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Application of Predictive Analytics in Consumer Buying Behaviour for Personal Use Automobiles: A Systematic Literature Review

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ABSTRACT
Advanced analytical methods have gained importance in the present times to determine, predict, and shape buying behaviour of consumer decision-making in personal-use automobiles purchase. This review is a synthesis of the present-day information regarding the use of predictive analytics as an analytical instrument in consumer behaviour study in the automobile industry. The research area incorporates the methods of predictive modelling, consumer preference analysis, and sustainability-related decision drivers to offer a comprehensive view of automobile purchase behaviour. Based on the study, the main result includes the fact that predictive analytics allows learning more about purchase intention, preference changes towards electric and environmentally friendly cars and inclusion of behavioural, social and environmental variables in forecasting. Besides, experiences of cross-industry applications, including food, fashion, and energy, prove that there are strategies that can be transferred, making predictive models of the automobile market more robust. The contribution of the review is that it integrates the disjointed research, balances theoretical models and their practical predictive uses, and identifies a research agenda that the integration of artificial intelligence, big data, and sustainability-driven analytics into the consumer behaviour of automobile consumers' needs to take in the future. The contributions provide viable implications to manufacturers, policy makers, and marketers who seek to make their products development and marketing strategy to keep pace with the growing consumer expectations in sustainable mobility....
Keywords: *Automobile Purchases, Consumer Behaviour, Electric Vehicles, Predictive Analytics, Sustainable Mobility.*

1. INTRODUCTION:

Predictive analytics has emerged as one of the most essential components of consumer research that has allowed enterprises and policy makers to predict behaviours, make predictions and adjust to changing market conditions. Over the past 50 years, consumer behaviour is no longer captured by psychological and economic factors, but has become more data intensive and modelled based, and now may include modern algorithms such as machine learning and artificial intelligence. This trend reflects the increased recognition of the fact that consumer decision-making is multi-dimensional and multi-faceted and requires analytical frameworks capable of capturing the rational and emotional effects (Kahn and Viglia, 2025).

There is one of the most interesting examples of the places where the predictive analytics may be used in the automobile industry in this broad context. Personal-use automobile purchases are high-involvement purchases occurring infrequently, but with high financial and emotional consequences to buyers. Such choices are determined by a combination of factors that involves price sensitivity, technology, sustainability of the environment, brand perception and social influence. The role of predictive analytics cannot be undervalued in the case of industries, where the mobility changes (e.g., the shift to using electric vehicles) are of interest: it allows identifying the drivers of behaviour and predicting new trends in consumer demand (Shbool et al., 2025).

Predictive analytics applied to study consumer behaviour in the automobile industry demonstrates that it has the potential of introducing rational and affective elements in the decision-making process. Dahake et al. (2024) demonstrate how the concerns of costs, loyalty to familiar brands, and environmental awareness are predictors,

which can be predicted through predictive models at the time of making purchase decisions of four-wheelers. Still, on the same note, Eastman et al. (2024) also emphasize the impact of consumer affect and brand commitment on sustainable consumption and prove that non-economic factors play a significant role in the purchasing behavior. On balance, these findings point to the fact that predictive analytics does not only provide a technical answer to forecasting, but also an invitation to understand the psychological and social context behind automobile purchasing behaviour.

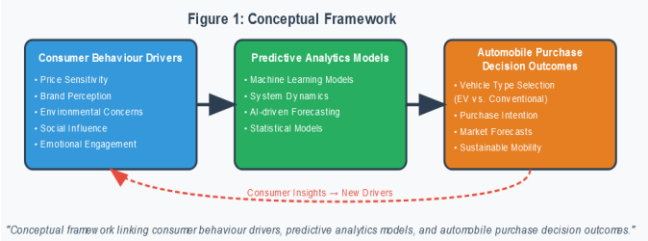

Figure 1: Conceptual framework linking consumer behaviour drivers

This review paper will attempt to systematically synthesize the existing literature on predictive analytics usage in personal-use automobile consumer behaviour, determine theoretical underpinnings, empirical uses, and cross-industry lessons. The four research questions used to guide this review include: How has predictive analytics been used to understand and predict personal-use automobile consumer behaviour? What are the best consumer behaviour drivers to include in predictor models in this field? So what can be learned in other industries and applied in the automobile industry to improve predictive frameworks? and What is the role predictive analytics could play in sustainable mobility and environmentally friendly buying?

