Understanding Consumer Complaint Dynamics in the Electronic Vehicle Market: A Text-Mining Approach*

Elena Kim, Wenjun Wang, Jaewon Choi†

Soonchunhyang University, Asan, South Korea
{voogiejam22, dwzhzsa22, jaewonchoi}@sch.ac.kr

Abstract

As the global electric vehicle (EV) market moves from a high-speed growth to a stable development phase, consumer complaints are becoming increasingly evident through negative comments on social media, which are a key source of post-adoption feedback and are also important drivers of technology and service innovation. To this end, this study aims to analyze negative reviews related to electric vehicles to identify major influencing factors of consumer complaints and explore implications for market acceptance and innovation strategies. Based on 134,374 comments collected by the Reddit platform from 2023 to 2024, the study will conduct text mining using methods such as emotion analysis, LDA thematic modeling, and keyword air network analysis. As a result, we identified three main complaint topics: brand awareness and cost-effectiveness deviations, disability of use such as mileage and charging convenience, and battery performance and manufacturer trust issues. The study combines expectation mismatch theory with social media marketing theory to theoretically interpret the above findings, validate the theoretical value of text mining methods in capturing consumers' real-world experiences after use, and present practical suggestions in terms of product optimization, service improvement, and public opinion management.

1 Introduction

The global electric vehicle (EV) market has continued to grow in recent years. According to 2023 data from SNE Research via Korea Economic Daily, the global EV market grew at an annual rate of 33.5%. However, market growth is expected to slow down somewhat from 2024 due to the impact of short-term economic uncertainty. The current trend of slowing growth can be attributed to the adjustment of production and sales strategies of finished car companies against the backdrop of a macroeconomic downturn. Based on data from the (IEA), the Chinese and European markets are forecast to face a significant slowdown in growth. Nonetheless, the European market is expected to rebound mainly on electric vehicles in the second half of 2024. The North American market is not growing well overall, affected by Tesla battery supply issues and delays in launching low-cost models by other automakers. Asia and other regions are expected to maintain relatively stable growth led by major automakers in each country. This global market trend not only indicates that the electric vehicle industry is in a structural transition phase but also highlights that consumer acceptance and dissatisfaction feedback play an important role in future growth engines. Therefore, it is

*Proceedings of The 2025 IFIP WG 8.4 International Symposium on E-Business Information Systems Evolution (EBISION 2025), Article No. 1, December 16-18, 2025, Sapporo, Japan.

†Corresponding author

necessary to deeply analyze the consumer's specific dissatisfaction with the electric vehicle technology, services, and policy environment from the perspective of user experience and feedback to discover the innovative potential and market optimization direction behind it. Global EV (EV) shipments continue to increase, according to the International Energy Agency. (2024) According to data from 2017 to 2023, the global EV (including BEV and PHEV) averaged 45.8% compound annual growth (CAGR). Of those, annual shipments in 2023 reached 13,969 thousand units, up 32.5% from 2022 (10,540 thousand units). In the first quarter of 2024, it reached 3,139 thousand units, up 20.4% year-on-year. While overall growth is positive, the pace of growth has slowed somewhat, and the market has entered a phase of transition from high-speed growth to stable development.

In terms of regional distribution, China is the world's largest market, with sales reaching 53.4% in the first quarter of 2023 with 13.92 million units, followed by Europe and North America with 26.0% and 13.0%, respectively, according to a report by SNE Research 2024. It should be noted that despite the leading positions in the Chinese and European markets, growth engines are slowing, while other parts of Asia and the "other" market are showing constant growth momentum. On the manufacturer side, data from Q1 to Q3 2023 showed that BYD had the largest deliveries of 5.8 million units, followed by TESLA (5.25 million units, 16.7%) and Gely (2.47 million units, 7.9%). Traditional automakers such as Volkswagen (VW), Stellantis, and Hyundai & Kia are also accelerating their deployment to the new energy vehicle sector, gradually forming a diverse competitive landscape. At the same time as the global market expands, consumers still have many gaps between their actual experience and expectations of electric vehicles, especially complaints about battery mileage, safety, convenience of charging, and policy support. This negative feedback is frequent on social platforms and comment areas and has become potential drivers for corporate innovation and policy optimization. Therefore, deep excavation of structural problems reflected by negative comments from consumers will help promote technological improvement and strategic restructuring in the electric vehicle market. With the global spread of electric vehicles, related safety and infrastructure problems are also increasingly emerging, and they are an important cause of consumer dissatisfaction. Several accidents involving electric vehicles have occurred in recent years, causing the public to be highly interested in the risk of using them. For example, on Sept. 8, 2024, a five-star hotel in Hangzhou, China, refused to allow electric vehicles to enter an underground parking lot for fear of safety risks in the underground space (Jimu News, 2024, September 6). On Aug. 1, 2024, a Mercedes-Benz EQE 350 caused a massive fire in an underground parking lot when its batteries spontaneously ignited in an underground parking lot in Incheon, South Korea, which damaged 480 homes and left several homeless (Chosun Ilbo, 2024, August 2). Similar events highlight the practical challenges electric vehicles face in their use in urban settings. On the one hand, parking lot management has set entry limits for safety considerations, on the other hand, electric vehicle users are strongly dissatisfied with the uniform policy, and they believe the lack of reasonable management measures will affect the convenience of using and willingness to purchase the vehicle. In key urban areas, the failure of electric vehicles to enter underground parking spaces in the absence of ground parking space resources will have a significant impact on day-to-day use and market acceptance.

