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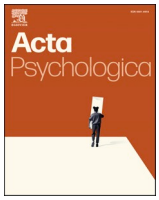

# Consumers' motivation to purchase electric vehicles: a mixed-methods belief elicitation study using theory of planned behavior

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ABSTRACT

Transportation ranks among the top sources for global carbon dioxide ($CO_2$) emissions. Though electric vehicles (EVs) offer a promising solution, consumer uptake remains low. The theory of planned behavior (TPB) identifies factors that drive pro-environmental behavior, yet seldom investigates the specific beliefs that inform and shape those factors. This article addresses that oversight by identifying key beliefs and investigating their relationships within an extended TPB to explain consumers' decision to purchase EVs. Semi-structured interviews with 33 consumers elicited underlying beliefs to the point of data saturation before a survey of 472 consumers was conducted and analyzed via partial least squares structural equation modeling (PLS-SEM). Specifically, this article extends the TPB by (i) identifying the behavioral and normative *beliefs* shaping attitudes and subjective norms toward EV purchases, (ii) investigating perceived behavioral control (PBC) as a unidimensional variable influenced by covert and overt control *beliefs* toward EV purchases, (iii) integrating moral norms alongside extrinsic and intrinsic religiosity as *values* shaping EV purchases, and (iv) inspecting the role of *generations* in EVs purchases. The results reveal attitude as the most influential determinant of consumers' intention to purchase EV, followed by PBC, moral norms, and subjective norms, while generational variations showed that extrinsic and intrinsic religiosity is only significant to Gen Y, but not Gen X and Gen Z, in EV purchases. These insights contribute by revealing how *beliefs*, *values*, and *generational differences* shape EV adoption, with practical suggestions to promote EV purchases in order to accelerate the transition to cleaner transportation.

## 1. Introduction

The transportation industry ranks as the second-largest source of carbon dioxide ($CO_2$) emissions globally—after the energy sector—contributing >20 % of total $CO_2$ emissions, primarily from conventional vehicles (Tiseo, 2024), wherein burning fuel in these vehicles releases pollutants that drive greenhouse gas accumulation, air pollution, and climate change (Gangadhari et al., 2025). Electric vehicles (EVs) offer an alternative by improving energy efficiency by 40 to 60 % and reducing carbon emissions by 30 to 50 % compared to conventional vehicles (Romm, 2006). Some studies (e.g., Adnan et al., 2017; Asadi et al., 2021) use "EVs" broadly to include hybrids, e-bikes, and e-scooters. Hybrids differ from pure EVs, which rely solely on electric power, and electric cars differ from e-bikes and e-scooters in cost considerations (e.g., more versus less expensive), performance requirements (e.g., more versus less mileage and power), and usage patterns (e.g., more versus less frequent). In this study, the term EV refers specifically to pure electric cars, as the perceived benefits and costs vary across hybrid and pure-electric models and among different types of electric transport.

Existing studies have identified factors that shape EV purchases. For example, Dong et al. (2020) found that in contexts with subsidies, charging availability and cruising power outweigh cost considerations, whereas Liu et al. (2020) observed that experienced users display greater adoption willingness than novices, and Huang and Ge (2019) reported that conventional vehicle owners respond to symbolic attitudes

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while battery EV owners are influenced by functional barriers such as driving range. Yet, the recent study by Uy et al. (Uy, Ong, De Guzman, et al., 2024; Uy, Ong, & German, 2024) showed that price remains a major concern and that EV availability continues to be limited in developing regions, which, in turn, explains why EV adoption remains low. While a clear imperative exists for EV manufacturers to invest and engage in research and development (R&D) to lower production costs and for governments to provide incentives to EV manufacturers to do so as well as subsidies to consumers to make EV purchases more affordable, we posit that an alternative non-monetary approach can be pursued not as a substitute but rather as a supplement to these strategies. This supplement, however, is complex, as it involves measuring and modeling latent (unobservable) consumer behavior, thereby necessitating well-designed scientific explorations (Lim et al., 2023).

