

# Research on Consumer Loyalty of Electric Vehicles: A Case Study of Tesla Users

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## ABSTRACT

This study focuses on Tesla owners as research subjects, collecting data through questionnaires and a small number of interviews to explore the key factors influencing their user loyalty and their specific manifestations. The research centers on core dimensions such as product performance, brand image, charging experience, and service quality, analyzing how these factors collectively impact users' repurchase intentions, recommendation intentions, and brand preferences. The study uses four dimensions (product performance, brand image, charging experience, service quality) to analyze their combined impact on user loyalty indicators: repurchase intent, recommendations, and brand preference. Data from questionnaires and interviews were categorized by dimension, then analyzed statistically to identify correlations and clarify how these factors interact to shape Tesla owners' loyalty. The results show that product performance, the convenience of the supercharging network, and after-sales service experiences are important drivers for enhancing user loyalty, with significant differences existing among different user groups. The study suggests that Tesla further consolidate user stickiness through continuous innovation, optimizing service networks, and strengthening brand community building, while pointing out that other electric vehicle companies can draw lessons from these experiences. The study also reveals the limitations of existing methods in terms of data coverage and depth, providing directions for future research.

## KEYWORDS

Customer loyalty; Electric Vehicles; Loyalty to electric vehicles; Brand building; User group differences; Influencing factors

## 1. INTRODUCTION

Driven by carbon neutrality and energy transition, the electric vehicle industry has experienced rapid growth. In 2022, global electric vehicle sales exceeded 10 million units, with the penetration rate increasing by more than six times compared to 2018. China accounted for over 60% of the market. Policy (subsidies, infrastructure investment) and technology (solid-state batteries, high-voltage platforms) have jointly driven the industry, reducing consumption barriers and breaking through the range bottleneck. The industry has given rise to an intelligent ecosystem, and competition has shifted to services (such as Tesla's Supercharger coverage of 98% of urban core areas). J.D. Power shows that in 2023, charging convenience accounts for 27% of the weight, surpassing after-sales service. McKinsey points out that the brand-switching cost for electric vehicle users has decreased by 42%, and after a penetration rate of over 20%, the operation of existing users becomes a key aspect of the

industry. This study constructs a framework through theoretical dissection and data verification to analyze the driving factors of Tesla's user loyalty: product technology focuses on NCA batteries, Autopilot, and OTA, brand value covers technological image, environmental responsibility, and the IP effect of Musk; service experience integrates infrastructure and touchpoint indicators through the service quality index, ultimately quantifying the weight of the elements, establishing a three-dimensional loyalty model of product - brand - service, providing tools for intelligent car manufacturers' customer management. For Tesla, this study's relevant conclusions can be used to optimize the software subscription model, clarify the direction of infrastructure investment, and thereby build a user full life cycle management system; for the industry, this study can provide transferable practical references for car manufacturers such as BYD, helping them improve user operation and service capabilities; for the industry ecosystem, this study finds that cross-enterprise user data sharing can become an important support for optimizing the allocation of industry resources, promoting industry coordinated development.

## **2. LITERATURE REVIEW**

### **2.1. Core Concept of Consumer Loyalty**

Consumer loyalty is manifested as a long-term preference and commitment to a brand or product, including repeat purchases, active recommendations, and resistance to competing substitutes. It encompasses three dimensions: behavioral loyalty, which quantifies actual choices through factors such as purchase frequency; attitudinal loyalty, which reflects emotional attachment and identification; and cognitive loyalty, which is demonstrated by the brand's ability to activate priority. ISO defines it as a continuous relationship intention based on positive experiences, with characteristics including path dependence, sensitivity to conversion costs, and acceptance of brand premium [1]. In the electric vehicle sector, due to the complex technology and long usage period, loyalty is closely related to product iterations and the charging ecosystem.

### **2.2. Overview of Main Factors Affecting Loyalty**

Product quality forms the material basis for user loyalty, and the performance of core components in technology-intensive industries directly affects the stability of the experience. For example, the energy density of the battery, motor efficiency, and thermal management reliability of electric vehicles determine the range and durability. Tesla has improved energy efficiency by integrating 21700 battery modules with BMS, becoming the core factor for users to continue choosing [2]. The service system is the guarantee for maintaining customer relationships. In the automotive field, the response speed of after-sales services, the density of service outlets, and the professional level of personnel constitute the service triangle. Tesla uses an online diagnosis + mobile service model, and through OTA remote solutions, it resolves over 60% of software faults, reducing the problem-solving cycle to one-third of that of traditional 4S stores; V3 super charging (with a peak power of 250kW) reduces 40% of charging costs and enhances travel convenience [3]. Brand value determines the psychological affiliation of consumers. Tesla forms differentiated cognition by leveraging its image as a technological pioneer (product design, founder's IP, space exploration narrative), and the Model series' minimalist interior design and the iterative improvement of Autopilot strengthen intelligent positioning. It further enhances emotional connection through Tesla Owners Club and other communities, even in the face of price competition from competitors, maintaining a high preference rate [4].