Therefore, the controversy over the safety of electric vehicles and the lack of support infrastructure have become important variables that affect consumer satisfaction and restrict market expansion. Consumers' complaints about safety norms, convenience of charging, fairness of policy, etc. are becoming increasingly clear in the form of online comments, etc. These negative public opinions not only reflect the "pain points" of the user's actual experience of use but also provide a true database for companies to optimize their product design and complete the government's support policies. The way to scientifically identify and respond to these structural complaints will directly determine the sustainable growth path of the future electric vehicle market. Given the shortage issues revealed in the rapid development of the electric vehicle market and the resulting widespread dissatisfaction of consumers, systematic identification and analysis of these complaints have become an important entry point in promoting industrial innovation and policy optimization. Therefore, this study aims to identify key factors influencing consumer complaints through text mining analysis of online reviews related to electric vehicles, and to explore the mechanisms by which these factors affect brand attitudes and market acceptance intentions.

This study will systematically organize and analyze negative comments posted by consumers on social platforms by utilizing text mining technology. It focuses on the problems that exist in the functional aspects of electric vehicles (e.g., battery mileage, convenience of charging, driving experience, etc.) and clarifies the path of impact on consumer complaints to provide a decision-making basis for companies to optimize their product function and service experience.

Based on the above background, this study raises two key research issues.

1. In terms of technology, service, and policy, what are the specific factors that significantly affect consumer dissatisfaction?

2. What role do consumer complaints play in the process of innovating a company's technology and adjusting its market strategy?

2 Theoretical Background

2.1 Current Status of Research on the Electric Vehicle Market

As global environmental policies have become stricter and sustainable technologies have developed in recent years, the industrial structure and consumption behavior of electric vehicles as important means of clean energy transfer have gained researchers' attention. From discussions on initial affordability and policy support to studies focusing on more action-oriented perspectives such as consumer awareness, usage experience, and satisfaction in recent years, existing studies have provided a solid foundation for model building and variable extraction in this study. Although the initial purchase cost of an electric vehicle is relatively high, it has an overall economic advantage due to low energy and maintenance costs for long-term use (Hackbarth & Madlener2013). Reports from IEA (2021) and Statista (2022) confirmed the rapid growth trend of the electric vehicle market from a macro perspective, especially with the Chinese market accounting for more than 50% of the global market, showing a strong growth engine. Consumers' perception and experience of electric vehicle technology have also become important variables that affect acceptance and satisfaction. Consumers' technology familiarity and actual driving experience have a great influence on product evaluation and willingness to adopt (Bühler et al., 2014). At the microscopic level, we analyzed non-owners and real-world user experience data, investigated the determinants of pure EV user satisfaction (especially cost savings, mileage, and rates) and their impact on share buyback/recommendation intentions. Previous research has discussed the structure and behavioral factors of the EV market from various angles, but it has mainly focused on traditional questionnaires or interviews and has not sufficiently integrated them into information sources that allow consumers to quantify the "discontent feelings" expressed on social media after actual use. The study seeks to structure negative reviews using text mining methods to fill gaps in existing research at the "post-action feedback" level and further reveal the relationship between consumer complaints and corporate innovation and market acceptance (Okada, 2019; Kwon et al., 2020).

2.2 Consumer Review Analysis and Text Mining Research

With the mass emergence of user-generated content (UGCs), comments from consumers on social platforms, forums, and e-commerce websites are increasingly important data sources for understanding user needs and complaints. Compared to traditional research methods, online reviews have more integrity, timeliness, and autonomous expressiveness, especially in high-interest products such as electric vehicles, users often express their experience of use and negative emotions through review channels. As a result of studying text mining and subject modeling analysis through Weibo review, it was found that brand, convenience of charging, battery technology, safety, and policy impact are key factors influencing the decision to purchase electric vehicles, and the public's attitude is generally positive, providing important reference materials for industry development and policy making. However, this study has a short research cycle with Weibo as the only data source and has limitations in excluding new technologies such as autonomous driving. Future research should expand into various platforms to consider long-term data and seek the impact of new technologies on consumer

