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RESEARCH ARTICLE

DRIVING GREEN: ASSESSING THE PURCHASING INTENTIONS OF SOUTH AFRICAN CONSUMERS TOWARD ELECTRIC VEHICLE ADOPTION

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ABSTRACT

This study investigates the intentions of South African middle to high-income consumers towards purchasing battery electric vehicles (BEVs) against the backdrop of a global shift towards sustainable mobility. Utilizing the Theory of Planned Behaviour to examine the interplay of attitudes, subjective norms, and perceived behavioural control, this research highlights the growing consumer interest in BEVs despite limited market share and firsthand experience. The study's quantitative approach, employing a self-completion questionnaire and leveraging constructs validated in prior research, reveals that attitudes, subjective norms, perceived behavioural control, and environmental concerns are significant predictors of BEV purchase intentions. The findings underscore the significance of subjective norms as the most influential predictor of purchase intentions, followed closely by environmental concerns, suggesting that social influence and environmental awareness play critical roles in shaping consumer behavior towards BEVs in South Africa. This research contributes to the understanding of consumer attitudes towards BEVs in a South African context, offering insights for businesses and policymakers to drive adoption and align strategies with consumer preferences and environmental goals. Future research is recommended to explore longitudinal changes in consumer intentions and actual BEV purchasing behavior, expanding the model with additional constructs to reflect evolving market dynamics.

KEYWORDS

Battery electric vehicles; Business sustainability; Environmental concerns; Extended theory of planned behaviour.

1. INTRODUCTION

In the evolving landscape of global mobility, personal vehicle ownership remains a cornerstone of modern society, serving not only as a means of transportation but also as a significant psychological and sociological emblem of autonomy, status, and convenience (Mairesse et al., 2012). Additionally, Katona posited that in the early stages of motorization, a private vehicle is often seen as the most conspicuous symbol of a family's status (Katona, 1964; Wu et al., 1999). Despite the predominance of internal combustion engines powered by petroleum fuels in today's vehicles, the automotive landscape is undergoing a significant transformation (Lešnik et al., 2020). The rise of alternative propulsion systems, including hydrogen fuel cells and battery electric vehicles, signals a shift towards more sustainable mobility solutions (Laurence and Macharis, 2008).

The electric vehicle (EV) market is categorized into battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and range-extended electric vehicles (REEVs), with a variety of models ranging from small city cars to large utility vehicles under development by leading manufacturers (Britt, 2020). In developed countries, consumers have an extensive selection of EVs to choose from. For instance, the United States market offered sixteen different passenger EV models in 2020, including those from Volkswagen, Nissan, and Tesla (Hyatt and Ewing, 2020). However, the South African market presents a stark contrast, with a limited selection primarily comprising the BMW i3, Nissan Leaf, and Jaguar I Pace, although this is expected to change with the introduction of new models (Kuhudzai, 2020).

The adoption of EVs has surged globally, with a 36% increase in 2018 compared to the previous year, surpassing five million electric passenger vehicles (International Energy Agency, 2019). Yet, in South Africa, adoption rates remain modest, with only 1,119 EVs sold by 2019, nearly equally split between BEVs and PHEVs (Kuhudzai, 2020). The transition from vehicles powered by internal combustion engines (ICEs) to electric vehicles (EVs) emerges as a critical juncture, poised to redefine societal mobility. This pivot not only heralds a significant technological leap but also underscores a pressing environmental imperative. However, this shift towards electric mobility introduces profound implications for the traditional petroleum value chain, which is deeply woven into the fabric of the global economy. Within this paradigm, the South African context presents a nuanced landscape characterized by a burgeoning interest in EVs amid a backdrop of entrenched fossil fuel dependence.

The crux of the issue lies in the dual challenge posed by the emergence of EVs: on the one hand, they offer a promising avenue to mitigate the environmental impacts of transportation, epitomized by their potential to reduce vehicular emissions significantly. On the other hand, their ascendancy threatens to upend existing business models and revenue streams heavily reliant on the petroleum sector, spanning from crude oil extraction to the retail of petroleum products. The dichotomy is notably evident in South Africa, where the early stage of electric vehicle (EV) adoption contrasts with the nation's strategic focus on investments in petroleum infrastructure.

