumers' intentions to purchase remanufactured products [3, 4]. Liu et al. studied consumer awareness and purchasing behavior of remanufactured products in China [5, 6]. Liu researched the market segmentation of remanufactured products [2]. However, very few scholars have specifically studied consumer purchasing intentions as they relate to remanufactured auto parts.

A consumer's purchasing intention refers to that consumer's attitude toward a specific purchasing behavior and the consumer's degree of willingness to pay. This, essentially, is a signal of consumer purchasing behavior [7]. The reasonable behavior model is considered to be a representative theoretical model and is among the group of prediction models used to analyze consumer behavioral intent. In this paper, we use a modified Theory of Reasoned Action model [8] for guidance in conducting empirical research into the main factors that influence Chinese consumers' intentions to purchase remanufactured new-energy auto parts. The main influencing factors are then used as variables in a two-step clustering analysis, in order to segment the consumer market.

2. Theoretical Models and Research Hypotheses of Factors Influencing Consumers' Intention to Purchase

2.1. Theory of Reasoned Action (TRA) and the Revised Model

2.1.1. Theory of Reasoned Action Model. The Theory of Reasoned Action (TRA) states that subjective norms and attitudes determine behavioral intentions. Meanwhile, one's behavior is the result of specific behavioral intent [9]. Therefore, one's intent is a great tool for predicting individual behavior [10] (Figure 1). Many studies have been conducted on Chinese consumer purchasing intentions using the TRA model. These include the study of consumers' ethical purchasing intentions in a Chinese context [11] and the research into the revision of the TRA model under the influence of Chinese culture [12].

2.1.2. Theory of Reasoned Action Revised Model. Although the TRA model explains consumers' purchasing intentions very well, the model was originally established under the guidance of Western consumer behavior theories. As such, the model might not be suitable for direct use in other social and economic environments [13]. In the meantime, more variables should be taken into consideration, and modification should be made when using the TRA model to study consumers' intentions to purchase different products [2, 14].

Remanufactured auto products are made from sources including wasted and used auto products. As such, consumers' brand recognition of the original manufactured products will have a significant influence on their choice and

FIGURE 1: Model 1.

purchase of remanufactured new-energy auto parts. In other words, the demand for remanufactured new-energy auto parts is closely and directly related to the brand extension effect of the original manufactured products. At the same time, a Chinese consumer's intention to purchase is affected by what is referred to as face consciousness. "Face" refers to one's self-sense of reputation in a social context. Being the first to purchase and use a new product will allow Chinese consumers to gain "face." Remanufactured new-energy auto parts are emerging products in China. As such, the level of social recognition is relatively low. Consumers perceive that there are high risks associated with purchasing remanufactured new-energy auto parts. Therefore, the effect of brand extension, face consciousness, and perceived risk is added to the revised TRA model (Figure 2).

2.2. Hypothesis

2.2.1. Subjective Norms and Chinese Consumer Intentions to Purchase Remanufactured New-Energy Auto Parts. A subject norm is the influence of the surrounding environment on individual behavior. A subject norm can also be described as the external pressure on individuals to perform (or not to perform) in a certain way. Generally speaking, when an individual has a positive attitude and the people around that person agree with his or her behavior, the individual will be more inclined and feel more greatly encouraged to take action. Conversely, negative attitudes and disagreements will lead to a weaker intention and inclination to act. Pollution and a scarcity of natural resources have given rise to the emergence of a special group of consumers who only purchase environment-friendly products. These consumers tend to influence the social norm through their green consumption behavior. Remanufactured products make use of used products and waste materials, which is in line with the government's stated policies regarding environmental protection and sustainable development.

H1: subjective norms are positively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts.

2.2.2. Attitudes and Chinese Consumer Intentions to Purchase Remanufactured New-Energy Auto Parts. Attitude refers to the comprehensive evaluation of an individual's positive or negative cognition of a certain behavior. Chinese consumer attitudes toward green products are strongly related to their intention to purchase such products [15]. Consumers will first consider cost when they compare original manufactured and remanufactured new-energy

FIGURE 2: Model 2.

auto parts [16]. Moreover, only when consumers believe in the quality and functionality of remanufactured new-energy auto parts will they make the decision to purchase such parts [17].