behavior for an overall understanding of the changing electric vehicle market. Keywords and topics of satisfaction and dissatisfaction derived through text mining play an important role in suggesting ways to strengthen Hyundai's competitiveness. Through online reviews, we found that different types of automotive consumers, such as 'space', 'power performance', and 'brand comparison', have the same needs for vehicles, with unique needs such as 'look', 'safety', 'service', and 'new energy characteristics'. Consumers who buy new energy vehicles are still used to comparing them to brands or models of internal combustion engines. New energy vehicle consumers pay more attention to service and quality of service as they purchase and use the vehicle (Wang et al., 2023). A broader comparison of consumer and media views on EVs aims to identify differences and commonalities in perceptions and discussions about EVs (Jiang, 2021, Carpenter, 2015). By analyzing data collected at a user discussion forum related to EVs, they identified critical emotions and topics of interest and found that "distance driving anxiety" and "price" were the two main obstacles to EV penetration. While previous studies have sufficiently validated the validity of review data in insight of consumer behavior, most studies still focus on emotional polarity judgment and scoring distribution analysis, and negative reviews are not structured as theoretical variables for model building and path validation. Considering that existing studies rarely discuss in-depth discussions by converting negative consumer reviews into structural variables, this study extracts complaints through text mining methods and interprets them from the perspective of expectation mismatch theory and innovative resistance theory to enrich the theoretical understanding framework of consumer reviews.

2.3 Consumer Complaints and Electric Vehicle Innovation Driving Mechanism

Not only does consumer dissatisfaction reflect barriers to experience in use, but it also constitutes an important driving force for technological innovation and market system improvement in many situations. According to several studies, complaints from EV users are often focused on charging inconvenience, lack of mileage, safety hazards, and high purchasing costs, which are objectively affecting acceptance but at the same time facilitating manufacturers and policymakers to continuously optimize their products and services. Compared to environmental protection and long-term affordability, consumers are more concerned with practical issues such as price, mileage, and infrastructure safety. This shows that technology and service imperfections are still key obstacles to EV purchases (Egbue & Long, 2012). Consumers have a negative overall attitude toward EV technology and are particularly concerned about charging times and equipment failures (Jena, 2020). Consumers are generally concerned about breakdown events such as "failures while driving" in the early stages of market acceptance (Eugensson et al., 2013). Gerssen-Gondelach & Faaij (2012) believe that market acceptance will continue to be limited unless battery costs fall further to a reasonable extent and realize operational cost comparability with traditional cars. From an earlier research point of view, electric vehicles are only suitable for home charging, and a lack of commuting and public space support will make it difficult for the "second vehicle function" outside the home to be exercised (DeLuchi et al., 1989). Factors such as the range of public charging facilities and access to charging at workplaces have become important policy levers affecting the speed of dissemination (Slowik and Lutsey, 2017).

Consumer complaints can be summarized as functional impairments (e.g., charging technology, price, and mileage) and situational impairments (e.g., ancillary facilities, safety concerns), and these factors not only constitute resistance to current market expansion, but also facilitate companies to perform some optimization and upgrade in terms of core performance. Therefore, in this study, we combine the types of complaints summarized in prior literature with the text mining results of this study to analyze specific expression formats and semantic structures in consumers' online reviews to explore potential innovative implications and market acceptance-related implications.

2.4 The rationale for consumer reviews and text mining

2.4.1. Consumer Reviews

Consumer review refers to the act of sharing, recommending, and communicating the experience of using a product or service through an online platform. In the background of the spread of digital platforms in particular, online reviews have not only become a key channel for business-to-consumer interactions, but also an important data source for brand management and consumer awareness research. Recent research has shown that consumer reviews can not only reflect individuals' subjective emotions but also extract meaningful information through structured methods. Technologies such as topic modeling can identify high-frequency agendas in large texts, helping brand awareness, ad optimization, and crisis response (Calheiros et al., 2017).

2.4.2. Text Mining

Text mining is a branch of data mining that focuses on extracting potentially meaningful information, patterns, or structures from large volumes of unstructured text (Douglas, 2012). Unlike traditional surveys, text mining is capable of processing vast amounts of naturally generated data, making it suitable for big data analysis in various fields, especially in marketing, public opinion monitoring, and consumer insight. Text mining methods can be widely used in various fields such as education, healthcare, and policy as well as market research. This is because users can effectively capture natural language expressions in real-world environments. Applications in consumer research are particularly suitable for complaint identification, purchase decision analysis, and psychological model building. Combining the theoretical basis of consumer review and text mining, this study systematically identifies key consumer complaints in EV use based on negative evaluation data from social media and provides theoretical support to understand the source and expression mechanism of the complaint.

2.5 Core Theory Foundation

2.5.1. Expectation Disconfirmation Theory (EDT)

Expectation Disconfirmation Theory (EDT) is an important theoretical framework for explaining the mechanism of consumer (unsatisfaction) formation. Disconflict occurs when consumers' actual experience with a product or service falls short of expectations, affecting future behavioral intentions (Oliver, 1980). In the EV situation, this theory is particularly appropriate. For example, automakers typically emphasize the maximum charging efficiency and service time supported by EVs in marketing, but when consumers find distinct differences from advertising in real-world use, "expectation gaps" are likely, which can develop into negative reviews or brand boycotts (Rosenberg & Czepiel, 1984).

In this study, we leverage the Expectation Disconfirmation Theory (EDT) theoretical framework to explore how differences in consumer expectations for technical performance (e.g., charging efficiency), service experience (e.g., customer service and repair), and policy support (e.g., subsidy and parking policies) contribute significantly to complaints.This study believes that the 'expectation discrepancy' that occurs in the process of consumers using electric vehicles is a key psychological mechanism that forms negative emotions and affects their acceptance attitude.