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Furthermore, the limited consumer-centric research within the South African context contributes to the uncertainty for businesses and government institutions. The dilemma is twofold: not only does it impede these stakeholders' ability to strategically pivot in response to this technological shift, but it also obscures the understanding of the market potential for EVs. This research aims to bridge this knowledge gap, focusing on the intentions of South African-based middle to high-income consumers towards purchasing passenger battery electric vehicles. By leveraging the Theory of Planned Behaviour, this study seeks to unravel the complex interplay of attitudes, subjective norms, and perceived behavioural control in shaping consumer intentions, thereby offering a nuanced understanding of the factors driving the adoption of EVs in Southern Africa.

2. Literature Review

2.1 Theory of Actioned Reason

The journey towards understanding and predicting electric vehicle adoption has been significantly informed by the Theory of Planned Behaviour, which offers a robust framework for this study. This theory, as highlighted by in their review of electric vehicle adoption studies from 2007 to 2015, is widely utilized due to its flexibility in incorporating additional constructs (Rezvani et al., 2015). Such adaptability proves crucial in exploring how environmental concerns influence the intentions to purchase battery electric vehicles. Originally stemming from the Theory of Reasoned Action developed by as cited in this framework posits that an individual's behavior is directly influenced by their intentions, which in turn are shaped by attitudes and subjective norms (Fishbein and Ajzen, 1980; Leone et al., 1999; Ajzen, 1991; Han et al., 2010; Yadav and Pathak, 2016).

Subjective norms, defined by as the perceived social pressure to perform or not perform the behaviour, alongside attitudes, play a pivotal role in shaping intentions (Ajzen, 1991). This concept underscores the influence of an individual's social circle and their motivation to align with or diverge from these social expectations (Ajzen, 1991; Ajzen and Fishbein, 1980; Kim and Han, 2010; Conner and Armitage, 1998; Yadav and Pathak, 2016).

2.2 Extended Theory of planned behavior

The extension of the Theory of Reasoned Action into the Theory of Planned Behaviour by Ajzen introduces the crucial concept of Perceived Behavioural Control (Ajzen, 1991). This concept reflects the individual's assessment of the ease or difficulty associated with performing the behaviour and has been identified as a significant determinant of intention (Ajzen, 1991; Zint, 2002). Particularly relevant in contexts like South Africa, where electric vehicles are a relatively new phenomenon, perceived behavioural control captures the practical considerations and barriers to adoption.

The Theory of Planned Behaviour posits that attitudes, subjective norms, and perceived behavioural control collectively influence an individual's intentions towards a behaviour. In the context of this study, it is hypothesised that the intentions of South African middle to high-income consumers to purchase battery electric vehicles are influenced by their attitudes towards these vehicles, the perceived pressure from their social circles, and their assessment of the feasibility of such a purchase (Ajzen, 1991).

Building upon this foundational framework, the study extends the Theory of Planned Behaviour to explicitly incorporate environmental concerns as a direct predictor of purchase intentions (Haustein and Jensen, 2018; Wang et al., 2016). This addition recognizes the significant role that environmental considerations play in shaping consumer behaviour towards electric vehicles. By integrating the current barriers to electric vehicle adoption into the perceived behavioural control construct, this study offers a nuanced understanding of the factors driving electric vehicle purchase intentions among South African consumers. The adapted framework thus provides a comprehensive basis for examining the interplay between consumer attitudes, social influences, practical considerations, and environmental concerns in the context of electric vehicle adoption in South Africa.

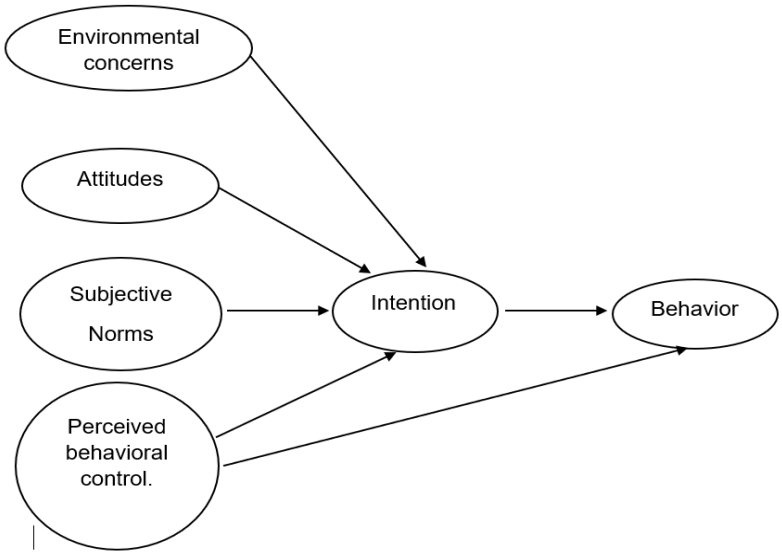

Figure 1: Extended theory of planned behaviour (Haustein and Jensen, 2018; Wang et al., 2016)

3. Research Questions and Hypothesis

To achieve the research purpose and address the research problem, the following research questions were formulated:

RQ1: What proportion of South African consumers currently consider purchasing battery electric vehicles?

