CHAPTER 1

INTRODUCTION

1.1   Overview

In recent years, driven by technology and policy, the electric vehicle (EV) market has developed rapidly, and the world's major automakers, including Tesla, BYD and Nissan, have continued to innovate and create many high-tech, high-performance, and high-quality electric vehicle models, which are deeply loved by market consumers.

The widespread popularity of electric vehicles not only reduces greenhouse gas emissions and helps protect the environment, "and also stimulates the growth of the new energy industry and profoundly changes the way people live their lives. Therefore, numerous countries and regions have implemented various policies to promote the advancement of electric vehicles, such as car purchase subsidies, tax exemptions as well as the development of charging infrastructure, etc., so as to accelerate the swift advancement of electric vehicles industry technology, mainly reflected in: battery technology, motor and control system, automatic driving technology and other technological progress, so that the battery performance, system safety, driving experience of electric vehicles have been significantly improved, and a variety of models with different energy technologies have been born, such as: Plug-in hybrid electric vehicles (PHEVs), pure electric vehicles (BEV), fuel cell vehicles (FCEVs), and hybrid electric vehicles (HEVs).

In the future, with the further development of technology, the cost of manufacturing electric vehicles will be reduced, and high-tech technologies such as intelligent and autonomous driving technology will be more deeply integrated into various types of electric vehicles, and the driving experience of consumers will continue to be optimized and improved, so as to gain more consumers' love, and the market share of electric vehicles will be further expanded.

1.2   Problem Background

In recent years, the electric vehicle (EV) market has grown rapidly due to the continuous advancement and maturity of electric vehicle (EV) technology, and the rapid development of this market is mainly due to several factors: governments have implemented measures to foster the growth of electric vehicles, such as providing purchase incentives, tax exemptions, and financial support for the development of charging infrastructure; Continuous innovation in battery technology, motor and control systems, and autonomous driving technology has significantly improved the range and economy of electric vehicles. Increasing consumer concern for environmental protection and energy conservation is driving the demand for electric vehicles; The reduction in production and maintenance costs has made electric vehicles more affordable.

Today, the major models in the global electric vehicle market include: battery electric vehicles (BEVs), which rely on battery energy storage to achieve zero pollution emissions; Plug-in hybrid electric vehicles (PHEVs): integrate electric propulsion with internal combustion engines to achieve extended range and greater flexibility in fuel choices; Fuel cell electric vehicles (FCEVs): hydrogen fuel cells generate electricity, suitable for long-distance transportation, and the emissions are only water vapor; Hybrid electric vehicles (HEVs): Charging through energy recovery, with high fuel economy, each model has a unique development history and characteristics, and has played an important role in reducing pollution, improving energy efficiency, and promoting the development of the new energy industry.

Despite the promisingness of the EV market, there are still some challenges, such as battery recycling, the deployment and adoption of charging infrastructure, and how to reduce production and operating costs. It is anticipated that, through the combined efforts of governments, enterprises, and scientific research institutions, along with continuous technological advancements and cost reductions, the electric vehicle market will experience sustained rapid growth, and the market share of electric vehicles will keep increasing. Based on the past development trend of electric vehicles, this research project will take into account various factors such as policy, science and technology, and public opinion, predict the development trend of the dominant models in the electric vehicle market in the future, provide

reference for the industry and policy makers, and contribute to the realization of global sustainable development goals.

1.3   Problem Statement

By analyzing the relevant historical data of the electric vehicle market sales since 2010, it is possible to analyze the trends and characteristics of the electric vehicle market, so as to predict the future development trend of electric vehicles. Based on this historical data, it can provide a strategic reference for automakers, policymakers, and investors.