2.5.2. Social Media Marketing

Social media marketing is an important theoretical tool that has been widely used in the field of consumer behavior research and brand communication in recent years. Social media means "online platforms and systems that allow interaction, collaboration, and content sharing among users." Examples include Reddit, Weibo, forums, and evaluation sites (Richter & Koch, 2007; Seo & Park, 2018). Social media is further defined as an "interactive information delivery mechanism based on Web2.0 technology," highlighting the importance

of real-time and engagement in the marketing system. In the EV sector, social media is not only the primary route of expressing consumer opinion, but it is also the key point of contact for companies to gather user feedback and coordinate their market strategy (Gunelius, 2011）.

Therefore, negative comments on social media platforms are not only expressions of genuine dissatisfaction from consumers, but also a window for brands and policymakers to understand market sentiment and optimize their strategies. Combined with social media marketing theory, this study highlights the mechanism of mutual feedback reflected by negative reviews from consumers.

3 Research Methods

3.1 Data Collection

The data in this study is taken from Reddit, a global social media platform, and focuses on users' online comments and discussions about electric vehicles. Through the Pushshift API tool, we collected original posts and comments containing the keyword "electric vehicle" from January 2023 to December 2024, collecting a total of 134374 user-generated content (UGC), including several subreddit (e.g., r/electric vehicles, r/interestablishedaspuck, etc.) that are closely related to electric vehicle issues. The crawl field includes comment body, post title, ID, author, created_utc, comment scoring, and subreddits sections. This data sample provides a sufficient basis for an in-depth analysis of user emotions, viewpoint topics, and comment structure.

3.2 Data Cleaning and Preprocessing

To ensure the accuracy and consistency of the analysis, the original text data was systematically cleaned and preprocessed in this study. First, it contains comment content, unrelated keywords, advertisement posts, or empty comments that are not related to EV topic. Second, it lowercases all text and deletes URL links, special characters, HTML tags, and other meaningless information. Finally, we perform word division, word removal, and punctuation theorem using Python's regular expression and natural language processing tools (e.g., NLTK). After multiple screenings, 32,384 valid texts were retained for subsequent analysis.

3.3 Sentiment Analysis

Sentiment analysis, as a key component in understanding public perceptions, has seen diverse applications and methodological advancements. This body of research not only shows the evolution of sentiment analysis techniques but also highlights its applicability across various domains(Tang et al., 2024). To identify the overall emotional tendency of users, this study performed a sentimental analysis for all reviews using NLTK's TextBlob tool. TextBlob is a Python library for processing textual data. It provides a simple API for diving into common natural language processing (NLP) tasks such as part-of-speech tagging, noun phrase extraction, sentiment analysis, classification, and more(Shao, 2025).This method classifies each review into positive, neutral, or negative emotions based on the polarity score, and considers it positive if the polarity score is >0.1, negative if <-0.1 and neutral if the rest. As a result of the analysis, 35.5% of positive reviews, 52.0% of neutral reviews, 12.5% of negative reviews, and 12.5% of negative cleaning reviews were the focus of this study.

3.4 Topic Modeling using LDA

To identify potential structural topics in negative reviews from consumers, the Latent Dirichlet Allocation (LDA) method was used in this study for thematic modeling. Latent Dirichlet Allocation(LDA) Topic modeling is a powerful technique in natural language processing (NLP) for uncovering latent topics and semantic structures in unstructured text (Blei & Jordan, 2003). In the topic modeling stage, this work uses the Latent Dirichlet Allocation (LDA) algorithm to perform unsupervised modeling on text data with negative emotion classification to identify potential structural semantic topics in the review text. The model models the probability of the text based on the probability of air between words and outputs the representative keywords in each topic and the probability distribution in the topic (i.e., weight).In this study, model adjustment was performed based on the cohesion score (topic consistency index) to secure model interpretation and subject concentration, and the number of subjects was finally determined to be three(3).

For each topic, the system outputs the top 10 keywords and their corresponding probability

