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Electric vehicle adoption attitudes: Exploring prospective market segments in the automotive industry

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The near-future customers of the automotive industry are currently young and differ from previous consumers. Generation Z is the first native digital generation, and their attitude towards brands and their behaviour towards consumption are extremely different from those of previous generations. Generation Z is shortly becoming a relevant customer segment of the automotive sector; hence, their values, priorities and factors of decision are considered invaluable information.
Climate change is currently one of the paramount challenges that many countries face. The related environmental concerns, including air pollution, became a major driver and priority for the electric vehicle (EV) transition to secure the survival of the human population in a sustainable way. In this regard, the automotive industry has been developing various alternative solutions to market-reduced and zero-emission vehicles, including EVs. Regarding this, the transition to EVs as the main mobility solution and proposition at this stage will allow us to largely reduce greenhouse gases based on significant maturing technological innovations. Therefore, the automotive industry is in a period of transition as EVs are replacing traditional internal combustion engine cars step by step.
This study aims to identify potential future market segments in the EV market. As a starting point, previous literature suggests that environmental concerns, perceived risk, ease of use and enjoyment may be among the most relevant drivers of the EV transition. To examine these questions, we performed cluster analysis on our respondents' data, and based on the empirical findings, we conclude that three clusters with unique features may be distinguished based on their focuses and priorities regarding enjoyment, perceived risks, ease of use and environmental concerns. We concluded that the description of these clusters may contribute to explore prospective market segments in the EV market.

Keywords: strategic technology management, electric vehicle transition, generation Z attitude, consumer clusters, diffusion of innovation, environmental concern

Environmental concern is transforming the consumer habits and behaviours of the population globally, obliging many sectors to change their product offers and services. The automotive sector is one of the main contributors to air pollution; hence, car manufacturers and suppliers are investing heavily to develop cleaner mobility solutions. This transition implies huge investment to develop new skills and transforms the traditional business model to ensure a successful market position. The progress made to develop electric vehicles (EVs) drives society to implement significant progress to ensure the daily usability of the innovative technology, which requires available infrastructure, for example, charging stations *(Apurvkumar et al., 2023)*. In this regard, the right steps and cadences are becoming inevitable for the successful transition of EV technologies.

The automotive sector is under immense pressure to transition rapidly to green mobility technologies, with transportation accounting for 23% of European GHG emissions *(Eurostat, 2020)* and road transport representing 75% *(IEA, 2023)*. National governments and regional and global organisations *(WHO, 2018)* are imposing rules to reduce CO_2 emissions by implementing electric technology for passenger and commercial transportation *(Theilen–Tomori, 2023)*.

Global EV sales crossed the bar of 10 million units in 2022 and showed accelerating growth, accounting for 13% of total car sales in 2022. Behind this steady growth, the transition is uneven by region, depending mainly on governmental policies and consumers' acceptance. The adoption rate is the highest in Norway (79%), Iceland (45%) and Sweden (32%), while the European average is 21% compared to China's 27% and the USA's 7% *(IEA, 2023)*. The spectacular growth in China is driven by the special support schemes provided by the central government as well as major cities (e.g. Beijing and Shanghai), reaching more than 40% of the sales mix in these megacities.

The EV transition has successfully passed the required threshold in many countries, although in others it has not yet reached the critical level in terms of acceleration, which is the case in Eastern Europe *(Zaheer–Usmani, 2022)*. In this aspect, the personal will of customers is expected to gain the momentum to switch society to EVs, meaning that consumer attitudes are crucial to accelerate the adoption of this new technology.

Generation Z – representing future customers in terms of car purchases and usage – is essential for this transition. Generation Z is special in many aspects as a study by McKinsey *(Francis–Hoefel, 2018)* found many differences from other generations. This generation has been using the internet since an early age, and they are fusional with social media, apps and mobile, making them hypercognitive to collect and cross-check information from different sources and integrate with their own experience to make pragmatic and analytical decisions. Generation Z values individual expression, and this is how they also behave towards brands. Consumption does not mean possession but access for this generation, which is key when considering EV adoptions.

