ANTICIPATING AUTOMOTIVE TRENDS: ENHANCING DECISION-MAKING WITH PREDICTIVE ANALYTICS IN RESPONSE TO CONSUMER PREFERENCES

**Introduction**

The study presented delves very deep into the automotive trends and the decision-making landscape. It narrows down how predictive analytics can bring about a new revolution in the approach that the industry takes to meet consumer preferences in automotive products and developing marketing strategies. The study adopts a dataset collected from Kaggle, which entails a collection of 97,712 used cars that encompass approximately 54 years, from 1970 to 2024. All these details on this dataset provide a comprehensive picture of changes undergone by automobiles over these five decades. The details include invaluable insights in the hands of researchers and enthusiasts, and ultimately, industry professionals. The data was filtered to contain the data from 2000 to 2024, this aided to narrow the scope of the analysis to recent trends and developments. The filtered data contained 97, 690 records.

In the world of automotive, change is constant in the market dynamic due to consumer preferences that keep on changing. In case such a market has to remain valid and competitive in the already developed market, then it is a mandatory case for automotive companies to understand these preferences and suit their products accordingly. In this study, hence predictive analytics will be applicable with the intention of unveiling underlying patterns and future trends in consumer conduct that will help the automotive make viable predictions and react properly to market shifts.

Knowledge obtained through both literature and prior research sheds light to the system ofautomotive trends and consumer behavoiur. Past literature reviews have expressed the overall impact of factors such as price, transmission type, fuel efficiency, and the reputation of the manufacturer upon the purchase decision. Building upon this existing knowledge will illustrate a greater degree of understanding with relation to the way in which these factors affect preference over time.

**Research Objectives:**

The primary aim of this study is to investigate the impact of predictive analytics on enhancing decision-making processes within the automotive industry, in response to changing consumer preferences. Specifically, the study aims to:

1. Analyze the relationship between car feature such as price, transmission type, mileage, fuel type and consumer preferences.

2. Develop Predictive Models for Car Pricing based on Year, Mileage, Fuel type, and Manufacturer.

3. Analyse the trend of change in car price with different clustering mode in different years, type of transmission, and different types of fuel.

4.Compare the performance of different manufacturers in terms of price, mileage, and consumer satisfaction.

5. Explore how predictive analytics will help automotive companies to proactively respond to market trends and changing tastes.

Two hypotheses are proffered for this study. The first hypothesis examines the relationship between price sensitivity and transmission type in the automotive market. For this purpose, the variables of interest are: price, and type of transmission (manual, semi-automatic, automatic). The hypothesis is that consumers exhibit different levels of price sensitivity as a function of type of transmission since cars that are equipped with automatic transmissions are at a higher price realization than either manual or semi-automatic transmissions.

The second hypothesis focuses on examining the relationship between brand (manufacturer) and consumer preferences within the automotive market. It hypothesised that renowned automotive brands such as BMW, Volkswagen and Ford demonstrate higher levels of consumer loyalty compared lesser-known brands. This loyalty is expected to exert influence over consumer preferences, affecting their purchasing decisions and potentially influencing pricing strategies within the automotive market.

The predictive modeling and analysis of this study are analyzed and done through the very powerful data analytic and predictive modeling software called R Studio. In this case, the predictive analytics technique and complex techniques were put in place that allows one to explore the relationship that consumer preferences have against different automotive factors. It provided a statistical analysis platform, built predictive models, and offered insightful visualization to support research findings and recommendations of this study.

**Literature Review**

The literature review section begins with a study conducted by Gaddam (2013), which aimed to analyse the trends of production and sales in the automobile industry. According to the findings of the study, passable sales performance was realized, especially evident by a high growth rate in passenger vehicle production. The findings indicated passenger vehicles were to turn out to be the fastest emerging category of automobile. There was also a comparison of the categories of automobiles. The study, therefore, by Gaddam (2013) has proved to be very informative in regard to the nature of the customer change in the automobile market. According to Passenger Vehicles Market Size, Share, Demand & Revenue Analysis (2023) cited in Gaddam (2013) passenger vehicles became the most important aspect of overall sales trends. It is through this study that forms a background in comprehension of the wider context of automotive production and sales. Study by Gaddam (2013), forms the groundwork for further probing on consumer preferences, market dynamism as part and parcel of these works.