H2: attitude is positively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts.

2.2.3. Face Consciousness and Chinese Consumer Intentions to Purchase Remanufactured New-Energy Auto Parts. The term “face consciousness” refers to an individual’s purchasing behavior under the influence of that person’s self-sense of reputation in a social context. Chinese people tend to place great value on four main relationship orientations, including respect for authorities, interdependency, group orientation, and “face.” Under the influence of traditional Chinese culture, consumer relationships in marketing are categorized into face consciousness and group orientation [12]. Newly introduced products represent new technologies and new market trends. Also, users of new products will earn “face,” which may lead to the decision to purchase newly introduced products.

H3: face consciousness is positively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts.

2.2.4. Brand Extension and Chinese Consumer Intentions to Purchase Remanufactured New-Energy Auto Parts. Using the brand extension strategy when introducing new products or services will help expand market shares, lower marketing costs, and avoid failure in the promotion of those new products or services. In the 1990s, 81% of new products in the United States were successfully introduced into new markets through brand extension strategies [18].

Brand extension has a significant impact on Chinese consumer intentions to purchase remanufactured new-energy

auto parts. First of all, when facing a newly introduced product, a consumer will have to refer to the product’s brand, merely due to the lack of any information regarding the new product, as well as information asymmetry [19]. At the current stage, remanufactured new-energy auto parts have gained neither the trust nor the recognition of Chinese consumers. Therefore, market acceptance of these new-energy auto parts is still relatively low. However, if remanufactured new-energy auto parts are introduced with brand names with which consumers are familiar, the products will become more acceptable and less concerning to consumers. Moreover, remanufactured new-energy auto parts have equivalent or higher quality than the original manufactured products. When consumers are provided with products that have the same or higher quality and brand but lower prices, they tend to make repeat purchases because of their familiarity with the brand [20].

H4: brand extension is positively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts.

2.2.5. Perceived Risk and Chinese Consumer Intentions to Purchase Remanufactured New-Energy Auto Parts. The concept of perceived risk was first put forward by Bauer, who stated that consumer-perceived risk affects not only consumers’ purchasing activity but also their postpurchase processes. This is due to the asymmetry of information and for other reasons [21]. Subsequent research studies prove that perceived risk is negatively related to consumer purchasing intentions [22].

The perception of risk exists throughout the activities that occur both before and after the purchase of remanufactured new-energy auto parts. On the one hand, consumers’ perception of risk before purchasing remanufactured new-energy auto parts is very high, due to the current lack of product recognition and market acceptance. On the other hand, certain differences do indeed exist between remanufactured new-energy auto parts and original manufactured auto parts [23]. Consumers perceive risk and have concerns about remanufactured new-energy auto parts due to an insufficient supply of information [24]. Consumers believe that remanufactured products are refurbished products, inferior products, defective products, products with quality defects, etc., and the market acceptance is not high [25–27].

H5: perceived risk is negatively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts.

3. Design of Consumer Market Research

3.1. Research Methods. Information and data on the subject norm, attitudes, face consciousness, brand extension, and perceived risk were collected through questionnaires. Analysis of the correlation between variables and comparisons between different theoretical models were conducted using SPSS 20.0. We used a two-step clustering algorithm by AMOS 17.0, in order to segment the target market.

3.2. Sample Selection. The questionnaire was distributed and the answers were collected using online software in this research. Of the 394 distributed questionnaires, all 394 were recovered, and 358 were deemed to be valid and effective. Among the respondents, 52.65% were male and 47.35% were female; 12.36% have obtained a three-year college degree and below, while 56.83% have obtained a Bachelor's degree, and 30.81% have obtained a Master's degree or above.

3.3. Variables Measurement. This design of this questionnaire on consumer intentions to purchase is based on the characteristics of remanufactured new-energy auto parts, combined with established theories and relevant documents. A Likert 5-point scale is used to express the degree to which respondents agree and disagree with statements on the questionnaire.

