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User Scenario and Demand Analysis of High-end New Energy Vehicle Brands

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ABSTRACT

This study aims to explore the needs and pain points of users of high-end new energy vehicle brands in different usage scenarios through a combination of quantitative and qualitative analysis. First, a large amount of user data was collected through questionnaire surveys, and the data was analyzed quantitatively using statistical analysis methods to reveal users' behavioral patterns and demand preferences in different scenarios, such as daily transportation, long-distance travel, and leisure and entertainment. Secondly, qualitative research methods such as focus group interviews and case studies were used to explore the real experience and hidden needs of users in specific scenarios. The research results show that users have obvious pain point needs in various scenarios such as daily transportation, leisure and entertainment, long-distance traveling, parking and resting, such as slow response speed of remote control, lack of precision in navigation, poor privacy in in-vehicle entertainment, and difficulty in parking. Based on these findings, the analysis shows that high-end new energy vehicle brands need to make more innovations in improving the interactivity of in-vehicle intelligent systems and personalized services to meet the diversified needs of users in different usage scenarios, so this paper puts forward targeted improvement suggestions and innovative function modes to enhance the user experience and market competitiveness of high-end new energy vehicle brands. The results of the study provide an important reference for new energy vehicle brands in product design and market strategy development.

KEYWORDS

High-end New Energy Vehicle Brands; User Scenarios; Demand Analysis; Functional Models

1. INTRODUCTION

With the aggravation of global environmental problems and energy crisis, new energy vehicles are gradually becoming an important development direction of the automobile industry. High-end new energy vehicle brands are attracting more and more consumers' attention due to their outstanding performance in technological innovation, performance improvement, environmental protection and energy saving. In recent years, China's new energy vehicle market has been growing rapidly, and the market share of high-end new energy vehicle brands has been expanding, resulting in increasingly fierce competition in the industry. In this context, it is of great practical significance to study the user scenarios and demands of high-end new energy vehicle brands. Changes in user demand directly affect the product development and market strategy of automobile enterprises. By analyzing users' usage scenarios and needs, it can help enterprises accurately grasp the pulse of the market, develop products that better meet users' expectations, and enhance brand competitiveness. Users of high-end new energy vehicles usually have a high level of consumption and brand loyalty, and studying their needs and usage scenarios can provide a scientific basis for enterprises to develop differentiated market strategies. In addition, with the wide application of intelligent network technology, users'

demand for high-end new energy vehicles is not only limited to the traditional driving experience, but also includes intelligent and humanized service experience. Through in-depth analysis of user scenarios, the current shortcomings of high-end new energy vehicles in intelligent and humanized service can be found, providing a direction for future technological improvement and service innovation. This study aims to explore the fit between user demand and market supply through a comprehensive analysis of user scenarios and demand of high-end new energy vehicle brands, and propose optimization strategies to provide theoretical support and practical guidance for the sustainable development of high-end new energy vehicle brands. In recent years, the application and development of new energy vehicles have rapidly become a research hotspot worldwide. Liu Heng, Cheng Zhenming et al1 pointed out that with the global population and economic growth, ecological issues pose a serious challenge to the Chinese economy. Especially in the context of the rapid development of heavy chemical industry, the exhaust emission of traditional fuel vehicles has become an important factor of environmental pollution. To cope with this problem, the development of new energy vehicles has become an inevitable trend. The study emphasizes the key role of the government in policy support and infrastructure construction, and points out the challenges currently faced by the new energy vehicle industry in technology research and development and industry chain construction. Zhang Meihua2 further discusses the development trend of electrification and intelligentization of new energy vehicles in China. It emphasizes that the rapid development of new energy vehicles is not only in line with the needs of a low-carbon economy, but also with the development trend of intelligence and automation. The study concludes that the future automotive market will gradually transform to electrification and intelligence, and although there are still many uncertainties, the shaping of the intelligent parts market provides a solid foundation for this trend.Wang Chao3 analyzed in detail the promotion and application of new energy vehicles in China. And pointed out that pure electric vehicles, hybrid vehicles and fuel cell vehicles are the main types of new energy vehicles at present. Pure electric vehicles are widely used in urban commuting, logistics and distribution, and public transportation because of their zero emission, low noise and high energy efficiency. Hybrid vehicles, on the other hand, combine the advantages of fuel engines and battery power, and have a longer range, making them suitable for scenarios that require frequent acceleration and braking. The study also explores the development prospects of new energy vehicles with policy support. Shu Wenjun4 analyzes the current development status of new automotive energy and new energy vehicles, and points out the main challenges faced by new energy vehicles in terms of market promotion, technology research and development, infrastructure construction, etc. At the same time, he looks forward to five trends in technology innovation, policy support, cross-border cooperation and international development. At the same time, he looks forward to the five major trends of new energy vehicles in technological innovation, policy support, infrastructure construction, cross-border cooperation, and international development. Based on the technology acceptance model, Li Xudong et al.5 construct a new energy vehicle purchase intention model based on "external scenario internal scenario application behavior" by combining scenario factors. They found that economic incentive policies have the greatest impact on consumers' willingness to buy, followed by technology enhancement policies and regulatory restriction policies; from the perspective of perception, perceived value has the greatest impact on willingness to buy. Zhou Limei et al.6 explored the key factors affecting the development of Chinese new energy vehicles in the process of overseas market development. Through generalization, these factors were classified into five levels: new energy vehicle product production, host country market conditions, new energy vehicle product marketing, technical support, and China's policy conditions. The study constructed an explanatory structural model (ISM) and used the hierarchical analysis method (AHP) to determine the relative importance of each factor. It is also suggested that in order to enhance the competitiveness of Chinese new energy vehicles in overseas markets, we should focus on product research and development, optimize export strategies, enhance user viscosity, and optimize the policy system, so as to enhance the market competitiveness and development momentum of Chinese new energy vehicles, strengthen its foundation in the international market, and better cope with the threat of substitute products.