Large proportions of young generations are or will become drivers, and subsequently, they will have a major impact on the global EV market. Their attitude towards adopting EVs requires more research, and our study aims to contribute by analysing Generation Z's EV acceptance characteristics. Our research primarily focuses on the factors that are related to environmental concerns, perceived risk, ease of use and enjoyment. In this aspect, possible future consumption patterns are primarily explored through cluster analysis.

The next sections of the study cover the topics as follows. Section 1 details the literature review, including the hypothesis development while. Section 2 describes the data and methodology. Section 3 focuses on cluster analysis. Section 4 delves into the results. Finally, Section 5 concludes with limitations and future research directions.

1. Literature review and hypothesis development

As a starting point, a viable solution has emerged for EVs to decarbonise the automotive industry. In this regard, a significant share of renewable sources could play a critical role in limiting greenhouse gas (GHG) emissions triggered by EV adoption *(Woo et al., 2017; Peng et al., 2021; Wei et al., 2023)*. Concurrently, recent research argues that increasing the EV mix could substantially reduce GHG emissions even if the electricity source is not so clean, driven by the higher energy conversion efficiency of electric motors compared to internal combustion engines *(Requia et al., 2018; Teixeira–Sodré, 2018)*.

From a holistic point of view, sustainable production driven by energy conversion and resource conservation might also play a key role in terms of EV adoption, considering the environmental significance of EVs, which is largely impacted by various connected infrastructures and systems, e.g. electric power systems *(Bahrami et al., 2020)*, charging facilities *(Tran et al., 2021)* and battery management solutions *(Yang–Fulton, 2023)*. Related to the required infrastructure investments, the rapid growth of high-power EVs is creating technical challenges for the electric power system, including voltage deviation, frequency imbalance and excess power loss. However, electrical infrastructure parameters could be optimised by the implementation of smart charging systems, resulting in reduced power loss, decreased voltage deviation and decreased peak power demand compared to conventional, unco-ordinated charging processes. In addition, smart charging, on top of addressing existing issues, may promote the integration of upcoming technologies such as next-generation autonomous vehicles and connected mobility *(Zhang–Wang, 2023)*.

Taking into consideration the implementation and application of EVs as one of the major innovation challenges globally, EV adoption may be assessed as part of the diffusion process. In this regard, an influential model of diffusion processes was initially mapped out by Rogers in the 1950s and 1960s *(Dodgson, 2014)*. *Rogers (1995)* defined 'diffusion' as the process by which innovations get adopted and used. The diffusion model became a key analytical tool over time and was subsequently used by many researchers (e.g. *Moore, 2006)*. Based on this model, social factors – including the cognitive and psychological attitudes of individuals as well as social groups – shape the willingness to adopt an innovation.

Rogers (1995) argues that the acceptance of technological innovations is influenced by several critical factors. Firstly, he emphasises the concept of relative advantages, suggesting that innovations offering greater advantages over existing technologies are more likely to be adopted quickly. Secondly, Rogers discusses the impact of complexity, noting that innovations requiring significant effort to understand and use effectively may face slower adoption rates. Additionally, he highlights trialability as a crucial factor, indicating that the ability to test an innovation can either positively or negatively influence adoption decisions. Moreover, the ease of use is identified as a key driver of diffusion, with the level of knowledge required to utilise an innovation playing a pivotal role in its adoption. Observability is also noted as significant, as it pertains to how easily the outcomes of an innovation can be observed and evaluated following a trial, thereby affecting its diffusion rate. Furthermore, Rogers addresses uncertainty, suggesting that higher levels of uncertainty regarding an innovation's outcomes can impede both the level and speed of adoption. Moreover, Rogers discusses the importance of an innovation fitting the individual needs of users, as well as the support required from initiators before users can efficiently apply it, both of which can impact the adoption rate and speed.

Rogers (1995) concluded user categories regarding their focus on innovation acceptance: innovators (who may act as gatekeepers of the latest ideas into the system), early adopters (often highly esteemed members of the community), early majority adopters (following opinion leaders), late majority adopters (typically sceptical) and laggards. In their focus on the adoptability of innovation, young generations might be distinctively different from other age groups, specifically in the case of innovative technologies. In this regard, Generation Z might be overproportionally represented in the category of early adopters in the coming future; thus, it highlights the necessity of understanding the attitudes of this generation with regard to EV acceptance.