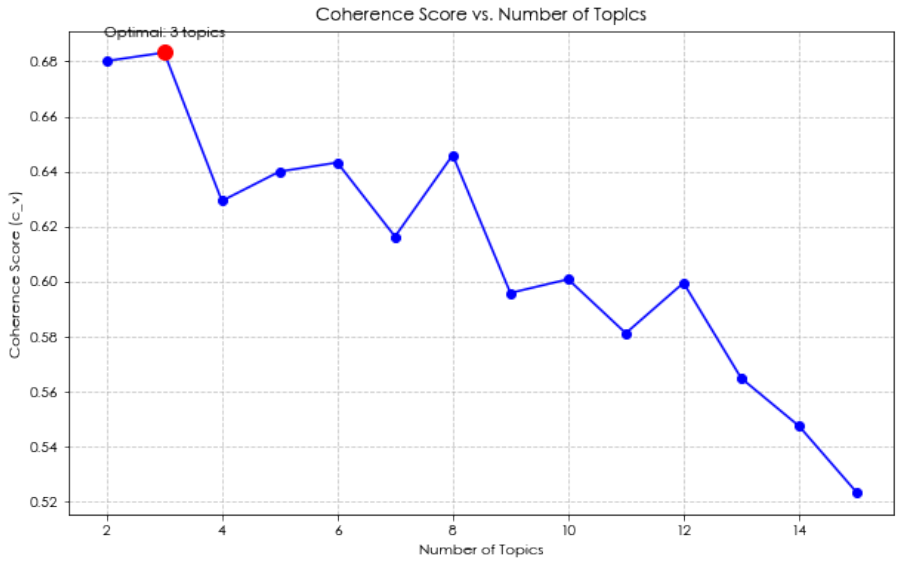

Figure 1: Topic Coherence Scores for LDA Model Selection

values. Higher weights mean that words are more representative and more semantic-centric in the topic. These keywords and weight values form the basis of subject tag naming and subsequent semantic interpretation and provide an initial set of variables for core node screening in co-occurrence network analysis.

4 Analysis Results

4.1 Sentiment Analysis Results

The study first identified overall user attitude trends by emotionally classifying 32,384 Reddit user reviews related to electric vehicles. After using the TextBlob tool to analyze the polarity score of the text, emotions are divided into three categories: positive (score >0.1), negative (score <-0.1), and neutral (between -0.1 and 0.1).

According to the results of the analysis, 35.5% of the comments expressed positive emotions, 52.0%were neutral, and only 12.5% expressed distinct negative emotions. Although the overall attitude is relatively optimistic, these negative comments intensively reflect the key complaints of users during the use of electric vehicles, as shown in Figure 2.

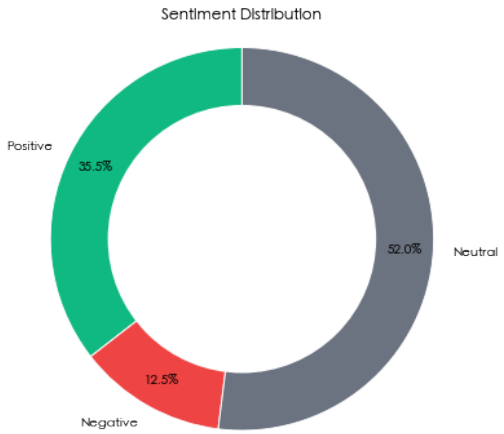

Figure 2: Sentiment Distribution of EV-related Reddit Comments

4.2 LDA Topic Modeling Results

In order to systematically identify the main topics of consumer concern in negative reviews, we conducted a study to model preprocessed negative texts using the Latent Dirichlet Allocation (LDA) method. As a result of optimization through the topic coherence score (0.68), we finally extracted three semantic representative topics. Each topic consists of Top10 high-weight keywords and summarizes artificial semantic labels in combination with keyword context.

• Topic 1: "Tesla", "Model", "Price" and "Ear" in this topic keyword represent the differences in consumer expectations for a particular brand, model, and price-to-performance, reflecting variations in brand perception and hesitancy in purchasing.

• Topic 2 (speed and charging convenience): Represented by 'range', 'charge', 'mile', and 'trip', it highlights users' realistic complaints about the convenience of using electric vehicles such as long-distance driving and charging facility distribution.

• Topic 3 (battery performance and manufacturing trust): Keywords "battery," "china," "company," and "trust" indicate user concerns about battery safety, production site trust (e.g., from China), and supply chain transparency.

Each topic represents a major axis of EV user complaints, and the core keywords and

	Topic1		Topic2		Topic3
word	**weight**	**word**	**weight**	**word**	**weight**
tesla	0.046	car	0.055	battery	0.029
year	0.026	ev	0.042	people	0.018
model	0.017	range	0.015	u	0.016
new	0.012	charge	0.014	china	0.014
price	0.012	vehicle	0.014	dont	0.014
im	0.009	also	0.014	good	0.014
sure	0.009	mile	0.013	company	0.013
never	0.008	time	0.013	chinese	0.011
money	0.008	much	0.012	thing	0.01
Look	0.008	even	0.011	way	0.01

Table 1. Top 10 Keywords and Weights for Each Topic

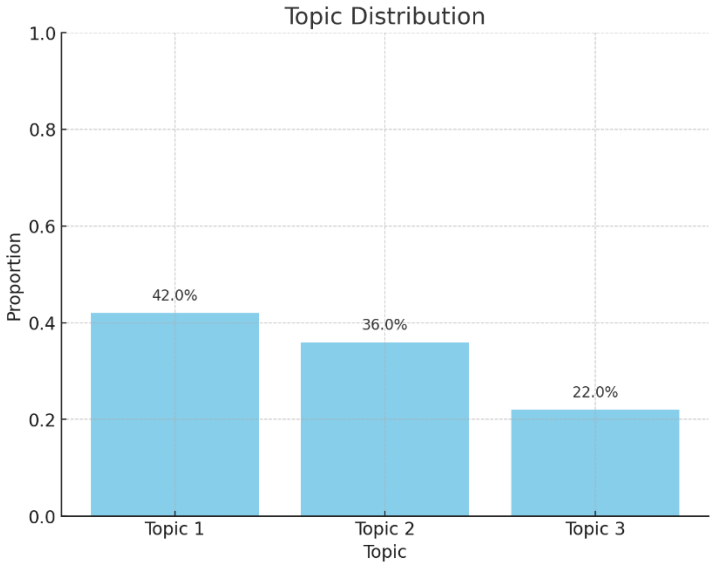

Figure 3: Topic Distribution across Negative Reviews

semantic structures of these topics can be interpreted as coming from multiple factors such as mismatch between consumer expectations and experiences, functional product defects, and failures in brand communication. The proportions of each topic are visualized in Figure 3 and can serve as foundational data for deriving strategic implications.