In the context of these questions, a conceptual framework is provided, which links consumer behaviour drivers, predictive analytics models, and outcomes of the automobile purchase decisions. The framework places consumer drivers that include price sensitivity, environmental issues, brand perception, and emotional engagement as inputs into predictive analytics models, including machine learning, system dynamics, and statistical forecasting models. These models, in its turn, produce such outcomes as selecting the type of vehicle, intention to purchase, market projections, and adopting sustainable mobility solutions. Notably, a feedback loop has also been included in the framework, where the results can inform and redefine subsequent consumer drivers and thus the dynamic and cyclic nature of automobile consumer behaviour is captured.

Methodology

The review follows a systematic literature review (SLR) approach to achieve transparency, reproducibility, and extensive coverage of the research based on predictive analytics in automobile consumer behaviour. The systematic approach was chosen as it enables to identify, screen, and synthesize scholarly contributions in various fields which can be systematically done. The methodological similarities have been used in earlier reviews of consumer research, including those in the field of hospitality (Norliza Aminudin et al., 2020), predictive analytics in sustainable consumption (Jaman, 2025), food waste and customer behaviour (Widayat et al., 2025), and customer involvement in the value creation (Mekhail Mustak et al., 2013). The examples of such precedents demonstrate that SLR is very strong in unifying piecemeal literature and producing thematic information.

The review was conducted under a protocol that was based on the PRISMA paradigm which focuses on a gradual procedure of identification, screening, eligibility, and inclusion. To begin with, the databases containing the necessary references (Scopus, Web of Science, IEEE Xplore, and ScienceDirect) were searched in order to obtain a wide scope of interdisciplinary articles. The first search term types were the words associated with predictive analytics, consumer behaviour and automobiles (e.g., predictive analytics AND consumer behaviour AND automobile OR car OR vehicle). This made sure that not only technical uses of predictive analytics are defined, but also the behavioural research of automobile consumption.

The search was restricted to research published between 2010 and 2025 to narrow the scope. This period was chosen as predictive analytics have not been actively introduced into consumer behaviour studies until the early 2010s and the timeframe also enables the review to capture most recent trends in artificial intelligence and sustainability-oriented consumer modelling. The inclusion criteria were that the studies must focus explicitly on consumer behaviour when predicting consumer behaviour in the automobile industry or provide transferable information to the related areas of energy, mobility or sustainable consumption research. Non-peer-reviewed sources, studies that did not deal with consumer behaviour, and technical literature where behavioural application was not applied were filtered by exclusion criterion.

The scope was themed in three areas of overlap: consumer behaviour theory, predictive analytics methodologies, and automobile-purchasing or sustainable-mobility applications. In the process of eligibility, the studies that did not meet at least two of these domains were eliminated. The screening has finally reduced the list of articles to the most relevant articles in regard to the research questions of this review, as per a structured PRISMA-inspired filtering pathway.

A summary of the systematic review protocol is provided in Table 1, detailing databases searched, key words, time period and inclusion and exclusion criteria.

Table 1: Systematic Review Protocol

Component	Description
Databases	Scopus, Web of Science, IEEE Xplore, ScienceDirect
Keywords	"predictive analytics" AND "consumer behaviour" AND ("automobile" OR "car" OR "vehicle")

Years Covered	2010–2025
Inclusion Criteria	Peer-reviewed studies; focus on consumer behaviour; application of predictive analytics; relevance to automobiles or transferable insights from mobility/consumption
Exclusion Criteria	Non-peer-reviewed sources; purely technical analytics without behavioural context; studies unrelated to automobiles or consumer behaviour
Screening Approach	PRISMA-inspired process: identification → screening → eligibility → inclusion