The measurement of attitude is mainly drawn from Bagozzi's research. The statements for this category include "I feel that purchasing remanufactured new-energy auto parts is a correct action" and two other items [28]. The measurement of brand extension is mainly drawn from Coulter's research. Here, the statements in the questionnaire include "I would love to purchase remanufactured new-energy auto parts that have been introduced by the brands I am familiar with" and two other items [29]. The measurement of perceived risk is mainly drawn from Dodds' research. The statements to which the respondents were asked to rank include "The quality and performance of remanufactured new-energy auto parts are more likely to cause issues, thus causing economic losses," and three other items [30]. The measurements of subjective norm and purchase intention are mainly drawn from Lee's research. The statements for subjective norm measurement include "In my opinion, my family members want me to purchase remanufactured new-energy auto parts" and two other items. The statements used for purchase intention measurement include "In my next purchase, I will choose remanufactured new-energy auto parts" and another item [31]. Finally, for face consciousness measurement, the statements used include "I will get applause from others for purchasing remanufactured new-energy auto parts" and three other items.

4. Consumer Market Survey Data Testimony and Analysis

4.1. Reliability Test. Cronbach's α is used to measure the reliability level. This test indicates the overall consistency of the measurements within each variable in the questionnaire. Six factors are formed based on the results, including subjective norm, attitude, face consciousness, brand extension, perceived risk, and purchasing intention. The accumulated variance contribution rate is 71.90%, the KMO value is 0.892, and Cronbach's α value of each factor exceeds 0.7 (subjective norm 0.909, attitude 0.775, face consciousness 0.910, brand extension 0.867, perceived risk 0.904, and purchase intention 0.927). These results show that all measurements of all the relevant variables are reliable.

4.2. Validity Test. A validity test was also conducted, because the scale items passing the reliability test may be invalid. In this research, a confirmatory factor analysis of all relevant variables is conducted through AMOS 17. The results of this analysis show that, compared to other models, the five-factor model has the best fit in this study and also indicates better discriminant validity ($\chi^2(55) = 65.19$, $p < 0.01$; RMSEA = 0.045, AGFI = 0.907 > 0.80, CFI = 0.945 > 0.90, and N-N FI = 0.938 > 0.90).

In terms of content validity, the questions used in this research were designed based on established theories, advice from experts and professionals, and research studies on related fields, in combination with the characteristics of remanufactured new-energy auto parts. Therefore, the scale items have high content validity.

Based on the results, the scale items used in this study have high reliability and validity.

5. Consumer Intentions to Purchase and Marketing Segmentation of Remanufactured New-Energy Auto Parts

5.1. Factors Influencing Consumer Intentions to Purchase Remanufactured New-Energy Auto Parts

5.1.1. Correlation Analysis. The following results were obtained via SPSS 20.0 correlation analysis: subjective norm is positively correlated with purchase intention ($r = 0.421^{**}$, $p < 0.01$). Attitude is positively correlated with purchase intention ($r = 0.439^{**}$, $p < 0.01$). Face consciousness is positively correlated with purchase intention ($r = 0.324^{**}$, $p < 0.01$). Brand extension is positively correlated with purchase intention ($r = 0.408^{**}$, $p < 0.01$). Perceived risk is negatively correlated with purchase intention ($r = -0.189^{**}$, $p < 0.01$).

5.1.2. Theoretical Model Structural Equation Analysis. Structural equations are used to compare the fit of the two theoretical models and the collected data. The results of the AMOS analysis show that both models are a good fit:

- (i) Model 1: $\chi^2/df = 5.197$, RMSEA = 0.095, GFI = 0.952, and CFI = 0.902
- (ii) Model 2: $\chi^2/df = 4.564$, RMSEA = 0.091, GFI = 0.955, and CFI = 0.902

When comparing the two models, it can be seen that Model 1 has higher χ^2/df value and higher RMSEA value, which indicates that Model 2 fits better. In order to clarify the correlation between the variables, path diagrams of both models are created (Figures 3 and 4).

Figure 3 shows that the path coefficient of the subjective norm is 0.32, while the path coefficient of attitude is 0.37. Figure 4 shows that the path coefficients are as follows: subjective norm is 0.23; attitude is 0.18; face consciousness is 0.08; brand extension is 0.37; and perceived risk is -0.07.