The changes in topic distribution across years are presented in Figure 4. In 2023, negative consumer reviews were primarily concentrated on Topic 1 (brand/value for money), which accounted for 40.35%, followed by Topic 2 (battery/charging, 32.26%) and Topic 3 (battery/trust, 27.39%). In 2024, the share of Topic 1 rose to 43.68%, indicating a continuous increase in complaints related to brand purchases, while Topic 3 declined by about 7% to 25.02%.

To test the statistical significance of these shifts, the study applied a chi-square test to compare the topic distributions between 2023 and 2024. The results showed $\chi^2 = 31.301$, df = 2, $p < 0.001$, confirming a significant change in consumer focus over the two-year period.

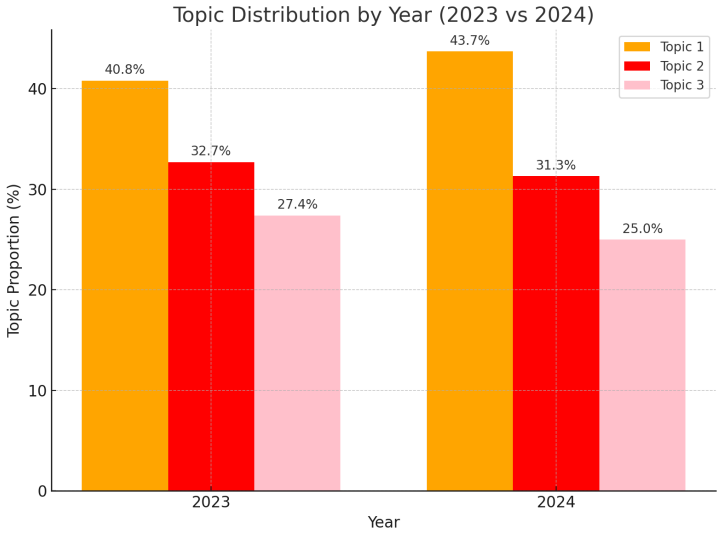

Figure 4: Topic Distribution by Year

4.3 Co-occurrence Network Analysis Results

To provide an in-depth interpretation of the LDA results, this study performed a co-occurrence-based network analysis. This analysis established connections based on the frequency of keywords appearing together within the same review, visualizing the results as a network to examine both the semantic structure and centrality patterns among keywords. The network analysis revealed that 'car' emerged as the central node of the entire network, with 'electric', 'EV', 'people', 'drive', and 'battery' appearing as closely connected keywords. This structure suggests that discussions about electric vehicles are strongly connected not only to technical specifications but also to issues of social acceptance. Furthermore, keywords such as 'battery', 'range', 'charging', 'China', and 'charging station' exhibited high degree centrality and betweenness centrality across multiple clusters, indicating they constitute core themes of consumer dissatisfaction. These keywords reflect concerns about battery reliability, range anxiety, charging infrastructure accessibility, and national technological trustworthiness, revealing the complexity and depth of consumer perception structures through their interconnectedness.

Notably, ‘battery’ is strongly linked to ‘trust’, ‘fire’, and ‘quality’, emphasizing that consumer concerns extend beyond technical defects to encompass emotional anxiety and broader skepticism about brand reliability. Similarly, ‘charging’ and ‘charging station’ are connected to ‘accessibility’, ‘waiting’, and ‘cost’.