Innovation adoption is a frequently researched area, and there are several theoretical frameworks that are typically applied in related research. Accordingly, we decided to analyse customer acceptance based on factors defined by *Roemer and Henseler (2022)* in their study. The authors investigated key determinants for EV adoption and acceptance, performing expert interviews as well as comparing their results with corresponding literature. Thus, the authors integrated Rogers' theory of adoption of innovations *(Rogers, 1995)* and the different theories related to the acceptance of technology, such as the Theory of Planned Behaviour *(Ajzen, 1985)*, the Theory of Reasoned Action (TRA) *(Ajzen–Fishbein, 1980)* and the Technology Acceptance Model (TAM). Remarkably, TAM is one of the most impactful theories based on Ajzen and Fishbein's TRA in the related research. TAM *(Davis, 1989; Davis et al., 1992)* is widely applied in the case of assessing users' acceptance as well as usage and utilisation of technology *(Venkatesh, 2000)*.

TAM – considering strong behavioural elements – takes the basic assumption that someone is free to act without limitation in case they form an intention to act. However, in real life, various constraints could come up, such as limited freedom to act *(Davis et al., 1992)*. EV transition as well as customer acceptance of the corresponding new technology have been studied in several countries; thus, empirical results are available for Sweden *(Jansson et al., 2017)*, Denmark *(Jensen et al., 2013)*, US urban areas *(Carley et al., 2013)*, German cities *(Degirmenci–Breitner, 2017)*, Germany *(Barth et al. 2016)*, the UK *(Schuitema et al., 2013; Skippon–Chappell, 2019)*, Spain *(Junquera et al., 2016)*, Malaysia *(Khazaei–Tareq, 2021)* and China *(Pang et al., 2023)*.

Considering customer behavioural aspects, the significant financial and lifestyle impacts of vehicle purchases make them one of the most relevant investments for private households *(Aspray–Hayes, 2011; Hagman–Stier, 2022)*. The vehicle selection processes involve various objectively and subjectively determined factors and attitudes *(Lane–Potter, 2007)*. Subsequently, intermediaries such as salespeople could play a key role in the product matching process by providing useful information and promoting direct experience, thus making a direct impact on adoption rates *(Matthews et al., 2017; Moriarty–Kosnik, 1989; Rogers, 2010)*. Concurrently, information overload might reduce decision quality, increase decision processing time and increase decision uncertainty *(Cao–Sun, 2018; Cheng et al., 2020; Yang–Lin, 2017)*. In this regard, *Cheng et al. (2020)*

highlighted in the context of EVs that consumers may experience information overload from various sources, which could affect their decisions to adopt EVs.

Perceived relative advantages might also have a significant impact on attitudes towards EV adoption. *Carley et al. (2013)* concluded in their study conducted in late 2011 that US urban drivers' intention to opt for plug-in vehicles is low, which is mainly driven by the perceived disadvantages, including the cost premium, the range limitations and the long recharging time. In addition, the authors identified that the segment of population with the greatest interest is the highly educated individuals considered to be part of the 'early adopters'.

In a recent study, *Roemer and Henseler (2022)* examined the EV transition in a complex model, in which they found a positive impact of environmental concern and attitude, ease of use and enjoyment on EV acceptance and adoption. The authors also took into consideration the potential negative impact of the perceived risk on behavioural intentions to use EVs. In their model, enjoyment overall balances the correlation between ease of use and behavioural intention.

The importance of socio-demographic variables (e.g. gender, age, income, highest qualification and cars in households) has been presented in research based on a large-scale sample in the UK about the consideration of environmental factors impacting EV car purchases. *Chng et al. (2019)* analysed the relationship among attitudinal, behavioural and socio-demographic predictors towards the consideration of environmental factors related to EV purchases. The authors argued that due to the specificity of this process – considered infrequent purchase behaviour with high financial costs – customer attitudes are extremely different from more regular, smaller-value purchasing decisions, which are often driven only by habits. The authors also identified that environmental concern – based on an incomplete understanding of its complexity and reality *(Rocco et al., 2018)* – in some cases is considered less relevant than utility- or image-related factors *(Thornton et al., 2011)*. In another aspect, their findings highlighted that female and urban respondents mentioned greater environmental considerations and focus.

