CHAPTER I
INTRODUCTION

This chapter includes research background, problem formulation, research objectives, research scopes, and outline of report.

1.1 Background

Global warming has become a massive term discussed in the last few decades. This phenomenon is characterized by an increase in the average temperature of the earth's surface, primarily propelled by the accumulation of greenhouse gases within the atmosphere. The consequences of global warming encompass detrimental effects on living beings and the environment, including the rising sea levels, irregular weather patterns, acidification of seawater, loss of biodiversity, and escalating health issues within the community (Sahoo, 2023). This triggers an upsurge in awareness among both the public and governmental bodies regarding the adverse repercussions of global warming, consequently driving significant undertakings to diminish greenhouse gas emissions as a means to alleviate the impacts of climate change.

Climate change is one of the main problems still faced by Indonesia today. One strategy to mitigate its effects involves reducing greenhouse gas emissions from transportation sector through the adoption of passenger vehicle electrification, commonly referred as electric cars. The electric car itself is one form of ground transportation that relies partially or entirely on electrical power as its energy source to drive its motor and stores its power in a battery (Cahyo, 2023). The widespread use of electric cars can have a positive impact in reducing exhaust emissions, minimizing environmental damage, and contributing to resource diversification through the use of renewable energy. As a relatively new and developing technology, the diffusion of electric cars is influenced by the level of knowledge and acceptance by the public in adopting new technology, necessitating the involvement of government and relevant industries in altering the prevailing transportation paradigm toward a more environmental friendly and emission free mode of transportation.

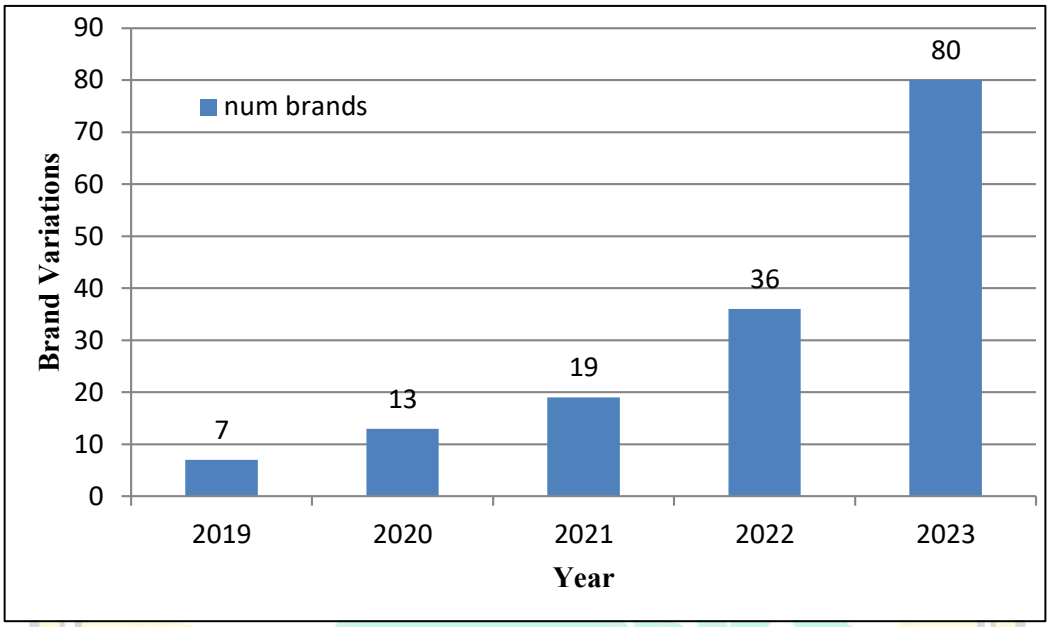

Figure 1.1 Proliferation of Various Electric Car Brands in Indonesia
(Source: Author's Data Visualization of GAIKINDO's Annual Report)

The availability of a diverse array of brand choices when purchasing electric cars signifies a positively reciprocal relationship between societal technology adoption and corporate competitiveness in sustainable transportation innovation. Based on processed data presented in **Figure 1.1**, *Gabungan Industri Kendaraan Bermotor Indonesia* (GAIKINDO) documented that in the year 2019, only seven electric car brands emanated from various automotive companies. This number gradually increased each year until it peaked in 2023 with the presence of 80 brands circulating in the market. This trend has created a competitive landscape among electric cars manufacturers, resulting in a wide range of products and slowly causing disruptions in industries reliant on the conventional automotive ecosystem.