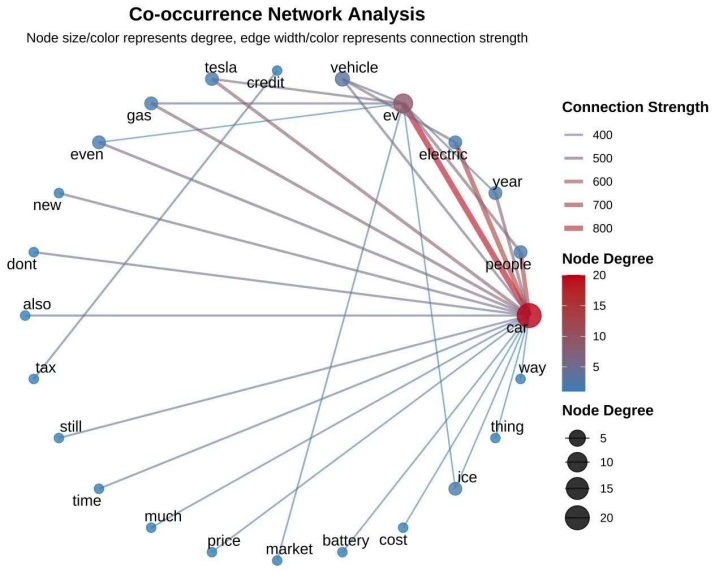

Figure 5: Co-Occurrence Network Analysis

5 Discussion

5.1 Structural features of consumer complaints about electric vehicles

In this study, through LDA modeling and keyword air analysis of negative reviews, the structural theme framework of consumer complaints was revealed. Consumer complaints are not a single-dimensional emotional expression, but rather a diversified structure formed around the product brand image, convenience of using technology, and trust in the supply chain. Among them, complaints about charging convenience and driving distance anxiety (Topic2) show the highest air strength, reflecting the core contradiction between "actual performance" and "expected value" in the process of use.

Understand and interpret from two theoretical perspectives: Expectation Disconfirmation Theory (EDT) and Social Media Marketing Theory. First, according to EDT, when consumers' experience falls short of previous expectations after using an actual product or service, they develop a perception of "negative discrepancy," which causes complaints. Among the three topics extracted from the LDA analysis in this study, Topic1 (considering brand awareness and vehicle purchase) and Topic2 (driving distance and charging convenience) clearly reflect differences in user expectations in terms of brand value perception, price rationality, driving distance performance, and ease of use. This discrepancy between expectations and reality constitutes an important cause of negative emotions in consumers. Second, from the perspective of social media marketing theory, the comments left by users on social platforms are not just information sharing, but social expression behavior, which has interactivity,

propagability, and public influence. In particular, the words 'battery', 'China', and 'trust' in Topic 3 are not just expressions of the experience of using technology on social media, but they also indicate that they have expanded collective awareness of brand sources, national images, and trust in products through the social space. These collective perceptions and remarks indirectly affect potential users and reflect the mechanism of social media's expansion of public opinion in the process of consumer evaluation and dissemination.

Therefore, the consumer dissatisfaction revealed in this study not only stems from the gap between expectations and reality but also reflects the propagation characteristics and psychological mechanisms of user evaluation behavior in the social media environment. This dual interpretation path helps to understand more comprehensively the mechanisms by which negative reviews work in market awareness formation and brand attitude building.

The findings provide important implications for product improvement and strategy optimization in the electric vehicle industry. Consumers repeatedly mention the convenience and driving distance of charging, advising that companies should prioritize addressing issues of compatibility with infrastructure compatibility, fast charging technology, and suitability with vehicle owners' daily usage habits. Second, distrust of brands and safety reflects public awareness disorders, and manufacturers should strengthen their efforts in information transparency, brand communication, and supply chain management. In addition, opinions such as "lack of policy support" and "parking restrictions" in negative comments suggest that the government should be more fully equipped with supportive policies when promoting EV distribution.

6 Conclusion and Future Research

Based on 134374 EV-related comments on the Reddit platform, this study systematically identified the core thematic structure of consumer complaints through text cleaning, emotion analysis, LDA thematic modeling, and keyword air analysis. According to the study, users have a collective and structure with clear dissatisfaction with brand value, convenience of mileage and charging, battery trust, and policy support, and can provide a data base and user perspective for service optimization and technological innovation in the electric vehicle industry.

At the theoretical level, this study has extended the application of text mining methods in consumer behavior research, providing a new empirical perspective on the path mechanism identifying consumer dissatisfaction, especially in the post-adoption stage. Through means such as emotion analysis and LDA subject modeling, the interpretive power of unstructured social media comment data in terms of restoring user real-world experiences, differences in expectations, and identifying potential demand has been studied and verified. Furthermore, this study combines the theory of expectation disagreement (EDT) and the theory of social media marketing (Social Media Marketing), providing an inter-area interpretation framework for the theoretical construction of negative reviews and expanding the theoretical depth of the study of consumer dissatisfaction and brand response mechanisms.

On a practical level, it was built by studying the logic of extracting structural variables based on user reviews, which helps EV companies accurately identify user grievances and acceptance resistance in many aspects, including product design, policy communication, and brand management. For example, frequent complaints about "distance driving," "easy charging" and "battery safety" provided decision-making references for technology path optimization and investment in charging infrastructure, while negative feedback on "trust," "manufacturing sources" and "policy fairness" presented governments and manufacturers with directional proposals in terms of crisis communication and public education.

Despite the preliminary findings of this study, there are limitations: Data sources are limited to a platform called Reddit. Although openness and breadth of topics are representative, user groups can be focused on a particular culture or group of interest, with certain sample deviations and limitations of cultural context.

Future research can first expand data sources to other social media platforms (e.g., Twitter, ZhiHu, Naver, Facebook, etc.) to build a contrast analysis system in multilingual and multicultural backgrounds to increase the external efficiency and universality of research. Second, future research can also present a dynamic mechanism between "review change-

brand response-market behavior" by dynamically tracking the trajectory of evolution in which consumer sentiment changes according to brand events or policies by introducing time series analysis or event analysis methods.