Theoretical Foundations of Predictive Analytics in Consumer Behaviour

The use of predictive analytics in studies of consumer behaviour is frequently supported by theoretically developed models that can be used to explain how consumers make choices, why they choose not to behave in line with their expectations, and how intention to act can and sometimes does not translate into behaviour. The Theory of Planned Behaviour (TPB) is one of the most popular frameworks that are still used. According to the TPB, attitudes, subjective norms and perceived behavioural control influence behavioural intention and interact to determine the decision making process. Scalco et al. (2017) meta-analytic work and reviews by Rana and Paul (2017) illustrate the predictive utility of TPB in consumption settings, including the purchase of organic foods, and underscore its potential to be applied to other high-involvement areas such as the purchase of automobiles. Equally, Taufique et al. (2018) apply TPB to green consumer behaviour, indicating that eco-consciousness and perceived social influence are decisive factors- knowledge that is directly applicable when it comes to the adoption of electric vehicles and the sustainable transition towards mobility.

The use of predictive analytics in consumer behaviour studies is frequently supported by a long-standing theoretic framework that assists in understanding the decision-making process by consumers, why they do not always act as expected, and the translation of intention into, or failure to translate into actual behaviour. Of these the Theory of Planned Behaviour (TPB) is one of the most popular frameworks. The TPB also assumes that attitudes, subjective norms and the perceived behavioural control influence behavioural intention and these factors combined affect the decision making. A meta-analysis study by Scalco et al. (2017) and reviews by Rana and Paul (2017) indicate that TPB predicts consumption (i.e., organic food purchasing) and, as a result, can be applied to other high-involvement areas, including automobile choice. On the same note, Taufique et al. (2018) apply TPB to eco-focused consumer behaviour, revealing that eco-consciousness and perceived social influence are key factors, which are directly applicable when considering electric vehicle adoption and sustainable mobility changes. The intentionbehaviour gap, the disparity between what is proclaimed by consumers to do and what is actually purchased is another key factor in theory, which can be directly transposed to this context to gain an idea of the adoption of electric vehicles and shifting to sustainable mobility. According to Carrington et al. (2010), this disconnect is especially noticeable with respect to ethical and sustainable consumption where the good moral or environmental intentions about purchasing can often be not converted into any specific buying action. Marta Nieto-García and colleagues further criticize consumer hypocrisy in sustainable tourism, showing how intention-based models tend to inflate the effect of behavioural impacts. In predictive analytics of automobile markets, it is essential to consider this gap because consumers might show the preference to the environmentally friendly cars but fail to choose them because of their price, convenience, or the availability of infrastructures.

Finally, rational and irrational consumer behaviour models bring in another ground of theorizing. According to Ulph and Pezzino (2023), rational people tend to become irrational due to the influence of short-term temptations or other situational factors when the long-term goals are predominant in the short-term ones, as the so-called dynamic self-regulation processes take place. In the case of purchasing automobiles, such dynamics can be deployed in the form of impulse upgrades or brand-based purchases or reluctance to adopt new technologies despite the claimed concerns of sustainability. Such behavioural irregularities are less likely to be captured by predictive analytics that does not integrate them, and this makes them more appropriate to capturing real-world consumer decision patterns.

All such theoretical foundations demonstrate that predictive models cannot be mere forecasting and must embrace behavioural subtlety. This would mean a combination of rational choice variables and in the case of automobile consumer behaviour, a combination of psychological, social and emotional variables to develop models that accommodate both intention and deviation. A summary of the main theories discussed and how they can be applied to predictive consumer analytics is provided in the table below.

Table 2: Theoretical Foundations in Predictive Consumer Analytics

Theory/Model	Core Idea	Application in Predictive Analytics	Relevance to Automobiles
Theory of Planned Behaviour (Ajzen) – Scalco et al. (2017); Rana & Paul (2017);	Behavioural intention driven by attitudes, norms, and perceived control	Predicts likelihood of sustainable or brand-driven choices	Explains adoption of EVs, role of peer influence, and eco-conscious automobile purchases

Taufique et al. (2018)			
Intention–Behaviour Gap – Carrington et al. (2010); Nieto-García et al. (2024)	Intentions often fail to lead to actual behaviour	Adjusts predictive models to account for discrepancies	Explains gap between preference for green cars and actual purchases of conventional vehicles
Rational vs. Irrational Behaviour – Ulph & Pezzino (2023)	Consumers sometimes act against rational self-interest	Integrates behavioural irregularities into forecasting	Captures impulsive buying, brand loyalty, or resistance to new sustainable technologies