The Theory of Reasoned Action Revised model (Model 2) fits better than the Reasoned Action model (Model 1). The factors proposed in the revised model (including subjective norm, behavioral attitudes, face consciousness, brand

FIGURE 3: Path diagram of Model 1. ** indicates the significance level at 1%.

extension, and perceived risk) all have a significant influence on Chinese consumer intentions to purchase remanufactured new-energy auto parts (Table 1).

5.2. Marketing Segmentation of Remanufactured New-Energy Auto Parts. First of all, a cluster analysis is conducted, and the influencing factors, including subjective norm, attitudes, face consciousness, brand extension, and perceived risk, are segmented into discrete groups. Secondly, the two-step cluster analysis is used to segment the consumer markets. The best classification is also determined by the value change of distance between the BIC value and the AIC value. Finally, market segmentation is determined, and the results of the cluster analysis are verified. In this research, consumers are segmented into three types, with silhouette value >0.4 , which suggests a good quality of clustering analysis [32].

5.2.1. Passive-Accepted. This type of consumer has a subjectively low purchasing intention and is highly influenced by social norms. This type of consumer shows relatively high scores in the areas of subjective norm and face consciousness, but they have low scores in other factors. One reason for these findings is that these consumers either do not care about or have not recognized the environmental value of remanufactured new-energy auto parts. They are also extremely sensitive to the perceived risks, and thus, they have a negative purchasing attitude. The second reason is that the consumers in this group are older, and it will probably take longer for them to accept new products. Another reason is that the consumers in this group pay special attention to their reputation and social status; they are greatly influenced by social norms and face consciousness. In this study, more than half of the consumers in this group work for private businesses.

5.2.2. Brand-Driven. This type of consumer attaches great importance to the product brand. As shown in Table 2, more than 90% of the consumers in this group are college students. The high score in subjective norm suggests that college students are more concerned with others' opinions and social norms. College students have a very positive attitude with regard to purchasing remanufactured new-energy auto parts, so the attitude score of this group is relatively high. However, no sufficient evidence exists to show that they consider such consumption behavior to be honorable. This group has a relatively high score in perceived risk and shows significant care for the quality and performance of remanufactured new-energy auto parts.

FIGURE 4: Path diagram of Model 2. ** indicates the significance level at 1%.

5.2.3. Green-Consuming. This group of consumers has a decent understanding of the economic, social, and environmental benefits of remanufactured new-energy auto parts. The results of the analysis of consumer perceived risk, subjective norm, and attitude all show positive numbers. Conversely, the results for brand extension and face consciousness both present negative numbers. Although green consumers know about the risks of purchasing remanufactured new-energy auto parts, their general perception is that there are in reality few risks, and they are subjectively willing to purchase the products for the greater eco-environmental value. In all, 47% of the consumers in this group work either for the government or in state-owned enterprises, and they are generally better off. The purchase potential of this group is huge, given their high level of environmental consciousness. Therefore, this group of consumers should be one of the target markets for the remanufactured new-energy auto parts industry.

6. Contribution and Implications

6.1. Contribution. The research conclusions of this paper are shown in Table 3.

6.2. Implications

- (1) Establishing a social credit system will create a friendly market environment for remanufactured new-energy auto parts in China, even though the "Remanufactured Units Quality and Technical Control Regulations (TRAIL)" stipulate that remanufactured products must meet the same quality and performance standards as original manufactured products. In spite of this, many consumers still consider remanufactured products to be inferior to the original manufactured versions. This is because consumers do not trust the manufacturers enough, due to the inefficiency of the social credit system. Therefore, the establishment and implementation of

TABLE 1: Research hypothesis conclusion.

Number	Hypothesis	Conclusion
1	Subjective norms are positively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts.	Yes
2	Attitude is positively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts.	Yes
3	Face consciousness is positively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts.	Yes
4	Brand extension is positively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts.	Yes
5	Perceived risk is negatively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts.	Yes

TABLE 2: Consumer market segmentation of remanufactured new-energy auto parts.