Generational research highlights that individuals within a generation perceive common events with regard to culture, politics, technology and economics *(Mannheim, 1952)*, which together drive shared values. As usual across previous generations, the evolution of values drove a progressive change *(Macky et al., 2008)*; concurrently, in the case of Generation Z, several key factors triggered sudden shifts in their values and behaviour *(Twenge, 2017)*. In comparison with previous generations, the direct access to technology directs Generation Z to become more individualistic in learning, interpersonal interaction and communication *(Chicca–Shellenbarger, 2018; Twenge, 2017)*. Subsequently, Generation Z spends more time alone *(Pichler et al., 2021)*.

As indicated above, generational factors are also assessed as a key segmentation variable in analysing demographic factors for the future development of consumer behaviour. In this regard, consulting companies such as McKinsey have identified that the increasing consumption power of younger generations, such as the generation born in the 1990s, will drive more than 20% of total consumption growth between 2017 and 2030, which accounts for more than any other demographic segment *(Francis–Hoefel, 2018)*. Subsequently, it is essential to study whether and how their preferences related to EVs are progressing over time in comparison with the older consumer groups *(Qian et al., 2023)*.

Concerning Generation Z, their consumer decisions based on their general attitudes may also be significantly influenced by numerous factors. Related to this, *Schuitema et al. (2013)* studied how the intention to adopt BEV and PHEV is influenced by the perception of their instrumental, hedonic and symbolic attributes; further, they concluded that individuals of Generation Z with a pro-environmental self-identity are more likely to have positive perceptions of EVs. Related to that, *Barth et al. (2016)* explored the perspective of potential EV users from Germany to identify predictors for intention to use EVs, with a special focus on the predictive power of social identity variables (i.e. social norms and collective efficacy) in the context of personal costs and benefits. Their findings confirm that cost-related variables (high-purchasing prices), limited range, missing infrastructure and the long recharging process of batteries are negatively impacting the acceptance and adoption of EVs.

In summary, while previous studies covered various aspects detailed above, we address a research gap related to the attitudes and clusters of Generation Z, which has received less publicity so far. Our study focuses on Generation Z, since they will be an essential part of society soon and a key consumer segment in the future automotive retail business. Subsequently, their attitudes and priorities could provide invaluable insights regarding their progressing consumer behavioural patterns and clusters.

Based on the above literature review, we defined the following research hypotheses.

To assess how Generation Z's perception of the notion of consumption is clustered among their sub-groups we identified our first and second hypotheses accordingly.

H1: Related to EV adoption, Generation Z's opinions and preferences are not homogeneous and are related to factors of car ownership, purchase intention and opinion about the future of the automotive industry.

H2: Related to EV adoption, Generation Z's opinions and preferences are significantly impacted by the gender of respondents.

To assess how Generation Z's environmental consideration is impacted as a potential key driving factor, our third hypothesis focuses on how environmental concern is represented within Generation Z.

H3: A significant sub-group exists within Generation Z so that the group members prioritise and focus on environmental concerns related to EV adoption.

2. Data and methodology

The data in the analysis were collected by an online questionnaire in May and June 2023 using an online application tool named Qualtrics based on email communication. The respondents were university students from various Hungarian universities. The opinion of this age group is essential as they will be the key customers of the automotive industry in the mid-term period. The questionnaire includes a wide range of questions related to the exploration of Generation Z members' attitudes towards the EV transition and the current developments in the automotive industry. The relevant questions related to the research topic of this study are introduced in detail in the following section.

Table 1

Questionnaire structure and theoretical background

Group	Question	Theoretical background
EC environmental concern	1. I participate in environmental protection activities.	Inspired by *Lee (2008)*
	2. I often think about how the situation in the environment can be improved.	
	3. In my daily life, I use environmentally friendly products.	
PR perceived risks	1. I fear/find that the range of the EV will be/is insufficient.	Based on expert interviews from *Roemer–Henseler (2022)*
	2. I fear/find that it will be/is difficult to find a charging station when I need it.	
	3. I fear/find that charging the battery takes too much time.	
ENJ enjoyment	1. I (will) have fun driving an electric vehicle.	Adapted from *Davis–Bagozzi–Warshaw (1992)*
	2. I (will) find driving an electric vehicle pleasant.	
	3. Driving an electric vehicle (will) thrill(s) me.	
	4. I (will) enjoy driving an electric vehicle.	
EOU perceived ease of use	1. I (will) find that driving an electric vehicle is easy.	Adapted from *Davis (1989)*
	2. Learning to drive an electric vehicle will be/is easy.	
	3. I find that handling an electric vehicle will be/is easy.	
	4. Learning to handle an electric vehicle will be/is easy.	