Applications of Predictive Analytics in Automobiles

The application of predictive analytics to simulate the consumer preferences in purchasing cars has been widely applied in predicting in high involvement purchases like decisions on whether to purchase normal or electric cars. These applications are grounded in the integration of consumer behaviour data i.e. sensitivity to price, compatibility to the lifestyle, and loyalty to the brand with advanced modelling applications that can model rational decision making alongside emotional or social processes. As the research by Dahake et al. (2024) demonstrates, the predictive approaches evidently can be used to predict consumer inclinations on the markets of four-wheelers taking into account some of the main factors such as financial constraints, green inclinations, and technology adoption. Such models give the manufacturing and marketing teams the means to predict the pattern of purchases better and adjust to the emergence of consumer interests.

The adoption of electric vehicles (EV) is one area in the automotive industry where predictive modelling has been the most studied over the last few years. Liao et al. (2017) also present the systematic review of the consumer preferences in EV and show that predictive frameworks can be applied to differentiate between the goodwill of the environment, limitations of infrastructure, and cost. Such frameworks not only characterize current barriers to adoption, but also forecast a situation where the adoption of EVs will be stimulated (e.g. improved charging infrastructure or government subsidies). This is particularly helpful to policymakers and companies on the journey to sustainable mobility since predictive analytics can model such adoption scenarios.

Using predictive analytics, forecasting, beyond personal tastes, is also conducted at the level of the market, system dynamics and artificial intelligence. Shbool et al. (2025) use system dynamics to simulate the development of the automobile market revealing the interplay between consumer demand and technological innovation, regulation and development of infrastructure. This systems approach emphasises the interdependence between consumer behaviour as related to the external market forces and therefore, allows a broader long-term planning of scenarios. To this end, Hermann and Pentland (2024) analyze how artificial intelligence is transforming the predictive analytics roles which have focused on descriptive and predictive roles into generative capabilities that enable more scenarios of consumer pathways to be simulated. On the same note, Okeleke et al. (2024) note the application of AI-assisted predictive analytics to monitor the rising consumer trends and enable business to spot opportunities in real-time.

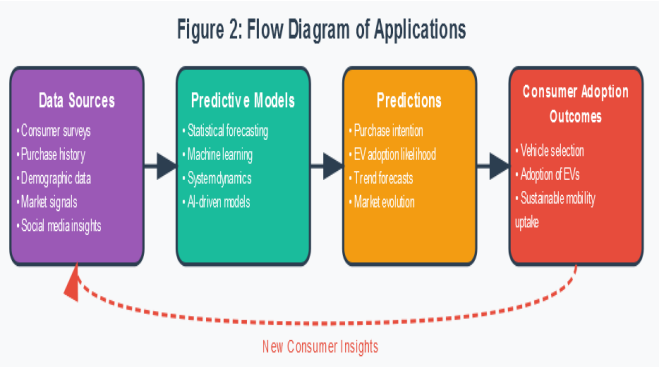

Figure 2: Flow diagram of predictive analytics applications in automobile buying

Combined, these applications demonstrate the scope of predictive analytics in automobile markets- both at the level of individual purchase intention modelling along with a system level market forecasts. They highlight that predictive models are dynamic rather than fixed systems that can integrate behavioural subtlety, technological advancement, and market changes. This two-fold interest - predicting consumer behavior on a micro-level and simulating the market on a macro-level - places predictive analytics as the key to predicting and influencing the future of automobile consumption in the personal-use category.

Table 3: Applications of Predictive Analytics in Automobile Markets

Application Area	Focus	Key Contribution
Consumer purchase prediction	Forecasting four-wheeler buying decisions	Identifies behavioural and economic drivers of car purchases
EV adoption modelling	Understanding preferences for electric vehicles	Explains adoption barriers and forecasts scenarios for uptake

Market-level forecasting	System dynamics for automobile markets	Captures interaction of consumer behaviour and external factors
AI-driven trend identification	Predicting emerging consumer trends using AI	Enhances real-time prediction of market dynamics
AI in consumer behaviour	Transition from predictive to generative modelling	Provides advanced simulations of consumer pathways

Cross-Industry Learnings for Automobile Consumer Behaviour

The implementation of predictive analytics has not been done in the automobile industry , however one can learn much based on the experiences of the predictive analytics implementations in other consumer-related industries like food, energy, supply chains, and fashion. Such industries as automobiles industry, can be characterized by the dimensions of the decision-making processes through the economic, social and sustainability concerns. By examining the approaches which they adopt, some transferable lessons can be identified which would foster predictive models of consumer behaviour in the automobiles.