2. OVERVIEW OF THE RESEARCH

The research utilized both quantitative and qualitative methods, with 30 samples of offline quantitative interviews completed for the quantitative research, and 2 user forums and 10 in-depth interviews completed for the qualitative research. The research object is high-end new energy vehicle brand users, 66.7% of the men and 33.3% of the women participated in the quantitative research; the age coverage is 25-40 years old, of which 31-35 years old accounted for 55.6%; the proportion of married families with children (children 0-5 years old accounted for 33.3%) is relatively higher; the educational level mainly consists of college and bachelor's degree (of which bachelor's degree is the most, accounting for 60.0%), and the annual income of families mainly focuses on 20-40 years old, and the annual income is mainly concentrated on 20-40 years old, and the annual income is mainly concentrated on 20-40 years old. annual income is mainly concentrated in 200,000-400,000 yuan (of which 350,000-400,000 yuan is the most, accounting for 23.3%). The users of qualitative research come from quantitative research, and the qualitative data are supplemented by digging deep into the users' car use scenarios and pain point needs, and solutions are proposed in a targeted manner.

3. USER SCENARIOS AND PAIN POINT DEMAND ANALYSIS

We mainly focus on quantitative and qualitative research methods for analysis, in which the user scene mainly includes daily transportation (commuting to and from work/transporting family members) driving to engage in various types of leisure activities (such as loitering, shopping, dinners, etc.), taking a nap in the car, driving to participate in the activities of the car club, short-distance excursions, watching in-car video in the car, camping, camping with equipment for trips (e.g., fishing tackle, cultural activities or sports equipment, etc.), and long-distance self-driving trips, Go back to visit relatives in overseas hometowns, travel with children, make-up in the car (makeup, dressing, etc.), long-distance driving business trips, picking up and dropping off customers, playing games in the car, business receptions, cross-country mountain running, in-car Karaoke, Vlog, daily travel with pets, going down the track and so on.

3.1. Quantitative Analysis

Daily transportation, driving for leisure activities and in-vehicle napping are the more important and relatively high-frequency scenarios for users. From Figure 1, it can also be analyzed that high-frequency and high-importance scenarios include daily mobility, driving for leisure activities and in-vehicle napping; low-frequency but high-importance scenarios include in-vehicle karaoke and going back to visit relatives in overseas hometowns.