Several questions in the analysis are similar to those examined in previous literature *(e.g. Roemer–Henseler, 2022)*. In addition to the questions introduced in Table 1 *(*similar to *Roemer–Henseler, 2022)*, we included some demographic and automotive industry–related questions in the current analysis. Various checks and internal tests were conducted before the distribution of the final questionnaire to determine the correct wording of the questions in Hungarian and maximise the response rate while minimising the response time. The number of respondents (with valid and complete answers) is 108, which corresponds to a response rate of approximately 18% (the questionnaire has been sent in emails to 612 students at Hungarian universities). The analysis was performed using SPSS v29.

Our study is related to the possible drivers and clusters of EV adoption attitudes; thus, the quantification of these drivers plays a vital role in the analysis. When measuring the main indicators in the analysis, answers to several questions could be provided on a scale from 1 to 7.

Several socio-demographic control variables (e.g. gender, car ownership, intention to purchase a car in the next 12 months, own income, interest in cars and opinion about the future of the automotive industry) have been identified *(Rogers, 1995)* as context-specific antecedents and partly integrated in research by *Chng et al. (2019)*, as previously indicated. All these control variables may influence the attitudes of the participants in the questionnaire related to EV adoption. For instance, we assume that car ownership creates experiences based on respondents' needs (usage, cost structure and specifications) regarding mobility. Short-term purchase intention, interest in cars and opinion about the future of the automotive industry all offer further insights about respondents' answers in terms of the robustness of their considerations. In light of these, the related binary variables are added to the analysis, and the relationships with the cluster analysis results are examined in more detail in the next section. The descriptive statistics are presented in Table 2.

The gender mix of respondents shows a 53.7% male and 46.3% female ratio. In comparison, the official Hungarian statistics *(HCSO, 2022)* confirm that 48.4% of the population in the age category of 18–34 are women; thus, our sample can be considered representative in this regard. In the case of other variables, 23.1% of respondents confirmed ownership of a car, and 16.7% considered purchasing a car in the next 12 months. Based on the official Hungarian statistics *(HCSO, 2022)*, motorisation is 40.3% in Hungary (data not available by age categories). In addition, a survey by *Forsense (2017)* indicates that 31.1% of the total population plans to change their cars in the coming 3 years; further, only 5.6% consider buying a new car, 21.5% consider buying a used car and 4% are undecided yet between buying new or used cars. These values are in the age category between 18 and 34 5.1%, 32.7% and 2.8%. In summary, car ownership of our respondents sets slightly below versus the total of Hungarian population which is in line with our expectation driven by the lower age category of our respondents. In terms of their own income, 40.7% of respondents have their own income, which – although there are no statistical averages available at the country level – appears to be quite frequent, meaning that out of 10 students, 4 work and have their own regular earnings.

Table 2

Descriptive statistics

Factors		Respondents	Percentage
	Total	108	100.0
Gender	Men	58	53.7
	Women	50	46.3
Car ownership	Yes	25	23.1
	No	83	76.9
Purchase intention	Yes	18	16.7
	No	90	83.3
Own income	Yes	44	40.7
	No	64	59.3
Interest in cars	Yes	58	53.7
	No	50	46.3
Opinion about the future of automotive industry	Yes	67	62.0
	No	41	38.0

Source: own data collection.

3. Cluster analysis

The objective of our analysis was to identify whether and what kind of distinctive sub-groups exist within Generation Z related to EV acceptance, taking into consideration the four variables (environmental concern, perceived risks, enjoyment, ease of use), and whether among these clusters' environmental consciousness appears as a driving factor. In addition, the distinctive characteristics and priorities of these clusters are the focus of our research. The findings can help us understand differences in the potential adoption rate of future customers.