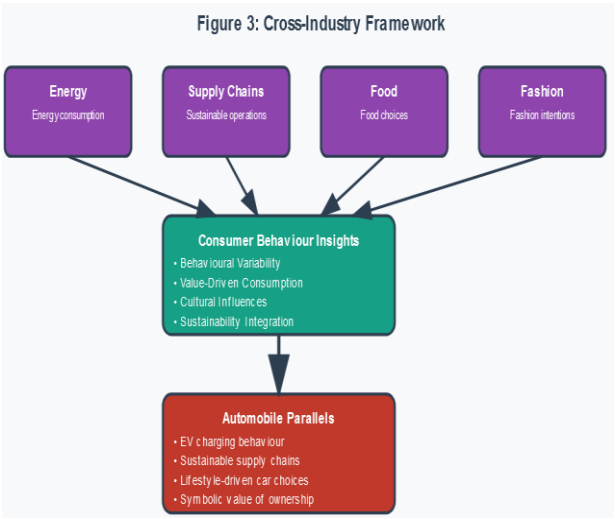

Figure 3: Cross-industry framework of predictive analytics

The use of predictive analytics has been applied to the energy industry to gain some insight in to the consumption behaviors of the households and more accurately predict the demand. Zhou et al. (2016) reveal how big data analytics provides us with granular data on households energy usage, which may be utilised to develop predictive models to not only reflect the variability of the behaviour, but also to reflect the dynamics of the system overall. Such techniques are highly applicable to the car industry especially in regard to the implementation of electric cars in which the demand of energy, the behaviour of the charging and the consumer preference is tightly linked.

Another area of view is the supply chain domain. Hazen and colleagues (2016) provide a theoretical agenda of big data and predictive analytics in sustainability of a supply chain where the authors argue that it is necessary to include environmental and operational aspects into the predictive models. Likewise, Dubey et al. (2019) point out the contribution that predictive analytics can have on becoming socially and environmentally sustainable simultaneously, predicting the risks and consumer tendencies. Within the automobile industry, these are lessons to integrate both supply chain analytics with consumer demand forecasting, particularly as car manufacturing becomes more directly linked to resource sustainability as well as lifecycle.

Predictive models of sustainability-oriented behaviour have also be useful in the consumption of fashion. Dangelico and Vocalelli (2022) show that awareness, perceived value, and cultural norms are the variables that define the consumer intentions towards sustainable fashion products. The interpretation of this into the context of automobiles implies that the predictive analytics must be oriented not only in the technological characteristics but in identity-related and cultural aspects of car ownership. As an example, the symbolic meaning of an electrical car ownership can be used as a mark of status in a given market, in the same way as sustainable fashion.

Collectively, the cross-industry points to the fact that automobile predictive analytics need to be multidimensional and combine behavioural, social, cultural, and systemic variables. By food, energy, supply chains and fashion, automobile predictive frameworks will be more able to consider not only rational economic motivations but also symbolic sustainability preferences and in doing so maximise their predictive and explanatory powers.

Table 4: Cross-Industry Insights Relevant to Automobile Consumer Behaviour

Industry	Predictive Analytics Focus	Key Insight	Relevance to Automobiles
Energy (Zhou et al., 2016)	Household energy consumption analytics	Captures behavioural variability in energy use	Informs EV charging behaviour and infrastructure planning
Supply Chains (Hazen et al., 2016; Dubey et al., 2019)	Big data for sustainable operations	Integrates sustainability and risk into predictive models	Links consumer demand with sustainable automobile production

			and supply chains
Food (Hartmann & Siegrist, 2017; Feil et al., 2020)	Predicting sustainable food choices and consumer profiles	Identifies socio-demographic and value-driven consumption patterns	Suggests segmentation of automobile consumers by values, identity, and lifestyle
Fashion (Dangelico & Vocalelli, 2022)	Behavioural intention for sustainable fashion	Considers cultural and symbolic drivers of sustainable consumption	Highlights identity and cultural influences in EV adoption and automobile choice