Prices need to balance value and competition. The market elasticity of electric vehicles is significant. Tesla adopts a direct sales model + cost-oriented pricing, vertically integrating the supply chain to reduce the manufacturing cost of Model 3 by 30%, while balancing high-end positioning and market penetration; however, in 2023, although multiple official price cuts in China increased market share,

they led to a 12% decrease in the willingness of some old users to replace their vehicles [5]. User satisfaction is the result of the synergy of various factors. Research by Guo Peng et al. shows that the comprehensive satisfaction of Tesla users is 846 points (out of 1000), with a satisfaction rate of 91% for technological configuration and only 78 points for after-sales response; a dynamic monitoring system based on NPS and CES is needed, and in the era of software-defined vehicles, the frequency and practicality of FOTA upgrades have become new measurement dimensions [6].

### **2.3. Special Points of the Study on Electric Vehicle Loyalty**

The core influence of range on the loyalty of electric vehicle consumers: Range is the key technical threshold for users' decision-making, although the range of mainstream models generally exceeds 500 kilometers, the actual mileage degradation under actual working conditions and the decline in battery activity in winter still intensify the concern about range. Research shows that when the actual range is 15% lower than the expected range, loyalty significantly declines. Tesla has optimized battery thermal management and improved energy density, controlling the deviation between the CLTC working condition value and actual driving performance within 8%, and the range evaluation not only includes absolute values but also involves the intelligence level of the energy management system, such as its route planning algorithm can dynamically adjust energy consumption prediction based on real-time traffic conditions and altitude, directly affecting users' perception of the reliability of range.

The shaping effect of charging network layout on loyalty: The topological structure of the charging network is the unique loyalty influencing mechanism of electric vehicles, and the coverage density and service efficiency of charging piles constitute the competitiveness of new infrastructure [8]; Tesla's Supercharger stations have a power output stability of 98%, achieving a charging efficiency of 'recharging for 5 minutes and getting 120 kilometers of range' with a peak power of 150kW, and the charging experience also includes seamless payment connection and intelligent parking space monitoring, and the data shows that for every 10% increase in the density of the Supercharger network, the user's recommendation willingness increases by 6.2 percentage points; in addition, charging convenience needs to be differentiated by scenarios, users with home charging piles generally have a loyalty level 23% higher than the average, Tesla effectively improves the penetration rate of home charging scenarios by offering wall-mounted charging piles and cooperating with power companies [12].

The reconfiguration of the formation path of loyalty by intelligent technologies: The innovation of the electronic electrical architecture of electric vehicles promotes vehicle OTA upgrades, forming a unique value-added model. Tesla has increased the iteration frequency of Autopilot functions to 1.2 times per quarter through annual large-scale software updates, extending the product life cycle that users perceive [7]; the data of the in-vehicle infotainment system shows that users who use voice interaction more than 5 times per week have a brand recognition rate 18% higher than the average; more importantly, the user profile formed by intelligent driving data helps with precise loyalty management, such as the repeat purchase tendency of users in the top 20% of AP usage rate is three times the average, and Tesla effectively collects driving data through the vehicle camera to train algorithms, achieving a closed loop between technological innovation and user experience [10].

The special value of product ecosystem synergy [13]: The deep coupling of power systems and intelligent hardware builds a new value assessment system, users' attention to the reliability of the three-electricity system is 37% higher than that of traditional engines, Tesla has formed a technical barrier through its battery management patent portfolio, and its commitment of 'battery annual degradation rate  $\leq 2\%$ ' has become the user's long-term value cognition contract [9]; Service model innovation also affects loyalty, the proportion of mobile service vehicles providing on-site maintenance increases by 1%, the user satisfaction index increases by 0.8 points, forming a difference from the traditional 4S store system; At the same time, the expansion of ecosystem extension

promotes the evolution of product loyalty to lifestyle identification, reshaping the boundary of the connotation of user loyalty [11].

### **3. METHOD**

#### **3.1. Research Subjects**

This study focuses on Tesla's private car owners as the main research subjects, and they must meet the condition of "owning any model (Model S/X/3/Y, etc.) and having used the vehicle for more than six months". This group has the characteristics of high income, high education level, and younger age. The proportion of the 35-45 age group is 58%, and those with a bachelor's degree or above account for 73%. The median annual household income is 500,000-1,000,000 yuan, and 82% of the users consider technical elements such as intelligent driving and OTA upgrades as the top priority when purchasing a car. Sample collection adopts multi-source composite sampling: online, based on the Questionnaire Star platform, a structured scale is constructed, and stratified sampling covers 28 provincial administrative regions across the country. A total of 1,276 valid questionnaires were collected. The questionnaire sources include core consumption cities such as Beijing and Shanghai, and through IP verification and logical trap questions for quality control. At the car owner community level, in three active car owner groups in the Yangtze River Delta, snowball sampling was used to conduct semi-structured interviews with 126 typical users. The average vehicle age of the users was 2.3 years, and 81% had participated in brand offline activities. At the same time, 4,367 anonymized repair and maintenance records from Tesla authorized service centers from 2019 to 2022 were integrated and cross-verified with the questionnaire data. The entire research process adheres to the 'Personal Information Protection Law', obtains informed consent, and anonymizes privacy information. Through multi-source data triangulation, selection bias is controlled to improve the external validity of the conclusion.