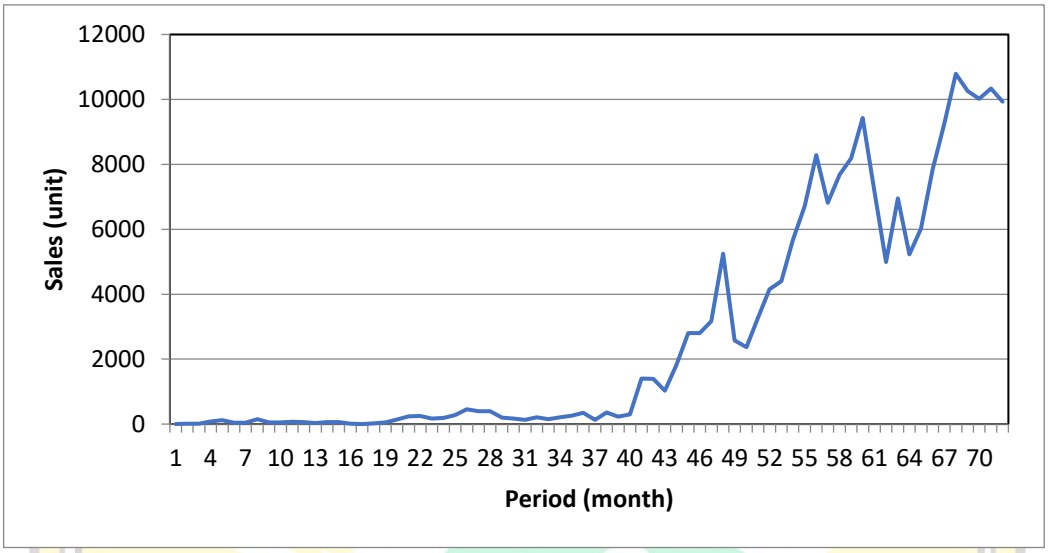

Figure 1.2 Electric Car Sales per Month in Indonesia

(Source: Author's data visualization of GAIKINDO's annual report)

The growth of the wholesale electric car market indicates a non linear development trend, as observed in **Figure 1.2**. This suggests that over time wholesale electric car sales continue to experience growth from month to month and then saw a drastic increase in subsequent phases The increase in sales trends can be explained by factors such as acceptance levels and the diversity of public perceptions regarding the development of electric cars. The chart also shows fluctuations in sales, highlighting the importance of accurate predictions in this industry, as these fluctuations can have a significant impact on production planning, inventory management, and the marketing strategies adopted by electric car manufacturers. Therefore, accurate forecasting is of utmost importance in comprehending and preempting market shifts, which do not always adhere to regular ascending trends within specific timeframes.

The transformation of electric car technology is the future mode of transportation that will replace fossil fuel vehicles, considering that the supply of fossil energy sources is limited and cannot be renewed (Olabi, A.G., 2023). However, the presence of electric cars in their early stages of adoption still sparks debates and discussions within society. The fundamental barriers and challenges faced in adopting electric cars during its initial phase are rooted in uncertainties that make individuals hesitant to transition. Some of the hindrances in the adoption of

electric cars include a lack of access to charging infrastructure, which hinders those interested in switching to electric cars. Moreover, uncertainties related to financing parameters, battery technology advancements, government incentive policies, the availability of diverse vehicle models, and the scarcity of repair workshops and qualified technicians are also obstacles (Rajeev, 2019). These uncertainties collectively create diverse sentiments within society, influencing the growth of the electric cars market. Therefore, it is essential for the government to identify the primary grievances stemming from public opinions as part of the improvement process in developing a better electric vehicle ecosystem.

The rapid expansion of information and communication technologies has significantly transformed the way society expresses opinions, shifting from word of mouth to an internet-based platform. This shift has not only broadened the reach and accessibility of conversations but has also redefined the boundaries of interaction and knowledge sharing. According to a report by We Are Social cited from DataIndonesia, the number of internet users in Indonesia reached 212.9 million at the beginning of 2023, with 167 million of them being active social media users. Considering the significant number of social media users in this age of digitalization, social media serves as a platform for the government and businesses in the automotive industry sector to convey information related to electric cars to as many prospective buyers as possible.