Type	Passive-accepted					Brand-driven					Green-consuming				
	SN	A	FC	BE	PR	SN	A	FC	BE	PR	SN	A	FC	BE	PR
Factor score	1.23	-1.82	0.86	-0.53	-0.7	1.02	0.73	-0.13	1.42	-0.35	0.78	0.21	-0.47	-0.09	0.46
Avg.															
%			162 people					97 people					99 people		
			-45.20%					-27%					-27.80%		
Avg. age			40					20					25		
Stats. Avg. annual income (¥)			150,000					20,000					80,000		
Occup.			Company employees or managers					Students					Government officers or SOE employees		
Dist.			94 people (58.02%)					88 people (90.72%)					47 people (47.47%)		

TABLE 3: Analysis conclusion.

Number	Conclusion	Explanation
1	The theory of reasoned action model shows a certain degree of cross-cultural adaptability.	However, the model needs to be modified when applied to different social and economic environments and to different research objects [33]. In this study, Model 1 proves the validity of the TRA model, while Model 2 is better suited to explaining consumer intentions to purchase remanufactured new-energy auto parts in China.
2	The factors of subjective norm, attitude, face consciousness, and brand extension are positively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts.	Conversely, perceived risk is negatively associated with Chinese consumer intentions to purchase remanufactured new-energy auto parts. The one special exception is that of the green consumers, with whom the perceived risk is positively associated with purchasing intentions. This is due to the fact that this group of consumers is highly aware of the environmental benefits of remanufactured new-energy auto parts and is therefore willing to bear the perceived risks [34]. Remanufactured new-energy auto parts are emerging products in the Chinese market, and they have not yet been fully accepted and recognized by Chinese consumers. In the current market situation, leveraging the recognition and trust of established brands will help the providers of remanufactured products to gain consumer trust and thus increase the level of consumers' intentions to purchase remanufactured new-energy auto parts [19].
3	Brand extension is the most important factor that influences Chinese consumer intentions to purchase remanufactured new-energy auto parts. This factor has the highest coefficient (0.37) with purchase intention in the path diagram.	Different marketing strategies should be provided and based upon different consumer needs and characteristics. Among all types of consumers, the passive-accepting consumer group is the largest. This finding indicates low consumer acceptance of remanufactured products at the current stage. On the other hand, green consumers should be the target market for suppliers of remanufactured new-energy auto parts [35]. A same conclusion is also obtained in the authors' another research on consumers' purchase intention on remanufactured products [33].
4	According to the analysis detailed above, consumers of remanufactured new-energy auto parts should be segmented into three types, namely, passive-accepting, brand-driven, and green-consuming.	

a social credit system should be speeded up, so that enterprises can operate with increasing integrity. At that stage, consumers will have proper guidance and adequate trust and belief in the manufacturers when purchasing remanufactured products.

- (2) Increasing publicity will enhance market acceptance of remanufactured new-energy auto parts. On the one hand, actively carrying out a public service will increase the awareness of consumer social responsibility. Advocating green consumption will also help remanufactured new-energy auto parts to attract more attention. On the other hand, increasing the level of the promotion of remanufactured products will also encourage price-sensitive consumers to purchase remanufactured products.
- (3) Relevant parties must ensure that the quality of remanufactured new-energy auto parts is as good as or better than the original parts. When that happens, the level of consumer perceived risk reduces. Not only should manufacturers provide good quality remanufactured auto parts at reasonable prices, but they should also provide after-sale services, such as maintenance and repairs. At the same time, the government should strengthen the supervision and control of the quality of remanufactured new-energy auto parts and remove any unqualified products from the remanufactured products market.
- (4) Leveraging the trust and recognition of established brands to promote remanufactured new-energy auto parts is possibly the best way to market remanufactured new-energy auto parts in the Chinese market. Evidence clearly shows that brand extension is a critical factor that influences consumer purchasing intentions. Therefore, new-energy auto parts that have been remanufactured by the original parts manufacturer would make those parts more acceptable to Chinese consumers. Therefore, it is necessary to encourage more original product manufacturers to participate in the recycling, reusing, and remanufacturing of waste products. This could be done by enforcing extended producer responsibility.
- (5) Different marketing strategies should be used for different market segments. Consumer needs vary and therefore, market strategies should diversify accordingly. Meanwhile, a strategy should be adopted that concentrates on green consumers, thus gradually developing consumer loyalty to remanufactured new-energy auto parts. Such a strategy would drive passive-accepting and brand-driven consumers to accept remanufactured new-energy auto parts.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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