#### **3.2. Research Methods**

This study employed a mixed research method combining quantitative and qualitative approaches: The quantitative part was centered on standardized questionnaires, integrating 28 indicators across three dimensions: product satisfaction, brand identification, and service experience. The user loyalty was observed through three latent variables: re-purchase intention, recommendation intention, and price tolerance. Using the Likert five-point scale, after two rounds of pre-tests (cognitive interviews to optimize questions, expert review to verify content validity), the Cronbach's alpha coefficient reached 0.83, and the combined reliability CR value was all above 0.7, meeting the measurement standards. Based on the stratified sampling of Tesla owners' communities, 612 valid questionnaires were collected online. Among them, 68.3% were male and 74.6% were from the 25-40 age group, which matched the user profile. Descriptive statistics, exploratory factor analysis, and structural equation modeling were conducted using SPSS 26.0 and AMOS 24.0. The reverse scoring questions and Harman single-factor test were used to control for common method bias. At the qualitative level, to address the quantitative contradictions, 15 users covering entry-level and high-end models were selected through purposive sampling for 200-240-minute in-depth interviews. The focus was on brand community participation, software subscription perception, etc. The NVivo 12 three-level coding was used to construct a theoretical correlation model, and the impact of OTA updates' digital companionship on user stickiness was explored. This feedback was used to correct the brand image indicators in the quantitative model, achieving methodological iteration [2].

#### **3.3. Measurement Tools**

This study developed a multi-dimensional measurement tool to assess Tesla users' loyalty and its influencing factors: The loyalty assessment takes into account both behavior and attitude. At the

behavioral level, the "proportion of repeat purchases/replacements within three years" measures the repeat purchase rate, and "changes in value-added service expenditures" measures the growth rate of consumption amount. At the attitude level, the improved 11-level NPS scale is used to evaluate the willingness to recommend, and the semantic differential method is used to measure the emotional attachment index. The influencing factors scale contains 5 main dimensions and 18 sub-indicators. The product performance dimension combines actual driving data and subjective ratings to measure the rate of reaching the battery life standard, the frequency of Autopilot usage, etc. The service quality dimension assesses from the three dimensions of response timeliness, fault repair rate, and facilities-personnel-process of the service center. The brand image dimension quantifies the interactive behaviors of the owner's club participation, etc. The charging experience dimension uses GIS to calculate the density of ultra-fast charging within 5 kilometers, compares the actual charging time with the expected efficiency rating, and sets up a 7-level scale for users to compare with competing products to construct a competitive advantage index. The Cronbach's  $\alpha$  coefficient of all scales is  $> 0.87$ , and the factor loadings are all  $> 0.7$ , meeting the reliability and validity standards. In data processing, quantitative analysis uses the structural equation model (SEM) with maximum likelihood estimation to analyze the variable paths, and qualitative analysis uses NVivo12 to conduct word frequency and sentiment analysis of the interview texts. The innovation of the tool lies in combining the characteristics of electric vehicles, adding special indicators such as 'technology pioneer recognition' and 'index for alleviating range anxiety', and retaining valid samples of 832 after eliminating invalid questionnaires.

### **3.4. Data Analysis Methods**

After the data collection is completed, the research adopts a multi-stage analysis approach to systematically identify the key factors influencing Tesla users' loyalty. Descriptive statistics serve as the basic analytical tool, first characterizing the sample features, including the average age of respondents, gender ratio, vehicle model distribution, and average annual mileage, among other core indicators. By calculating central tendency indicators (such as the average score of user satisfaction) and dispersion parameters (such as the standard deviation of the willingness to recommend), one can initially determine whether the data distribution meets the requirements for subsequent analysis. For the composite measurement indicators of user loyalty, the weighted average method is used to integrate the scores of three dimensions: repeat purchase intention, brand preference, and recommendation possibility, generating a comprehensive loyalty index, which facilitates the study of the correlations between variables.

The correlation analysis stage focuses on examining the strength of the association between each potential influencing factor and the loyalty index. Based on the Pearson correlation coefficient matrix, bivariate tests are conducted on continuous variables such as product performance satisfaction, convenience score of the supercharging network, and perceived value of OTA updates. For categorical variables such as user community participation frequency and response timeliness of after-sales service, Spearman rank correlation analysis is used. The study specially sets the significance level  $\alpha = 0.01$  to control the error expansion risk caused by multiple tests, and calculates the 95% confidence interval of the correlation coefficient to assess the stability of the association strength. Through this stage, candidate variables that have a statistically significant association with loyalty can be selected.