Twitter (X) as a very popular social media, has become one of the main choices in obtaining data sources in various academic research. (Al-Sarem *et al*, 2019). As a microblogging platform, Twitter facilitates users to share thoughts, express opinions, and convey information. Twitter's main advantage lies in its ability to provide real-time data and the ease of accessing data compared to other social media platforms, as well as its capacity to provide conversational data on a large scale. With a population of around 24 million active Twitter users in Indonesia and ranked sixth globally, this platform has significant potential in representing various trends and patterns of behavior related to frequently discussed products or services. (Sadya, 2023). This provides numerous research opportunities to gather

information, such as opinions and societal dynamics in an ever evolving digital environment with a large data population coverage.

The process of extracting information based on text data in the form of opinions is called sentiment analysis. Sentiment analysis is a framework for scrutinizing texts comprising opinions or stances towards a given issue, wherein the resultant analysis yields insights into the polarity of the text or document under examination, classifying it as either positive, neutral, or negative (Birjali, 2021). The concept of sentiment analysis finds applicability in comprehending public sentiment and is readily transferable across diverse domains, spanning the realms of governance, commerce, and marketing. It avails organizations and scholars the means to glean profound insights into the public's perceptions of specific subjects, products, or services. Furthermore, sentiment analysis serves as a catalyst for data-driven decision-making, an enhancer of customer contentment, and facilitating the analysis of grievances. It has become an integral component of data analysis in the era of big data, providing a channel for extracting meaningful insights from the vast source of textual information.

In most forecasting studies, current public sentiment is often overlooked as a factor influencing the volume of product or service sales. This research addresses that gap by developing a forecasting model for electric car sales that integrates both time series analysis and sentiment analysis derived from public opinion on Twitter (X). The expected outcome is to generate accurate future forecasts of electric car sales while supporting policymakers and the automotive industry in better understanding public perception, ultimately contributing to the development of a more robust electric car ecosystem.

1.2 Problem Formulation

The problems to be solved in this research are as follows:

1. What is the most common negative perception shared by people on social media about electric cars?
2. How to create predictive models to project upcoming sales of electric cars as a recomendation for making optimal decisions regarding the future.
3. What are the valuable insights on electric car sales forecasts and public perception that can be considered by the government and business actors in the automotive industry?

1.3 Research Objectives

The objective of this research based on the problem formulations above are as follows:

1. Identifying people's perception that most frequently appearing in discussions on social media about electric cars.
2. Creating predictive models to project upcoming sales of electric cars as a recomendation for making optimal decisions regarding the future.
3. Providing valuable insights into electric car sales forecasts and public perception as a consideration for government and business actors in the automotive industry.

1.4 Research Limitation

The limitations in this research are:

1. The data collected is national electric car sales data from various brands and online opinion data on social media Twitter (X) for six years, from January 1st 2019 to December 31th 2024.
2. This research focuses on the electric cars market in Indonesia, where companies are affiliated as members of the GAIKINDO association. Therefore, it excludes international markets and other types of vehicles.

3. Sentiment classification, consisting of positive, negative, and neutral categories, was applied to tweets written in Indonesian using VADER sentiment library, which was originally designed for English language texts. This approach required a prior translation process, which introduces several limitations such as semantic distortion, loss of contextual meaning, and reduced classification accuracy in capturing informal expressions commonly used on Twitter (X) social media.

1.5 Outline of Report

The outline of this final project report as follows:

CHAPTER I INTRODUCTION

This chapter consists of background, problem formulation, research objectives, research scopes, and outline of the report.

CHAPTER II LITERATURE REVIEW

This chapter contains theories from various sources related to the problems discussed in this study

CHAPTER III RESEARCH METHODOLOGY

This chapter outlines the research flow used by the author in conducting the study. The research methodology describes the stages or steps taken to ensure that the research is conducted systematically and with a clear purpose.

CHAPTER IV DATA COLLECTION AND PROCESSING

This chapter contains the data collected during the research process as well as the results of the data processing that will be used and needed in the analysis and interpretation chapter.

CHAPTER V ANALYSIS

This chapter presents an analysis of the discussion based on the data that has been collected and processed in the previous stages of the study.

CHAPTER VI CONCLUSIONS AND SUGGESTIONS

This chapter presents the conclusions derived from the analysis and interpretation of the data, as well as suggestions based on the research findings. The conclusions summarize key outcomes of the study, while the suggestions offer recommendations for future research and practical improvements based on the results obtained.