Sustainability, Predictive Analytics, and Automobiles

The increased global concern with sustainability has changed consumer behaviour, particularly in high involvement markets such as personal automobiles. Predictive analytics is a critical way to address the disconnect between the understanding of environmental friendliness among consumers and the adoption of the sustainable mobility system, such as electric cars, hybrids, and shared mobility service. This method can assist researchers and practitioners to determine how many consumers are likely to adopt the behavior and come up with interventions which evokes a more sustainable purchasing behavior by including the signals of sustainability in the prediction models.

The image of corporate governance and environmental responsibility is more likely to influence the eco-friendly consumption, as Shamsuzzoha (2024) underlines. In the example of automobiles, it means that predictive models are supposed to assist in considerations of brand-level sustainability indicators, as well as product characteristics. The researchers also show that the consumer behaviour of electronic waste in the developed and developing environment differs (Shahrasbi and Shahparvariables, 2021), which can be employed to reflect the end-of-life vehicle management. Predictive analytics has the potential to become not just purchase forecasting and can expand their lifecycle perspectives to include issues of sustainability in the ownership cycle.

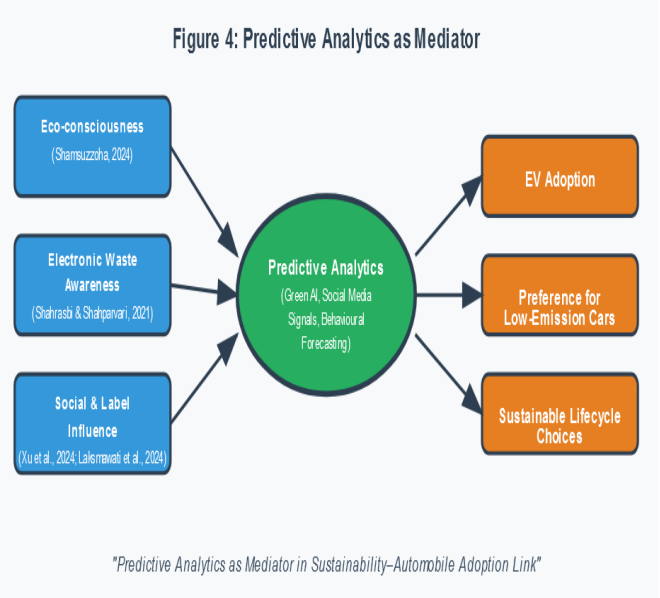

Figure 4: Predictive analytics as a mediator between consumer sustainability attitudes and eco-friendly automobile adoption.

New labels also contribute to influence the environmentally conscious car decisions. Xu et al. (2024) show that carbon labels are capable of nudging consumers to purchase sustainable food products, and Laksmawati et al. (2024) establish that social influence enhances the consumer responsiveness to carbon footprint cues. Applying these insights to the automobile market implies predictive analytics will be able to understand consumer sensitivity to carbon labels on cars, and can predict the effect of labelling policies or disclosure policies on low-emission car demand.

Concurrently, emerging technologies are increasing the predictive toolkit in terms of sustainability-directed mobility. Bolon-Canedo and colleagues (2024) briefly outline the role of the so-called green AI in more efficient analytics with fewer resources, and it shows how to reduce the carbon footprint of calculations, but it still allows detecting consumer trends. At the same time, Lim et al. (2022) introduce the importance of the analytics of social media use in learning about a sudden shift in the attitude to sustainable products. Taken together, these measures focus on the fact that predictive analytics in cars does not only focus on itself in terms of predicting purchase intent, but also alignment to broader sustainability goals, methodologically and substantively.

All in all, predictive analytics can be explained as a factor between the attitudes of consumers to sustainability, on the one hand, and real behavioural adoption of environmentally friendly vehicles, on the other hand. It embodies the often complex processes of symbolic signals (e.g. carbon markers, eco-branding) and the practical considerations (e.g. affordability, availability) in the construction of mobility decisions. Predictive analytics is well-positioned to facilitate sustainable mobility transitions given this integrative positioning on the part of industry and policymakers having a better understanding of shifts in the eco-conscious consumer.