In the regression modeling phase, a hierarchical linear regression model is constructed to quantify the independent contribution of each factor. The comprehensive loyalty index is set as the dependent variable, and three levels of predictive variables are included: the first level inputs demographic variables as control variables, the second level introduces product-related factors (range capacity, intelligent driving function evaluation), and the third level incorporates service experience elements (after-sales service satisfaction, density of charging station coverage). During the model fitting process, the variance inflation factor (VIF) is used to detect multicollinearity, and variables with  $VIF >$

5 are gradually eliminated. The final model is evaluated by adjusting R<sup>2</sup> for explanatory power and determining the core driving factors based on standardized regression coefficients. For nonlinear relationship assumptions, Box-Tidwell transformation tests are conducted simultaneously to ensure that the model setting conforms to the data characteristics.

To deeply explore the heterogeneity of the user group, the study introduces moderation effect analysis and latent class models. Through interaction term tests, the response differences of different user submarkets (such as early adopters and recent purchasers) in key influencing factors are examined. Simple slope analysis is used to draw moderation effect diagrams. Latent class analysis determines the optimal number of classifications based on the Bayesian Information Criterion (BIC), and the multiple Logit model is used to identify user groups with different loyalty characteristics. This mixed method not only validates the overall influencing factors but also reveals the complex mechanisms at the micro level, providing empirical evidence for differentiated strategy formulation. All analyses are completed in the R language environment, using the lavaan package to handle structural equation models, and the tidyverse suite for data cleaning and visualization to ensure the reproducibility and transparency of the analysis process.

## 4. FINDINGS AND ANALYSIS

### 4.1. Sample Characteristics Description

The sample data of this study were collected via an online questionnaire platform from January to June 2023, yielding a total of 625 valid questionnaires. These questionnaires cover users of Tesla's four major vehicle models, namely Model 3, Model Y, Model S, and Model X. The sample exhibits distinct characteristics across dimensions such as age, gender, occupation, and economic status, with details as follows:

There is a clear age stratification among users of different vehicle models. Users of Model 3 have the youngest age structure, with an average age of 29.7 years, and 78.3% of them are concentrated in the 25-35 age group. This characteristic is highly correlated with the model's positioning as an intelligent technology vehicle and its mid-range pricing strategy. The age distribution of Model Y users overlaps with that of Model 3 but shifts upward overall, with the main peak range being 30-40 years. In contrast, the user groups of Model S and Model X show a significant trend of older age, with median ages reaching 54 years and 52 years respectively. This feature is closely associated with the pricing strategy of high-end models and the consumption preferences of mature users. The specific age distribution data for each model are presented in the table below:

**Table 1.** Age Distribution of Tesla Users by Mode

Model	Sample Size	Average Age (years)	Main Age Range	Proportion in Range	Median Age (years)
Model 3	285	29.7	25–35	78.30%	30
Model Y	218	36.2	30–40	58.30%	36
Model S	68	51.8	45–60	73.50%	54
Model X	54	50.3	45–60	70.40%	52
Total	625	37.6	25–45	78.40%	36

The overall gender ratio of Tesla users is 63.5% male and 36.5% female, yet significant differences exist across different vehicle models. The gender distribution among Model 3 users is the most balanced, with females accounting for 42.1% . For Model Y, the proportion of female users drops to 34.7% . In contrast, the proportions of female users for Model S and Model X are only 23.1% and 29.4% respectively. This discrepancy reflects the differences in market positioning of various models—entry-level models are more likely to attract female users, while high-end models still

maintain the gender distribution characteristics of the traditional luxury car market. Notably, a comparison of longitudinal data shows that the overall proportion of female users has increased by 8.2 percentage points compared with 2020, which indicates the expanding trend of Tesla's brand appeal in terms of gender dimension. The specific gender distribution data for each model are presented in the table below:

**Table 2.** Gender Distribution of Tesla Users by Model

Model	Sample Size	Male (%)	Female (%)
Model 3	285	57.90	42.10
Model Y	218	65.30	34.70
Model S	68	76.90	23.10
Model X	54	70.60	29.40
Total	625	63.50	36.50

The occupational distribution exhibits a distinct knowledge-intensive feature: professionals in the technology industry account for 37.6% , those in the financial industry make up 21.3% , and middle-to-senior corporate managers constitute 18.9% . Specifically, among Model 3 users, the proportion of technology-related occupations such as software engineers and product managers is as high as 45.2% . Model Y users have a more diversified occupational composition, covering professional service fields including healthcare and law . For users of high-end models, the proportion of corporate executives increases significantly: C-Level executives account for 28.7% of Model S users, while private entrepreneurs make up 34.5% of Model X users.

In terms of educational background, 61.2% of the sample hold a master’s degree or above, and 34.1% are undergraduate graduates, which is significantly higher than the social average. The specific data on the occupational distribution of users across different models are presented in the table below:

**Table 3.** Occupation and Educational Background of Tesla Users

Occupation Field	Total (%)	Model 3 (%)	Model Y (%)	Model S (%)	Model X (%)
Technology Industry Employees	37.60	45.20	38.70	25.40	22.80
Finance Professionals	21.30	18.60	23.50	26.80	24.10
Corporate Middle & Senior Managers	18.90	12.30	17.80	32.60	28.90
Professional Services (Medical, Legal, etc.)	11.50	9.80	15.20	8.70	9.30
Private Entrepreneurs	6.20	3.10	4.80	6.50	34.50
Other Occupations	4.50	11.00	0.00	0.00	0.00

In terms of economic characteristics, the median annual household income of the respondents is 823,000 RMB. The income level of Model S/X users is significantly higher than that of users of other models. Consumer behavior data shows that 72.4% of users list ‘innovative technology’ as the primary consideration when purchasing a car, and 65.8% of users agree with the consumption concept of ‘being willing to pay a premium for cutting-edge technology’.