References

Blei, D. M., & Jordan, M. I. (2003, July). Modeling annotated data. In Proceedings of the 26th annual international ACM SIGIR conference on Research and development in informaion retrieval (pp. 127-134).

Bühler, F., Cocron, P., Neumann, I., Franke, T., & Krems, J. F. (2014). Is EV experience related to EV acceptance? Results from a German field study. *Transportation Research Part F: traffic psychology and behaviour, 25*, 34-49.

Calheiros, A. C., Moro, S., & Rita, P. (2017). Sentiment classification of consumer-generated online reviews using topic modeling. *Journal of Hospitality Marketing & Management, 26*(7), 675-693.

Carpenter, T. (2015). *Measuring & Mitigating Electric Vehicle Adoption Barriers* (Doctoral dissertation, University of Waterloo).

Chosun Ilbo. (2024, August 2). *전기차 1 대 화재가 부른 날벼락...차 40 여대 톨라고, 아파트 5 개동* [English translation: Single EV fire causes catastrophe...40 cars and 5 apartment buildings damaged]. Retrieved from: https://www.chosun.com/national/incident/2024/08/02/USJ33MN5PBDBNPJF4ZVQWAYGAM/

Egbue, O., & Long, S. (2012). Barriers to widespread adoption of electric vehicles: An analysis of consumer attitudes and perceptions. *Energy policy, 48*, 717-729.

Eugensson, A., Brännström, M., Frasher, D., Rothoff, M., Solyom, S., & Robertsson, A. (2013, May). Environmental, safety legal and societal implications of autonomous driving systems. *In International Technical Conference on the Enhanced Safety of Vehicles (ESV)*. Seoul, South Korea (Vol. 334).

Gerssen-Gondelach, S. J., & Faaij, A. P. (2012). Performance of batteries for electric vehicles on short and longer term. *Journal of power sources, 212,* 111-129.

Gunelius, S. (2011). *Content marketing for dummies*. John Wiley & Sons.

Hackbarth, A., & Madlener, R. (2013). Consumer preferences for alternative fuel vehicles: A discrete choice analysis. *Transportation Research Part D: Transport and Environment, 25*, 5-17.

Hemavathi, S., & Shinisha, A. (2022). A study on trends and developments in electric vehicle charging technologies. *Journal of energy storage, 52,* 105013.

International Energy Agency. (2021). *World Energy Outlook 2021*. Retrieved from: https://www.iea.org/reports/world-energy-outlook-2021#overview

International Energy Agency. (2024).*Global EV Outlook 2024: Trends and developments in electric vehicle markets[Report].* Retrieved from https://www.iea.org/reports/global-ev-outlook-2024

Jena, R. (2020). An empirical case study on Indian consumers' sentiment towards electric vehicles: A big data analytics approach. *Industrial Marketing Management, 90,* 605-616.

Jiang, X., & Everts, J. (2021). Making sense of electrical vehicle discussions using sentiment analysis on closely related news and user comments. *arXiv preprint arXiv:*2112.12327.

Koch, M., Richter, A., & Schlosser, A. (2007). Produkte zum IT-gestutzten Social Networking in Unternehmen. *WIRTSCHAFTS INFORMATIK, 49*(6), 448.

Kwon, Y., Son, S., & Jang, K. (2020). User satisfaction with battery electric vehicles in South Korea. *Transportation Research Part D: Transport and Environment, 82*, 102306.

Okada, T., Tamaki, T., & Managi, S. (2019). Effect of environmental awareness on purchase intention and satisfaction pertaining to electric vehicles in Japan. *Transportation Research Part D: Transport and Environment, 67*, 503-513.

Oliver, R. L. (1980). Conceptualization and measurement of disconfirmation perceptions in the prediction of consumer satisfaction. *Refining concepts and measures of consumer satisfaction and complaining behavior*, 2-6.

Rosenberg, L. J., & Czepiel, J. A. (1984). A marketing approach for customer retention. *Journal of consumer marketing, 1*(2), 45-51.

Seo, E. J., & Park, J. W. (2018). A study on the effects of social media marketing activities on brand equity and customer response in the airline industry. *Journal of Air Transport Management, 66*, 36-41.

Shao, Y. (2025). Exploring Text Classification and Emotion Detection Using Keras Models on Reddit Data.

Slowik, P., & Lutsey, N. (2017, July). *Expanding the electric vehicle market in US cities*. Washington, DC, USA: ICCT.

SNE Research. (2024.05.14). Global 전기자동차 시장 및 Battery 수급 전망 (~2035) [Global electric vehicle market and battery supply outlook (~2035)]. Retrieved from https://www.sneresearch.com

Tang, M., Cao, J., Fan, Z., Gong, D., & Xue, G. (2024). Public Perceptions of EV Charging Infrastructure: A Combined Sentiment Analysis and Topic Modeling Approach. *Studies in Informatics and Control, 33*(2), 59-72.

Wang, X., Cheng, Y., Lv, T., & Cai, R. (2023). Fuel vehicles or new energy vehicles. A study on the differentiation of vehicle consumer demand based on online reviews. *Marketing Intelligence & Planning, 41(*8), 1236-1251.