Our first step was to identify the number of sub-groups based on hierarchical cluster analysis with Ward linkage. Based on the dendrogram, we have identified three distinct sub-groups. Table 3 indicates the number of participants in each sub-group (frequency), which shows that each group has a sufficient number of members (the smallest sub-group contains 24 out of 108 members, representing 22.2%).

In addition, in Table 3, in line with the above methodology *(Roemer–Henseler, 2022)*, we can see the mean values of the four key variables (environmental concern, perceived risks, enjoyment and perceived ease of use), which can assist us in describing the main priorities and focus areas of each sub-group. The average values of these four variables are zero; thus, the positive values are associated with being above average. For instance, in Cluster 1, the average value for environmental concern is above average (higher than zero). These average values can contribute to identify cluster characteristics.

Table 3

Definition of clusters

Characteristics	Group 1	Group 2	Group 3
Frequency	46	24	38
Percentage	42.6	22.2	35.2
Environmental concern – average value	0.0894462	−0.9562602	0.5708406
Ease of use – average value	0.3480974	−0.2544423	−0.3251436
Perceived EV risk – average value	0.0193961	0.3363212	−0.3381221
EV enjoyment – average value	0.9008751	−0.4489225	−0.9311926

Source: own data collection.

We have also analysed the relationship of these clusters with several socio-demographic control variables (e.g. gender, car ownership by the respondents, intention to purchase a car in the next 12 months, own income, interest in cars and opinion about the future of the automotive industry) identified by *Rogers (1995)* as context-specific antecedents, and these were partly integrated into research by *Chng et al. (2019)*. In our assumptions, all these control variables in Table 4 may influence the attitudes of the participants in the questionnaire related to EV adoption.

Table 4

Relationship between clusters and other variables

Socio-demographic control variables	Pearson chi-square value	Asymptotic significance	Cramer V value
Gender	4.896	0.086	0.213
Car ownership	6.199	0.045	0.240
Intention to purchase a car in the next 12 months	6.497	0.039	0.245
Own income	1.376	0.503	0.113
Interest in cars	3.825	0.148	0.188

Source: own data collection.

Table 4 presents the cross-table analysis results. Based on these results, we can identify that the relationship between clusters and car ownership and purchase intention can be considered statistically significant (p-values below 0.05). The relationship with gender can be considered statistically significant only at a 10% significance level (p-value between 0.05 and 0.1). Conversely, factors of own income and interest in cars do not have significant relevance in this regard. Cramer V values also indicate similar results.

In the case of measuring opinions about the future of the automotive industry, the respondents were asked to evaluate the following statement on a scale from 1 to 10: 'What is your opinion about the future of the automotive industry'? In our view, the values of 8–10 indicate a strong positive preference; subsequently, we created the corresponding binary variable. The results of a cross-table analysis (Pearson chi-square: 8.687; p-value: 0.013; Cramer V: 0.284) confirm that there is a statistically significant relationship between the clusters and this binary variable. In addition, the positive opinions in the three clusters fluctuate between 76% (Cluster 1) and 45% (Cluster 3), depending on the characteristics and priorities of each sub-group.

In line with the above analysis, we can describe the three sub-groups.

In our view, Cluster 1 may be named the 'Sunshine Generation', which is quite balanced in terms of gender and has the lowest ratio of own income. Concurrently, the Sunshine Generation has the highest ratio of car ownership as well as the highest ratio of planning to buy a car in the next 12 months; hence, they also have the highest opinion about the future of the automotive industry. In terms of EV adoption, their highest motivation refers to enjoyment; however, environmental concern does not significantly influence the Sunshine Generation.

Cluster 2 may be named 'Petrol Heads', which has the lowest ratio of females in this sub-group and the highest level of interest in cars. Concurrently, their attitude towards EVs focuses on perceived risk, and all other EV aspects are associated with negative average values, especially the lowest value that can be observed in cases of environmental concern. In our assumption, all these attitudes are driven by the fact that this sub-group still prefers internal combustion engine technologies, which refers to their naming of petrol heads.