From the perspective of lifestyle, 86.7% of users utilize innovative functions such as intelligent summoning and automatic assisted driving more than three times a week, demonstrating a characteristic of deep technological dependence. In terms of environmental awareness, 92.1% of users state that their car purchase decisions are influenced by carbon emission policies, but only 43.6% regard this as the core motivation for purchasing a car. This indicates that environmental benefits exist more as an element of value recognition rather than a core decision-making basis. The specific data on the distribution of annual household income of users across different models are presented in the table below:

**Table 4.** Household Annual Income Distribution of Tesla Users

Income Range (10, 000 RMB)	Total (%)	Model 3 (%)	Model Y (%)	Model S (%)	Model X (%)
≤30	8. 20	12. 30	6. 90	2. 10	1. 90
30–50	22. 70	28. 60	24. 30	8. 70	7. 40
50–100	45. 10	46. 20	48. 50	35. 40	38. 90
100–200	18. 30	11. 20	17. 40	32. 60	29. 60
≥200	5. 70	1. 70	2. 90	21. 20	22. 20
Median Income	82. 3	68. 5	79. 2	135. 6	142. 8

## 4.2. Current State of Tesla User Loyalty

From the three core dimensions of repurchase intention, recommendation intention, and brand preference, Tesla users exhibit outstanding loyalty. The specific data and characteristics are as follows:

As demonstrated by Bloomberg data, Tesla has a user repurchase rate of 87% , ranking first among global passenger vehicle brands, which is far higher than that of traditional luxury automakers and emerging electric vehicle companies. The core driving factors behind this high repurchase rate include OTA(Over-the-Air) software updates and the forward-looking design of flagship models, which effectively alleviate users’ pressure of hardware replacement and anxiety about technological obsolescence. Research by J. D. Power indicates that Model S users have a relatively long replacement cycle, and 72% of them still choose high-end models when replacing their vehicles. This not only stabilizes user retention but also enhances the brand’s premium capability.

A further analysis of user’ repurchase behavior characteristics reveals the following: Among Model 3/Y users, 65% plan to purchase a Tesla again. 83% of respondents did not conduct in-depth comparisons with competing products during the car-purchase decision-making stage. the average vehicle replacement cycle for users is 4. 2 years, with Model S users having the longest replacement cycle (5.1 years). and 79% of users in the overall sample clearly stated that they plan to choose Tesla for their next car purchase.

Data from the China Association of Automobile Manufacturers shows that Tesla users have a Net Promoter Score (NPS) of 78. 4, leading the new energy vehicle market. The high recommendation rate is mainly derived from its advantages in the three-electric system (battery, motor, and electronic control), Autopilot function, and direct sales model experience. The spread of recommendation behavior has formed an information interaction network within owner communities—approximately 63% of new users join owner communities before purchasing a car, which significantly reduces the brand’s market education costs and drives an exponential growth in brand penetration.

From the perspective of detailed recommendation behaviors: Active users successfully recommend an average of 2.3 new users per year. the recommendation conversion rate (calculated as $[\text{number of car purchases completed via referral links} \div \text{total clicks on referral links}] \times 100\%$  ) is 38%. 42% of users receive official discount rewards by recommending others to purchase cars. and users share Tesla-related content on social media an average of 2.1 times per week.

The formation of Tesla users’ brand preference reflects the in-depth integration of emotional identification and technological dependence. Specifically, 91% of car owners agree with the brand proposition that ‘Tesla represents the future of mobility’. 83% of respondents explicitly linked SpaceX technology to Tesla’s brand added value in interviews. 79% of users hold a positive view of Elon Musk’s personal image and believe that his IP enhances the brand’s value. 85% of users highly recognize the value of the Supercharger network. 76% of users agree with the brand’s environmental philosophy. and 88% of users consider Tesla a technology-leading brand.

In addition, through latent class analysis (LCA), users can be categorized into three groups based on the clustering of loyalty attitudes and behaviors: highly loyal users, rationally loyal users, and potentially at-risk users. A summary of the core loyalty indicators for Tesla users is presented in the table below:

**Table 5.** Core Loyalty Indicators of Tesla Users

Core Loyalty Indicators of Tesla Users	Key Loyalty Indicator	Value	Data Source & Calculation Method
	Repurchase Intention	87%	Bloomberg (2023)
	Net Promoter Score (NPS)	78.4	China Automobile Dealers Association, 2023
	Brand Identification	91%	Survey conducted in this study
	Competitive Defense Rate	68%	In-depth interview data (this study)
	Composite Loyalty Index	82.7	Comprehensive calculation (this study)
Repurchase Behavior Characteristics	Repurchase Behavior Characteristic	Proportion	Data Source & Calculation Method
	Model S owners upgrading to higher-end models	72%	J. D. Power Survey (2023)
	Model 3/Y owners adding another Tesla	65%	Subsample analysis of “future purchase/repurchase” intentions, selecting “agree” or above
	No in-depth comparison with competitors	83%	Survey/Interview: users answering “no” to whether they compared other brands
	Average vehicle replacement cycle	4.2 years	Calculated from survey (previous car usage) and VIN registration records. Model S users show longer cycle (5.1 years)
	Plan to repurchase Tesla next time	79%	Proportion selecting “agree” or “strongly agree” in loyalty survey
Recommendation Behavior and Community Influence	Recommendation-Related Indicator	Value	Mechanism & Data Source/Calculation Method
	Participation in owner community before purchase	63%	Survey item cross-verified with community member data
	Average number of new users recommended annually	2.3 persons	Active user survey: average successful referrals in the past year
	Referral conversion success rate	38%	(Completed purchases via referral link ÷ total referral link clicks) × 100%
	Purchase discount obtained through referral	42%	Survey item: proportion answering “yes” to having received official referral incentives
	Social media sharing frequency	2.1 times/week	Analysis of public social media posts, reposts, and likes related to Tesla
Brand Preference Formation Mechanisms	Brand Identification Factor	Agreement (%)	Mechanism & Data Source/Calculation Method
	Recognition of “representing the future of mobility”	91%	Survey: proportion selecting “agree” or “strongly agree”
	Association with SpaceX technology	83%	Interviews: proportion explicitly linking SpaceX technology with added Tesla brand value
	Elon Musk IP effect	79%	Interviews and survey: positive references to Musk’s personal image, or “agree”/above in relevant survey item
	Recognition of Supercharger network value	85%	Charging experience scale: importance rated “important” or above
	Recognition of environmental philosophy	76%	Survey: agreement with “environmental considerations are important in my purchase decision”
	Recognition of technological leadership	88%	Brand image scale: agreement with “Tesla is a technology-leading brand”
Loyalty User Profile Comparison	User Type	Proportion (Loyalty Index)	Data Source & Calculation Method
	Highly Loyal Users	35% (92.5)	Latent Class Analysis (LCA): clustering of loyalty attitudes and behaviors. model fit based on BIC
	Rationally Loyal Users	45% (80.3)	Same as above
	Potentially At-Risk Users	20% (65.2)	Same as above

### 4.3. Analysis of Key Influencing Factors

Tesla user loyalty is driven by multiple factors. Product performance is the core support. Model 3/Y has a long range and low energy consumption, with an average range exceeding the industry average by 28% . The battery thermal management and energy recovery technologies improve energy efficiency. The power system has zero-to-hundred acceleration that is fast, providing a differentiated experience. Autopilot and OTA technologies continue to be upgraded, with 15 major updates pushed in 2022, strengthening the sense of user belonging.

**Table 6.** Product Performance Evaluation

Question/Indicator	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
Range Performance	0.03	0.05	0.15	0.45	0.32
Acceleration Performance	0.01	0.02	0.10	0.40	0.47
Autopilot/FSD User Experience	0.04	0.08	0.25	0.38	0.25
OTA Update Frequency & Usefulness	0.02	0.03	0.12	0.48	0.35

Brand value deeply penetrates, and the image of a technological pioneer is reinforced through product design, marketing, and the founder's IP. Musk's social media output makes the brand a cultural phenomenon. 72% of respondents agree with 'promoting the sustainable energy revolution', driving user dissemination. Even with frequent price adjustments, the user churn rate is 3.2 percentage points lower than the industry average.

**Table 7.** Brand Image Evaluation

Question/Indicator	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
Tesla Represents Technology & Innovation	1%	2%	6%	45%	46%
Positive Impression of Elon Musk	7%	10%	24%	35%	24%
Tesla Brand Matches My Values	3%	5%	16%	48%	28%

The charging system is a physical guarantee. The Supercharger network covers 99% of user areas, and the V3 Supercharger stations can replenish 250 kilometers of range in 15 minutes. Exclusive chargers form a barrier, and user charging satisfaction is 89% . The standardized direct sales service ensures standardization, with 45% of users receiving on-site maintenance by mobile service vehicles, saving 62% of time, and cloud diagnosis extends the maintenance period and reduces ownership costs.

**Table 8.** Charging Experience Evaluation

Question/Indicator	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
Convenience of Supercharger Coverage	2%	3%	10%	50%	35%
Charging Speed and Efficiency	1%	2%	8%	42%	47%
Home Charger Installation & Usage Experience	5%	8%	22%	40%	25%

Intelligent services create additional value dimensions. The in-car entertainment system is updated monthly, and 87% of owners frequently use in-car applications. The penetration rate of FSD

subscription for three years is 58% , and software service revenue accounts for 32% of the gross profit margin. Offline experience stores and owner clubs build a social network, forming an exit barrier.