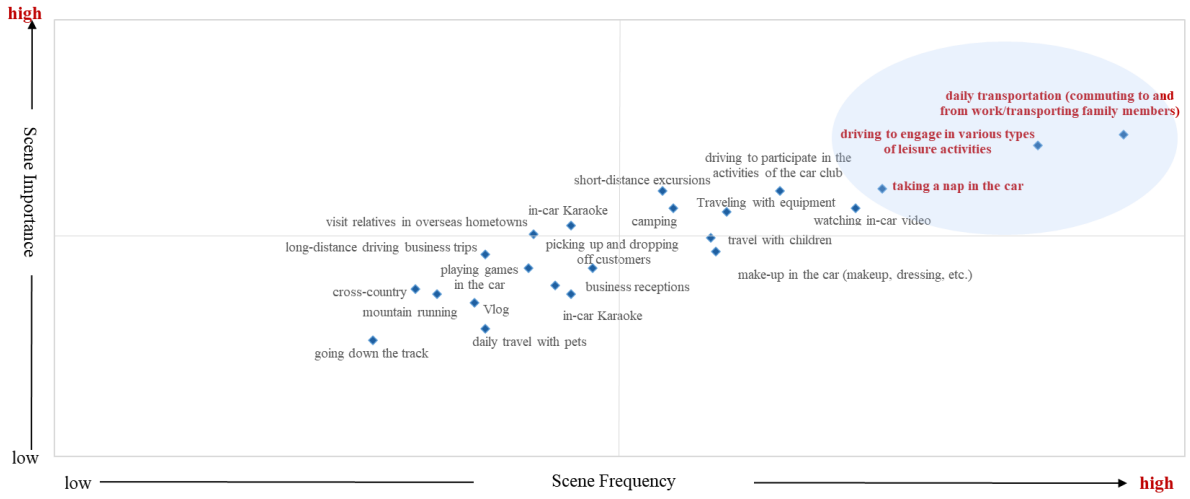

Figure 1. Frequency and Importance of Car Use Scenarios

3.2. Qualitative Inorganic Analysis

Through qualitative analysis, this paper focuses on three primary scenarios of daily commuting, parking, and leisure and entertainment, and seven secondary scenarios of commuting, traveling with children, resting in the car, entertaining in the car, long-distance returning home, camping in the suburbs, and traveling with pets, to analyze the pain points and needs of users of high-end new energy vehicle brands.

3.2.1. Scenarios for daily transportation

(1) Commuting scene

During daily commuting, car owners face several pain points. First, before departure, the response speed of remote control is slow, especially in winter, the air conditioning heating needs to be turned on 10 minutes in advance, and this operation will significantly increase power consumption. In addition, the shutdown of LIDAR cannot be completed by voice control, which makes the user experience not convenient enough. Owners want to send the navigation position to the car before getting into the car, so as to simplify the operation process before traveling. During the driving process, the main problems encountered by the owner include the 360-degree panoramic image automatically popping up from the camera during traffic jams, which interferes with the display of other information on the center control screen. In addition, the strength of the seat massage is light, which is difficult to feel especially when wearing thick clothes in winter, and the massage duration cannot be set, resulting in a lack of experience. Owners hope that the seat massage function can provide stronger strength and longer duration, and automatically stop massaging after locking the car at the destination. In the parking stage, the wider body brings the problem of inconvenient parking, especially in the narrow parking space is more obvious. In addition, there is a delay in the feedback from the reversing radar, which does not provide timely and effective assistance. All of these problems are disturbing to the owner's daily use and need to be addressed in future vehicle design and improvement.

(2) Traveling with Children Scenario

In the scenario of traveling with a baby, car owners face a series of challenges during the driving phase. First of all, car owners are worried that their babies are fidgeting and restless in the seat, and they cannot help their babies to toilet or eat in time during the driving process. In addition, babies are reluctant to sit in the seat for long periods of time and are eager to move around and play. In order to cope with these problems, the owner hopes to adjust the second row of seats through the center control panel, set up a safe small space for the baby to move around and play, and equipped with a storable toy box to enhance the comfort and safety of the baby in the car. In the preparation stage of getting out of the car, the owner often encounters the situation of parking the car and finding that the baby has wet his pants and needs to change his clothes urgently. To solve this problem, car owners need the car to be equipped with a car trash can or a small toilet with an automatic odor removal function to ensure a clean and comfortable environment inside the car. These improvements will significantly enhance the convenience and user experience of traveling with a baby.

3.2.2. Parking lot view

(1) Resting scene in the car

In the parking and resting scenario, car owners usually encounter the following pain point needs: when resting in the car, the headrest of the driver's seat is troublesome to adjust, and the head is uncomfortable when lying down, the angle of the seat is not flat enough, and the support is insufficient, so it is not possible to stretch the whole body. In addition, there is a lack of comfortable environment and entertainment facilities when resting in the car, which affects the quality of rest. Owners would like the seats to be more easily adjustable and provide better support and comfort, especially if they can be fully lowered to lie flat. To enhance the resting experience inside the vehicle, owners would also like to add adjustable ambient lighting, a quality sound system, and entertainment options such

as a video playback system for relaxation and entertainment during breaks. Meanwhile, heated and massaging seats add comfort and allow owners to rest and recover after a long drive.