Future Directions and Research Agenda

Despite the success of predictive analytics in consumer behaviour modelling, the automobile industry is not completely investigated in this aspect when compared to food, fashion and energy industries. A further validation of more domain-specific models that would provide information on the complex relationship of consumer motivations, sustainability imperative and technological change is badly needed. Agu et al. (2024) demonstrate how the predictive analytics has been used to design sustainable business models in any industry, but the parallels of this practice to the particulars of automobile consumption and a high level of purchase involvement, lifecycle costs, and symbolic ownership value is not elaborated. Predictive models centered around cars may be developed and be able to help scientists capture these subtleties and provide more practical information to the industrial and policymaking.

Generative AI is also one of the opportunities in the consumer research frontier. Hermann and Pentland (2024) state that the generative methods extend the predictive modelling processes that are older to model novel behavioural patterns and situations. As an example when applied to cars, generative AI could model how consumer preferences respond to various policy interventions, or to changes in technology or cultural discourses about sustainable moving. Not only would the developments optimize forecasting demands, but they would widen scenario planning of sustainable changes in the transport sector.

The need to use predictive AI is only strengthened by emerging consumer generations. Romero Borrea et al. (2024) point out that digital-native consumers are becoming more dependent on AI-based solutions when making sustainable purchase decisions. Their behaviour is not dependent only on the traditional product features but also on the experiences mediated by algorithm like personalized recommendations and social media interaction. Automobile based predictive models will be required to incorporate these digitally mediated decision processes especially as the young generations take over the future car ownership and mobility markets.

The importance of consumer attitudes to sustainability has become one of the foundations of future research. Wiśniewska (2025) demonstrates that the impact of sustainability-oriented attitudes on behavioural intentions in food markets is strong, whereas Deo et al. (2024) emphasize the same situation with green energy. These results indicate that the automobile studies ought to incorporate the eco-conscience attitudinal measures as a primary variable in predictive factors, especially at the point where they come into contact with the price sensitivity, technological preparedness and social influence. Rinallo et al. (2025) also underline the topicality of the sharing economy with the demonstration via collaborative consumption models, which alter the behavioural expectations. In the case of automobiles, it may imply that predictive analytics need to extend beyond ownership to predict trends in car-sharing, ride-hailing, and subscription based mobility models. Altogether, the future of predictive analytics in automobile consumer behaviour is becoming more industry-specific models enhanced with the use of generative AI and adding the preference of new consumer generations and sustainability as one of the main determinants of behaviour.

2. CONCLUSION

This review has addressed the application of predictive analytics in understanding consumer buying behaviour in personal vehicles, particularly in the context of both sustainability and the technological revolution. The systematic reviews methodology development and cross-industry parallelism give the research a chance to determine the poly-faceted presence of predictive analytics in shaping the demand forecasting, drivers of consumer segment, and the promotion of environmentally-friendly mobility choices further. The other aspect which the review points to is that predictive analytics are not limited to statistical modelling, it is an integrative instrument that encompasses rational, emotional and symbolic features of car consumption.

The article contributes to the academic community in summarising a variety of threads of consumer behaviour and sustainable consumption research and how predictive modelling applies to a consistent model which is particular to the car market. The outcomes provide viable guidance to the practitioners on the mechanisms of integrating predictive intelligence on the product development, marketing strategies applications and supply chain strategic planning, under the sustainability, value creation to the consumers' framework. The research reveals to policy making how predictive analytics can inform policy-based responses such as carbon labelling, the use of infrastructural and subsidies to utilize electric vehicles.

Lastly to conclude, the introduction of the predictive analytics acts as a facilitator of the car consumer behaviour sustainably. As fuel economy and continued use become a part of the consumer-consideration process, predictive models may be adopted to model demand trends, emulate the withering impact of policies and craft business frameworks that portray a mobility fusion to eco-consciousness. Predictive analytics will eventually be an intrinsic element of the solution to the gap between consumer attitude and their actual adoption behaviours, and in this matter they will be a major key to mobility future sustainability...

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