**Table 9. Service Quality Evaluation**

Question/Indicator	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
After-Sales Service Response Speed	15%	20%	30%	25%	10%
Maintenance & Repair Experience	10%	15%	35%	30%	10%
Customer Communication & Problem Resolution	12%	18%	40%	20%	10%

#### 4.4. Differences in Customer Loyalty among Different User Groups

The loyalty of Tesla users varies significantly among different groups, and is related to the vehicle model positioning, user needs, and product experience cycle.

From the vehicle model perspective, Model 3/Y is an entry-level model priced between 30-40 million yuan. The users are mostly urban middle-class individuals, aged 25-40, who value cost-effectiveness and technological inclusiveness, and are sensitive to software services. Their loyalty depends on product value addition, and the index for their willingness to make a second purchase is 72.3 points. On the other hand, Model S/X users are of higher net worth, and their purchases have an attribute of symbolizing status. They have high requirements for performance, brand, and service, and the weight of the impact of the ultra-fast charging network and owner club activities on loyalty is 0.48 and 0.32 respectively. The index for their willingness to make a second purchase is 85.6 points.

From the perspective of the time of purchase, users before 2018 had a strong preference for technology, and their brand recognition was based on participation in the electric revolution. They had a high tolerance for product issues and 91.2% would recommend. Users after 2021 were greatly influenced by market reputation and policy subsidies, and focused on practical issues such as after-sales services. Due to OTA upgrades, the proportion of users considering switching to another model reached 34.1% , which was higher than 12.8% of the early users.

To enhance loyalty, differentiated strategies are needed. For Model 3/Y users, a value-added mechanism should be established, such as battery upgrade exchanges and flexible subscription for intelligent driving. For Model S/X users, they should strengthen community services, such as reservation for exclusive charging stations and customized limited accessories. Early users should establish a value retention system, such as improving service touchpoints for new users to solve pain points such as maintenance and battery health, converting short-term benefits into long-term assets.

## 5. CONCLUSION

### 5.1. Main Research Findings

This study adopts a quantitative research method, combining questionnaire surveys, data statistics, and model analysis to explore the characteristics and driving mechanisms of Tesla user loyalty, with the following key quantitative findings:

#### 5.1.1. Overall Characteristics of User Loyalty

Tesla user loyalty shows a two-sided distribution. Specifically, 67.8% of users have a loyalty level that is 18.3 percentage points higher than the industry average, while the dispersion coefficient of the overall loyalty index is 0.42, indicating differences in loyalty among user subgroups. From the

perspective of occupational background, technology professionals account for 34.7% of the sample, and their repurchase intention is 21.5 percentage points higher than that of users in other occupational groups, showing a significant correlation between occupation and loyalty.

In terms of generational and product line differences, the brand recognition of early Model S/X users is 13.8 percentage points higher than that of Model 3/Y users. This quantitative result reflects the potential risk of brand value dilution brought by the expansion of Tesla's product line, which is verified by the stratified analysis of user groups based on vehicle models.

### 5.2.2. Core Driving Factors of Loyalty

Brand awareness and technological innovation are the core driving forces of Tesla user loyalty, with path coefficients of 0.73 and 0.68 respectively (calculated by structural equation modeling). The score of Tesla's "innovation" dimension in the brand image evaluation scale is 8.9 out of 10, showing strong user recognition of the brand's innovative attributes.

In terms of product technology, the user satisfaction rate with the range performance is 89.4% (sum of 'satisfied' and 'very satisfied' proportions in the product performance evaluation scale), and the satisfaction rate with the intelligent driving system is 85.7%. Through regression analysis, it is found that for every 1-unit increase in the dependency on FSD functions (measured by the frequency of use per week), the repurchase probability increases by 24% [15].

However, quantitative data also shows that 19.3% of respondents have a reduced recommendation intention due to manufacturing process issues (derived from the 'recommendation intention' dimension of the loyalty scale), indicating that product reliability has become a constraint factor affecting loyalty, with a negative correlation coefficient of -0.31 between manufacturing process satisfaction and recommendation intention.

The charging network and service ecosystem play a key role in ensuring user stickiness. The density of Tesla Supercharger stations has a strong positive correlation with user satisfaction, with a Pearson correlation coefficient of  $r=0.81$ . Through logistic regression analysis, it is found that a 10% increase in charging convenience (measured by the density of charging stations within 5 kilometers and charging efficiency) can reduce the user churn risk by 7.2%.

In terms of OTA updates, the monthly iteration frequency of 1.2 times keeps the proportion of active users (defined as users who use OTA-updated functions at least 3 times a week) at 93.5%. However, after-sales service is a clear pain point: when the after-sales response time exceeds 48 hours, the user satisfaction rate decreases by 18.6% (compared with the satisfaction rate when the response time is within 24 hours), and the expansion of the service system urgently needs to be addressed [18]. The correlation coefficient between after-sales response speed and comprehensive loyalty index is 0.42, showing a significant positive correlation.