(2) In-car entertainment scene

When carrying out in-vehicle entertainment such as Karaoke or playing games, car owners encounter the following pain point needs. First, the singing mode in the car is so loud that it can be heard outside the car, and the privacy is poor, which will generate noise in public places. Owners want to enjoy high-quality in-vehicle Karaoke experience, while avoiding sound leakage affecting others, so they need to improve the design of the in-vehicle audio system, such as the use of better acoustic materials and headrest audio, in order to improve privacy. Secondly, when sitting in the main passenger car to play car games, you need to squint your eyes or sideways to watch the screen for a long time, which causes discomfort. Owners hope that the position and angle of the car screen can be adjusted more flexibly so that it can be viewed comfortably in any seat. Introducing multi-screen interaction and floating display technology can make the entertainment experience more convenient and enjoyable. At the same time, providing a premium seat design that supports comfortable seating for long periods of time further enhances the overall experience of in-vehicle entertainment. Owners also want richer entertainment options and smoother connectivity to ensure that gaming and Karaoke are not interrupted by technical issues, enhancing the coherence and enjoyment of in-car entertainment.

3.2.3. Leisure and Entertainment Scene

(1) Long Distance Home Scene

In the leisure and entertainment scene of long-distance return home, car owners face the following pain point needs. Firstly, the car navigation is prone to errors and less accurate compared to cell phone navigation, so it is hoped that the car navigation function can be optimized to improve the navigation accuracy. Secondly, the driver monitoring system is too sensitive, when the owner talks with the car, the system frequently sends out safety reminders because it detects the driver's mouth opening and closing, and even if it is adjusted to the lowest sensitivity, there are still false alarms, which seriously affects the experience of using the car. Finally, car owners often face mileage anxiety during long-distance trips, and hope that the vehicle can judge in advance when charging is needed and plan charging routes, and proactively push charging station information, including the number of charging piles and their usage status, so that the car owner can reasonably arrange charging time and routes to ensure the trip goes smoothly. These improvements will greatly enhance the comfort and safety of long-distance driving.

(2) Suburban Camping Scene

In the suburban camping scenario, the pain points in the start-up preparation stage mainly include fully charging the car in advance, checking the weather, planning the route, and worrying about accidents and insufficient power while traveling. The demand is to plan the power level, remind the weather and plan the route through the car, and provide the charging pile occupancy situation alert and reservation replenishment function. Problems in the driving phase involve the stability of assisted driving on highways, conservative braking, the need for traffic for navigation, mosquitoes and insects in the car, access to hot and cold drinking water, and the risk of the chassis bumping into the battery. Corresponding needs are more accurate driving assistance, provision of offline maps, in-vehicle mosquito aromatherapy, hot and cold storage boxes and power battery safety guards. Pain points in the off-road phase include the inability to drive the vehicle near the campsite, difficulties in storing and putting away the tent, discomfort from sweaty hands and feet, as well as limited space for in-vehicle karaoke and ineffective ambient lighting. Demands are for detachable on-board mobile power, portable tents and on-board water tanks to provide a convenient camping experience and improve the Karaoke experience.

(3) Scenes of traveling with pets

In daily life, many of our families always like to take pets a piece of travel, but in the travel with pets scenario, contains many headaches for the owner of the pain points, such as parking, will leave the pet alone in the car, worried about the safety of pets; driving, pets due to boredom often barking but can not be moved, emergency braking when the cage is unstable, worried about the safety of pets in the process of driving and the pet's damage to the vehicle. The corresponding demand realization includes the passerby reminder function, informing the safety status of pets; exclusive safety basket for pets fixed on the seat, pet enclosure plus pet safety belt set up an independent rear space, wear-resistant and anti-scratch pet seats matching the model; air conditioning "one-key negative pressure de-feathering mode", preventing the pet hair from flying around. These measures are designed to ensure the safety and comfort of pets while protecting the interior environment.

4. FUNCTIONAL MODEL RECOMMENDATIONS

4.1. Greeting Mode

The Welcome Mode function is dedicated to providing owners with a driving experience full of rituals, including cool lighting of the car, ambient lighting on, active welcome light language display, hidden door handle pop-up and rearview mirror automatic unfolding. In the busy life, in the gradual indifference of the crowd, these thoughtful features are designed as if silently waiting for the care, always warmly welcome the owner's return, adding a special sense of ceremony and cozy experience for daily driving.