Zpryme Research and Consulting (2010) conducted a survey study on anticipated demand for electric vehicles among consumers. With insights gathered from 1046 participants (men and women), the study revealed that 8.2% of respondents expressed a strong likelihood of purchasing an electric vehicle within the next two years, while 28.7% considered it somewhat likely. Over the subsequent five years, 25.8% of those initially categorized as somewhat or very unlikely expressed intent to buy. Price emerges as a primary consideration, influencing 66.8% of respondents, followed closely by fuel efficiency (50.4%) and environmental concerns (64.1%) among those inclined to make a purchase. Additionally, preferences regarding driving range are discerned, with 33.7% favoring a range of 650 km and 33.3% preferring 500 km. A notable portion (31.1%) of respondents is willing to pay more for electric vehicles, with percentages varying up to 5 lakhs above conventional vehicle prices. The data suggests a substantial demand for electric vehicles in the coming years, projected at approximately 30-40%, particularly for vehicles offering a range of 500-650 km and with consumers willing to invest an additional 2.5-5 lakhs compared to conventional vehicles.

Singh (2022) conducted a review study on the development of the automobile industry in India. The study aimed to investigate the challenges that contribute to the recent vehicle sales slump within the country. This was done to identify the dynamic landscape in the automobile market and what influence it had on customer preferences and the subsequent spending. This underlines the centrality of good customer satisfaction, which forms the bedrock of business success and all points to the implementation of good maintenance practices. Shen et al., (2012) cited in Singh (2022) noted that good practices could help end-users to maximize the benefits delivered over the life-cycle of their vehicles. In light of the above, study by Singh (2022) points to the need for better investment decisions within the sector if its stakeholders are to deliver better-quality services. The study also underlines an improvement in customer satisfaction levels. This study is so holistic in nature that it throws light on the various critical dimensions of the Indian automobile industry, so that necessary strategic interventions can be planned to deal with these challenges on one end, and optimize for customers on the other.

Singh (2014) discussed the consequences of shifting policies in expanding and exporting potential in the Indian automobile industry. The study, on its pretext, tries to reveal the influence traced on the policy landscape over the past three decades for the respect of industry growth and export intensity. The policy dynamics have been an important determinant that clearly depicts the expansion and export orientation of the automobile sector in India. Singh (2014) study has been a review of the role of policy frameworks that have remained, to date, at the cutting edge in shaping the trajectory of the automotive industry but more importantly, pointing out the same importance they still hold, that is, their impact on economic growth and global competitiveness.

In another related study, Singh (2017) conducted extensive research on the patterns of growth in the automobile industry and its concomitant economic implications in abundance by India. Out of this extensive research, the powerhouse by India in automobile has to present economic positive indicators ranging from GDP, Exports, Foreign Direct Investment (FDI), among others. The findings underline that the automobile industry is a linchpin in the Indian economy: it supports major employment generation, export revenues, contribution to GDP, and provides the bases for foreign direct investment in India. This study by Singh (2017) is quite enlightening about the various aspects in which the auto industry has related to economic development in India and also its importance to the growth and prosperity of the economy.

Sarangi (2014) undertook the step to understand and recognize the massive environment of the Indian Automobile Industry, taking years from 2013-14 to 2015-16 to study. The statistical approach of this study digs out the emerging trends within the Indian Automobile Industry while ascertaining the performance of different segments within the specified time frame. Though it had several ups and downs in the past, the findings of the study remained positive. Additionally, it also marked that positive growth had been seen by all the segments of the Indian automobile industry. Achen (2021) cited in Sarangi (2014) states that statistical analysis talks a lot about the strength and potential of the industry through which it can be understood and insight is availed regarding the trends and the dynamics of the industry to reach up to all the stakeholders. Ultimately, statistical analysis turns out to be a very helpful tool for the automobile industry. In turn, it lays the foundational framework for well-informed decision-making and strategic planning for Indian auto, offering invaluable guidance to the players in the industry and policymakers (Sarangi 2014).

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