RQ2: How do attitudes, subjective norms and perceived behavioural control affect South African consumers' intentions to purchase battery electric vehicles?

- H1: Attitudes have a positive significant association with the purchase intentions for battery electric vehicles among South African based middle to high-income consumers.
- H2: Subjective norms have a positive significant association with the purchase intentions for battery electric vehicles among South African based middle to high-income consumers.
- H3: Perceived behavioural control have a positive significant association with the purchase intentions for battery electric vehicles among South African based middle to high-income consumers.

RQ3: What is the relationship between environmental concerns of South African based middle to high-income consumers and battery electric vehicle purchase intentions?

- H4: Environmental concerns have a positive significant association with the purchase intentions for battery electric vehicles among South African based middle to high-income consumers.

4. Methods and Results

A quantitative research strategy was employed to assess South African middle to high-income consumers' intentions towards purchasing battery

electric vehicles, utilizing a self-completion questionnaire as the primary data collection instrument. A cross-sectional research design was adopted to collect data from a defined point in time, facilitating the analysis of intentions in the context of existing barriers to adoption without implying causality.

The methodology involved selecting participants through non-probability convenience sampling. Data analysis was conducted using Statistical Package for the Social Sciences (SPSS), employing descriptive and multivariate analysis techniques to elucidate the relationships between consumer attitudes, subjective norms, perceived behavioural control, environmental concerns, and intentions. The reliability and validity of the measures were carefully considered, with the study leveraging constructs validated in prior research, ensuring the integrity and applicability of findings within the theoretical framework set by the theory of planned behaviour and its extensions to encompass environmental concerns.

4.1 Participants' Characteristics

Table 1: Decriptive statistics of respondents

Highest Education Level	Age Group	Frequency		Percentage	
		Gender		Gender	
		Male	Female	Male	Female
Less than matric	65 and above	1	0	0.17%	0%
	Total	1	0	0.17%	0%
Matric	24 to 34	7	1	1.17%	0.17%
	35 to 44	5	3	0.84%	0.5%
	55 to 64	0	1	0%	0.17%
	Total	12	4	2%	0.7
Diploma or degree	24 to 34	79	91	13.3%	15.3%
	35 to 44	69	60	11,6%	10.1%
	45 to 54	33	20	5.6%	3.4%
	55 to 64	2	4	0.34%	0.67%
	65 and above	2	0	0.34%	0%
	Total	185	175	31.1%	29.5%
Masters or doctorate	24 to 34	50	48	8.4%	8.1%
	35 to 44	43	29	7.2%	4.9%
	45 to 54	22	12	3.7%	2%
	55 to 64	7	4	1.2%	0.7%
	65 and above	1	0	0.17%	0%
	Total	123	93	20.7%	15.7%
Total	24 to 34	136	140	22.9%	23.6%
	35 to 44	117	92	19.7%	15.5%
	45 to 54	55	32	9.3%	5.4%
	55 to 64	9	9	1.5%	1.5%
	65 and above	4	0	0.7%	0%
	Total	321	273	54%	46%

Notably, there was no significant difference between the one-way ANOVA test on intention and the five age groups [F (4,589)= 2.103, p = 0.079]. There was also no significant difference between the one-way ANOVA test on intention and income level for the three income groups [F (2, 591) = 0.265, p = 0.767]. In addition, there was also no significant difference between the one-way ANOVA test on intention and education level for the four education groups [F (3,590) = 0.226, p = 0.878]. Therefore, regarding the demographic characteristics, respondents have similar views regarding their intentions to purchase battery electric vehicles.

4.2 Measurement instrument reliability

The internal reliability of the remaining measure as measured through Cronbach Alpha coefficients were found to be acceptable as they were all above 0.800 which is above acceptable limit of 0,7 (Hair et al., 1998).

Table 2: Cronbach Alpha reliability of scales

Scale	Cronbach's Alpha
Attitude scale	0,915
Subjective norm scale	0,810
Perceived behavioural control scale	0,825
Environmental concern scale	0,818
Intention scale	0,889

4.3 Hypotheses Results

This study's first, second, and third hypotheses were that there is a significant positive relationship between the three predictors of intention, namely attitudes, subjective norms, and perceived behavioural control, with South African-based middle to high-income consumers' intentions to purchase battery electric vehicles.