4.2. Partner Mode

In companion mode, the vehicle can interact with the owner through voice and emotion recognition technology. Before getting into the car, the navigation is shared to the car screen through the mobile app with one click. While driving, when fatigue driving is detected, the system will remind the owner to take a break through seat belts, sound and double flash. The vehicle also recognizes the owner's emotions, actively comforts and converses with him/her, providing continuous recognition and expression interaction. To address the owner's mileage anxiety, the vehicle determines in advance when charging is needed and plans charging routes, actively pushing information about charging stations. In addition, owners can customize their partner's voice and enjoy an immersive experience with holographic projection technology.

4.3. Mode of Accompanying the Child

This mode has the following features: center control screen adjustable seats, the second row of seats can be adjusted through the center control screen, which is convenient for parents to quickly adjust the seat position and angle to take care of the baby's needs while driving; safe activity space, the rear row can be set up with a small, safe space to allow the baby to move around and play in the car while ensuring its safety. The space can be equipped with soft cushions, functional buttons and other safety facilities; toy storage box, the car is equipped with a storable toy box, easy to store and access the baby's toys, to keep the car clean; emergency sanitation facilities, in order to deal with emergency situations such as finding the baby wetting his pants after stopping the car is equipped with a car garbage can or a small toilet, and has an automatic deodorization function, to ensure that the environment inside the car is clean and comfortable. These features will significantly enhance the convenience and user experience of traveling with a baby, ensuring that both the owner and the baby can enjoy a more comfortable and safe environment during the journey.

4.4. Nap Mode

According to previous surveys, 95% of employees don't have their own private office and nap mostly on the sofa or table. The nap mode function allows owners to nap comfortably in their own cars through a number of innovative designs such as sleep headrests, sunshade, good quiet performance (e.g. silent glass and active noise reduction), air purification function, sleep-aiding fragrance, seat lumbar support, appointment nap mode, wake-up mode (e.g. music and air conditioning), and many other features. These features not only provide a quiet, comfortable environment, but also ensure that owners can make the most of their lunch breaks through the appointment and wake-up functions, enhancing overall quality of life and work efficiency.

4.5. Entertainment Mode

When parking and resting, car owners may not always need to sleep, and relaxation or sleep aids are common needs. Lying down and watching a movie in the car is a good way to relax and rest, while also helping to fall asleep. For example, the Xiaopeng G9 has a 5D music cockpit with concert hall-level cockpit acoustic design, panoramic sound azimuthalized sound and immersive full-scene 5D viewing experience, which provides high-quality sound and visual experience. The Ideal L9, on the other hand, supports video input, is equipped with a 3K-class flip-down screen, and provides convenient operation through gesture interaction to create a 4D theater effect. These advanced configurations not only enhance the in-vehicle entertainment experience, but also provide owners with more options for relaxation and sleep aids when parking and resting.

4.6. Energy Saving Mode

This function mode provides a variety of measures to alleviate remaining mileage anxiety, including automatic or reminder adjustment of energy recovery intensity, automatic search for the nearest available charging post, automatic reduction of screen brightness, zoned power supply (e.g., turning off the air conditioner when no one is in the passenger seat, etc.), customization of the function priority when low battery is present (selecting which functions to turn off and keep), and use of solar charging kits. The integration of these features makes the driving process smarter and more efficient, reduces owners' anxiety about insufficient remaining mileage, and enhances the peace of mind and convenience of traveling.

4.7. Camping Mode

The camping mode provides car owners with a variety of outdoor entertainment options, including headlight illumination, Karaoke mode, in-car VR games, in-car projector movie screening, active external discharge, and intelligent light language. This mode enables car owners to enjoy barbecue, camping, photography and other activities outdoors to meet the needs of the whole family or friends' gatherings, significantly enhancing the fun and convenience of the traveling experience.

4.8. Pet Mode

Pet mode includes a number of functions: passer-by reminder function to inform the safety status of pets; automatic adjustment of air conditioning to maintain the appropriate temperature; air purification function to ensure fresh air inside the car; active opening of the sunroof for ventilation to further enhance the ventilation effect; equipped with an exclusive safety basket for pets, which is fixed to the seat; pet enclosure and pet safety belt set up independent rear space; and wear-resistant and anti-scratch pet seats matched with the model; The air-conditioning "one-touch negative pressure hair removal mode" prevents pet hair from flying around. These features work together to ensure the comfort and safety of pets in the car, so that the owner can also feel at ease when leaving for a short time.

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