Finally, Cluster 3 may be named 'Environmentalists', which has the highest female ratio and the highest ratio of own income. Concurrently, environmentalists represent the lowest ratio of car ownership and interests in cars. In addition, this sub-group has the lowest ratio of positive opinions about the future of the automotive industry. Their attitude towards the adoption of EVs refers to environmental concerns; however, their interest is quite low in all other aspects.

Based on the above cluster analysis, the conclusions about our three hypotheses can be formulated as follows. The empirical results demonstrate that H1 and H2 (relationship with car ownership, purchase intention, opinion about the future of the automotive industry and gender) and H3 (existing cluster with a focus on environmental concern) are all accepted.

4. Conclusions and managerial implications

Generation Z already has and will play a key role in contemporary and future consumption culture as this generation is primarily influenced by advanced technologies. Generation Z's attitudes and clusters as future consumers define their substantial impact on the major aspects of overall business propositions. In this regard, how Generation Z may be clustered – as opposed to being homogeneous – could be a major driver of future corporate strategies. Studying this may explain frameworks for segments of cultures and human behaviours; thus, this may support corporate actors in understanding and fulfilling human expectations by adding value to their business propositions *(Ecem et al., 2023)*. Each generation has their own specific beliefs and practices – Generation Z is not different – evolving in line with global advancement, which makes them unique *(Blocksidge–Primeau, 2023)*.

Research about young generations' attitudes related to EVs has received limited academic attention so far, although previous literature has examined the adoption of EVs in various aspects. As the exploration of this topic is highly topical in the automotive industry, where recent years have been characterised by the growing importance of the EV transition, this study aims to identify potential future market segments in the EV market based on the relationship between drivers of adoption.

Previous literature suggests that environmental concerns, perceived risk, ease of use and enjoyment may be among the most relevant drivers of the EV transition. Based on our findings, including indicators for these factors, the empirical findings indicate that three clusters with unique features may be distinguished based on their focuses and priorities. Cluster 1 may be named 'Sunshine Generation', and their highest motivation in terms of EV adoption refers to enjoyment; however, environmental concern does not necessarily influence them significantly. Cluster 2 may be named 'Petrol Heads' as their attitude towards EVs focuses on perceived risk and all other EV aspects are not considered priorities, especially the lowest importance that can be observed in cases of environmental concern. In addition, this sub-group may still prefer traditional internal combustion engine technologies. Finally, Cluster 3 may be named 'Environmentalists' based on their attitude towards the adoption of EVs focusing on environmental concerns; however, their interest is quite low in any other aspect.

We conclude that the description of these three clusters may contribute to explore prospective market segments in the EV market. Hence, corporate actors might consider the distinctively different motivational patterns of such sub-groups when creating their distribution and communication strategies for EV market launches.

In summary, exploring the consumer clusters of young generations may provide useful insights into future EV adoption trends. Additionally, when analysing current EV marketing or distribution strategies, a comparison with the behaviours and clusters of current consumers might add meaningful value.

5. Limitations and future research directions

Focusing on the limitations of our research, the main limitation is triggered by the sample size, which suggests that the representativeness of this sample (linked to demographic features of Generation Z) may not be secured in this study. Concurrently, our findings may highlight estimated drivers and useful insights on future consumer behavioural clusters of Generation Z related to the acceptance of EV technologies.

Taking into consideration specific characteristics of Generation Z and its sub-groups, this distinctive part of society is digitally native, always connected to the internet and to their social networks; subsequently, they are continuously exposed to global sources of information, which drives their analytical and pragmatic consumer approach. In this regard, extending our research to additional markets and/or regions could provide further insights about Generation Z's attitudes and could confirm or reject our assumption related to their lower level of geographical diversity.

Apparently, we studied the current attitudes and drivers of EV adoption within Generation Z. However, all these may alter and may be transformed over time by when Generation Z will play a significant role in general consumption. In our view, the current distinctive consumption attributes of Generation Z and its clusters may remain relevant in the future, and at the same time, we may accept this aspect as a limitation of this study.

In addition, this study could generate several further research questions with regard to decision-making processes as well as environmental concerns of Generation Z. Further research may provide in-depth insights into their motivational patterns and their decision-making behaviours, which would be essential inputs for corporations fine-tuning their distribution strategies to continuously adapt and update these in line with the values and priorities of Generation Z.

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