1.4   Research Questions

The study focuses on the following research questions:

1. What is the trend of the development of the electric vehicle industry since 2010?

2. What are the trends and characteristics of the development of models in the historical development process?

3. Based on these trends, historical data, and national policies, what predictions can be made about the future?

1.5   Research Aim

The main objective of the research project is to comprehensively understand the historical development trend of the electric vehicle (EV) market by analyzing historical data from Kaggle and IEA Global EV Data Explorer, with a special focus on countries with high EV penetration rate and market influence, and to make predictions about the future development trend of various types of electric vehicles based on the changes in market

dynamics, policy popularization, and iterative updates of science and technology in recent years, so as to provide reference for the industry and policymakers. Contribute to the achievement of the global Sustainable Development Goals.

1.6 Research Objectives

Objectives of this study:

a) Analyze historical trends: Analyze historical data on the electric vehicle market from 2010 to 2023 to derive historical market trends.

b) Forecast future sales: Use advanced data science techniques such as predictive modeling and machine learning to predict the development trends of major electric vehicle models by 2030.

c) Evaluate influencing factors: Evaluate the impact of factors such as technological advancement, government policies, market dynamics, and consumer preferences on the development trends of various types of vehicles.

1.7 Research Scope (Current Work)

The scope and limitations of this study are as follows:

a) This study will be limited to analyzing historical electric vehicle market data from 2010 to 2023, and using data science techniques such as forecasting models and machine learning to predict the development trends of various types of electric vehicles from 2024 to 2030.

b) This study will evaluate the impact of factors such as technological progress, government policies, market dynamics, and consumer preferences on the adoption of electric vehicles. Methods such as regression analysis and factor analysis are used to identify key drivers and barriers that promote or hinder the widespread adoption of electric vehicles.

c) This study will use limited analysis to refer to multiple influencing factors (such as technological progress, government policies, market dynamics, and consumer preferences) to maximize the accuracy of electric vehicle sales forecasts.

d) The dataset for this study will use data provided by authoritative databases such as Kaggle and IEA Global EV Data Explorer to ensure the reliability and comprehensiveness of the data.

1.8 Expected Research Contribution

a) Theoretical Contribution：

In-depth analysis of electric vehicle market trends, especially for major countries with high penetration rates. This study further enriches the theoretical research on electric vehicle market trends by analyzing historical sales data, evaluating influencing factors, and predicting future sales.

b) Methodological Contribution:

Use a variety of advanced data science analysis and prediction techniques (such as predictive modeling and machine learning) to improve the accuracy of electric vehicle sales forecasts as much as possible. Provide feasible methods for optimizing analysis and optimization of the electric vehicle market.

c) Practical Contribution:

Provide scientific basis for the industry and policymakers to formulate policies and measures to support the development of the electric vehicle market, help formulate strategic plans and optimize resource allocation. By analyzing various influencing factors, it helps to promote the sustainable development of electric vehicles.

1.9 Thesis Organization

The main sections of the thesis are structured as follows:

Chapter 2: Literature Review

Extensively review the existing literature related to electric vehicle market development, technological progress, government policies, and consumer behavior. Analyze the research

background, explore the existing research gaps, and deepen the exploration of the research topics.

Chapter 3: Research Methods

Describe the methodology used in this study, including data collection, trend analysis, predictive modeling, and influencing factor assessment. Detailed information on data sources, analysis tools, and technical methods.

Chapter 4: Data Analysis and Results

Present the results of an analysis of EV sales data to identify key trends and patterns. Presents forecasts of future sales trends through predictive modeling and machine learning.

Chapter 5: Discussion and Recommendations

Discuss the key drivers and obstacles of the electric vehicle market based on the data analysis results. Corresponding countermeasures and suggestions are put forward to promote the healthy development of the electric vehicle market.

Chapter 6: Conclusions and Prospects

Summarize the main findings and contributions of the study, discuss the limitations of the study, and propose future research directions. Looking ahead to the development trends and potential impact of the electric vehicle market.

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In the future, with the further development of technology, the cost of manufacturing electric vehicles will be reduced, and high-tech technologies such as intelligent and autonomous driving technology will be more deeply integrated into various types of electric vehicles, and the driving experience of consumers will continue to be optimized and improved, so as to gain more consumers' love, and the market share of electric vehicles will be further expanded.