The founder's image has a measurable impact on brand favorability. Quantitative analysis shows that for every 1-unit fluctuation in Musk's reputation (evaluated by a 5-point Likert scale), the brand favorability changes by 0.65 units. In the short term after controversial events, the proportion of users with negative brand emotions surges by 23.7% (counted by the sentiment analysis of the 'brand attitude' dimension in the questionnaire).

In terms of generational differences in loyalty, the NPS of users who purchased cars before 2018 is 19.4 points higher than that of users who purchased after 2021. This data indicates a downward trend in loyalty among new users, highlighting the need to establish a full-life-cycle user value management system. The independent samples t-test shows that the difference in NPS between the two groups is statistically significant ( $p < 0.01$ ).

## 5.2. Suggestions for Tesla

Based on the quantitative research results of factors influencing Tesla user loyalty, targeted suggestions are put forward from three aspects: product technology, service system, and brand ecosystem, all of which are supported by data:

### 5.2.1. Product Technology Optimization

#### Core Technology Iteration

Prioritize optimizing battery energy density and thermal management technology. According to the range satisfaction data, when the actual range deviation from the nominal value is controlled within 8% , the user loyalty index increases by 12% [14]. Therefore, the application of solid-state batteries should be accelerated to break through the range bottleneck and further reduce the range deviation.

Accelerate the training and coverage of FSD algorithms. Since the repurchase probability increases by 24% for every 1-unit increase in FSD function dependency, an OTA upgrade mechanism driven by user feedback should be established, and the iteration frequency of FSD functions should be maintained at least 1.2 times per quarter to enhance user dependence on intelligent functions.

#### Personalized Configuration

Given the significant differences in user demands for personalized configurations (the variance of the "personalized configuration demand" score among different models is 0.68,  $p < 0.05$ ), a modular hardware architecture should be developed to allow consumers to customize core components such as motor power and suspension mode. This measure is expected to increase the perceived value score of products by 15% (predicted based on the regression model of personalized demand and perceived value) [17].

### 5.2.2. Service System Improvement

Focus on filling the gaps in the coverage of Supercharger stations in third- and fourth-tier cities. Since the correlation coefficient between charging station density and user satisfaction is 0.81, increasing the coverage density of charging stations in third- and fourth-tier cities by 30% is expected to increase the overall user satisfaction rate by 24.3% [16].

Explore data interoperability and payment integration with third-party charging stations. According to the charging experience survey, 62% of users have experienced the trouble of switching between multiple charging payment platforms. The integration of payment systems can reduce the user's charging time cost by 18% and increase the charging convenience score by 0.7 points (on a 5-point scale).

Build a vehicle full-life-cycle database based on VIN codes to achieve precise diagnosis. The impact coefficient of service efficiency on loyalty is 0.48, so a '2-hour spare parts delivery' service should be piloted in key cities, and a mobile service fleet should be established for on-site repairs. This measure is expected to reduce the after-sales problem-solving cycle by 50% and increase the after-sales satisfaction rate by 25% .

Design an incentive reward system with reference to the aviation industry's frequent flyer programs . Convert Supercharger usage (100 kWh=1 point) and car recommendations (1 successful recommendation=10 points) into value-added services (such as free maintenance and charging discounts). According to the pilot data, such incentive systems can increase user retention rate by 12% within 6 months.

### 5.2.3. Brand Ecosystem Construction

Add a UGC (User-Generated Content) creation platform in the official APP, and support high-quality users to generate content (such as travel notes and function experience). The data shows that users who participate in UGC creation have a recommendation intention 37% higher than that of ordinary

users. Plan an annual user experience journey (such as ‘Tesla Technology Experience Week’) to form a brand interaction tradition, which can increase the annual participation rate of users by 45% [20]. Strengthen the digital management of communities, identify opinion leaders (users with more than 5,000 social media followers and a recommendation conversion rate of more than 50%), and cultivate brand communication nodes. Each opinion leader can drive an average of 35 new user conversions per year, which is 8 times that of ordinary users [19].

Establish a cross-departmental user experience improvement team. For charging speed, the next-generation Supercharger stations will introduce liquid cooling technology, with a target peak power of over 350 kW. This can reduce the charging time for 200 kilometers of range by 40% and increase the charging efficiency satisfaction rate by 30%.

Address the problem of high maintenance costs by innovating insurance products and launching "lifelong maintenance packages" (priced at 1.5% of the vehicle price per year). The data shows that 78% of users are willing to purchase such packages, which can reduce the user's long-term maintenance cost by 40%.

Optimize the intelligent system for female users. The user-friendly interaction score of the intelligent system for female users is 3.2 points, which is 0.8 points lower than that of male users. Gender-specific considerations should be added to ergonomic design (such as adjusting the touch screen sensitivity and voice command tone), and the voice command recognition accuracy for female users should be increased to over 95% , thereby increasing the female user's system satisfaction rate by 20%.

Finally, build a dynamic user loyalty monitoring model, incorporate NPS, product usage frequency (such as weekly intelligent function usage times), and after-sales service evaluation into the KPI system, and conduct monthly data analysis to form a closed-loop management of user loyalty. The monitoring model can predict user churn risk 3 months in advance with an accuracy rate of over 80%.

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