The results of the multiple linear regression indicate that the three predictors of intention explain 44,9% of the variance in the consumers' intentions to purchase battery electric vehicles ($R2$ =44, 9%, F (3,590) =160.505, p<0.001). It was found that attitudes positively and significantly predicted intention (β = 0.330, p<.001); therefore, hypothesis 1 is accepted.

In addition, subjective norms were found to also positively and significantly predict intention (β = 0.375, p<0.001), therefore hypothesis 2 is accepted. Equally, perceived behavioural control was also found to positively and significantly predict intention (β = 0.131, p<0.001). Thus, hypothesis 3 is accepted. Given these points, there is a significant positive relationship between the dependent variable of intention and independent variables of attitudes, subjective norms and perceived behavioural control.

The measuring scale of environmental concerns was added as an independent variable to the three scales analysed, and a multiple linear regression test was performed. The results of the multiple regression indicated that the four direct predictors of intention explain 47,4% of the variance in the consumers' intentions to purchase battery electric vehicles (R2 =47,4%, F (4,589) =132.544, p<0.001). The addition of environmental concerns as the fourth direct predictor of consumers' intentions to purchase battery electric vehicles marginally improved the explanation of the variance in the dependent variable by 2, 8% when compared to the original model with the three predictors of intention.

Firstly, the study found that attitudes positively and significantly predicted intention in the extended model (β = 0.310, p<.001). Secondly, the results show that subjective norms positively and significantly predicted intention in the extended model (β = 0.376, p<0.001). Thirdly, it was also found that perceived behavioural control positively and significantly predicted intention in the extended model (β = 0.148, p<0.001). Lastly, it was found that environmental concerns positively and significantly predicted intention (β = 0.314, p<0.001), therefore hypothesis 4 is supported.

On balance, there is a significant positive relationship between the dependant variable of intention and independent variables of attitudes, subjective norms, perceived behavioural control and environmental concerns. It can be noted from the unstandardized beta coefficient that subjective norms remained the strongest predictor of intention to purchase battery electric vehicles, followed by environmental concerns and attitudes respectively. Perceived behavioural control continued to contribute the least.

5. Discussion

This study explored the intentions of South African middle to high-income consumers towards adopting battery electric vehicles (BEVs), leveraging the Theory of Planned Behavior (TPB) as a foundational framework. The findings reveal that despite the low current market share and firsthand experience with BEVs among respondents, considerable interest exists in BEVs, with 49% expressing positive intentions towards purchasing them. The lack of government incentives and the limited availability of BEV options in the South African market underscores this interest. Notably, male respondents exhibited higher intentions to purchase BEVs compared to females, a finding that aligns with Haustein and Jensen, though it contrasts with who found higher acceptance among females (Haustein and Jensen, 2018; Ziefle et al., 2014). This discrepancy suggests a complex interplay between gender, environmental consciousness, and actual purchase behaviors, indicating that while males may show higher

purchase intentions, this does not necessarily translate into higher ownership rates among them.

Crucially, the TPB predictors—attitudes, subjective norms, and perceived behavioral control—were all significant positive predictors of BEV purchase intentions, confirming the utility of the TPB in the South African context. Among these, subjective norms emerged as the most influential predictor, highlighting the importance of social circles in shaping purchase decisions, especially among consumers with limited BEV knowledge or experience. The inclusion of environmental concerns as a predictor further enriched the model, positioning it as the second strongest predictor of purchase intentions after subjective norms. This emphasizes the role of environmental benefits in marketing BEVs, aligning with consumer perceptions of BEVs as environmentally friendly alternatives to conventional vehicles. The study's findings offer valuable insights for businesses and policymakers, suggesting a need to address the attitudinal, normative, and control beliefs that shape consumer intentions, while also capitalizing on the environmental appeal of BEVs to drive adoption in the South African market (Haustein and Jensen, 2018; Wang et al., 2016; Yadav and Pathak, 2016; Ziefle et al., 2014; Lebeau et al., 2013; Mairesse et al., 2012).

Recommendations for Future Research

Future studies can conduct longitudinal studies to evaluate how consumers' intentions change over time as battery-electric vehicles become more common in the South African automotive market. Therefore, future research can improve on the model by employing additional constructs. Equally, as battery electric vehicles become more common in the country, it may be beneficial to move from focusing on purely intention and consider the actual behaviour regarding purchasing them.

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