The theory of planned behavior (TPB) frequently explains and predicts behavioral outcomes, but many applications stop short of eliciting the underlying beliefs that give its constructs meaning (Koay et al., 2024). For example, Jain and Singh (2024) and Malathi and Jasim (2024) confirmed that attitude predicts intention but did not elicit the specific behavioral beliefs that drive those attitudes. Importantly, past scholars have emphasized that identifying these beliefs is crucial to developing TPB constructs and uncovering the factors that guide individual behavior (Koay et al., 2024; Nimri et al., 2017; Nimri et al., 2020). In this regard, eliciting those beliefs is inarguably necessary to translate abstract TPB constructs into concrete drivers of EV adoption, thereby sharpening the theory's predictive accuracy to guide targeted interventions—an imperative given the urgent need to reduce transportation emissions.

Furthermore, EV adoption represents a form of sustainable consumption, making value considerations central to understanding the formation of this behavior, as sustainable consumption entails aligning purchase choices with personal ethical and environmental convictions (Lim, 2024b). In this regard, two core value dimensions are considered: moral norms and religiosity. In essence, moral norms capture individuals' internalized ethical obligations toward environmental stewardship and enhance TPB's explanatory power for pro-environmental behavior (Conner, 2020; Fishbein & Ajzen, 2010; Klockner, 2013; Liu et al., 2020; Razali et al., 2020), whereas religiosity shapes consumption through an extrinsic orientation—using religion as a means to personal ends—and an intrinsic orientation—practicing faith for its own sake—and has been shown to influence sustainable choices (Batool et al., 2022; Zhang et al., 2022). Yet, EV research rarely explores these value dimensions (Minton et al., 2015; Wang, Wang, et al., 2020), thereby highlighting the need to expand the TPB to include moral norms and religiosity as potential factors influencing EV purchases.

Moreover, generational cohorts develop distinct beliefs and behaviors through shared experiences (Mannheim, 1952; Strauss & Howe, 1991). Research reports divergent pro-environmental behavior across generations (Casalegno et al., 2022; Ivanova et al., 2019; Zhang et al., 2020). Albayrak et al. (2011) observed that younger consumers favor sustainable products more strongly, whereas Ivanova et al. (2019) found that Gen Y's belief that their individual actions can make a meaningful environmental impact has a greater effect on their eco-friendly purchase intentions than it does for Gen X. Yet, Rotaris et al. (2021) reported no correlation between environmental awareness and age. Therefore, such inconsistencies underscore the importance of accounting for generational differences when studying sustainable behaviors.

To address these gaps, this study (i) elicits the behavioral, normative, and control (overt and covert) beliefs underlying the TPB through semi-structured interviews, (ii) extends the TPB to include moral norms, extrinsic religiosity, and intrinsic religiosity, and (iii) examines whether generational cohorts (Gen X, Gen Y, and Gen Z) moderate the relationships among these TPB constructs and consumers' intention to purchase EVs. Thus, the research questions (RQs) that will be answered through this study are as follows:

**RQ1**. What are the salient behavioral, normative, and control beliefs that influence consumers' attitudes, subjective norms, and perceived behavioral control toward making EV purchases?

**RQ2**. How do the original and extended TPB constructs of attitudes, subjective norms, perceived behavioral control, moral norms, and (extrinsic and intrinsic) religiosity influence consumers' intention to purchase EVs?

**RQ$_3$**. . Do generational cohorts (Gen X, Gen Y, and Gen Z) moderate the relationships between the original and extended TPB constructs and consumers' intention to purchase EVs?

## 2. Literature review

### 2.1. Theory of planned behavior

The TPB (Ajzen, 1991) was developed to address the limitation of the theory of reasoned action (TRA), which relies solely on attitude and subjective norms to predict intention. In particular, the TPB adds perceived behavioral control (PBC) as an additional determinant of intention to account for the potential occurrence of the intention-behavior gap, where intention does not translate into behavior (Ajzen, 1991). The TPB ranks among the most widely recognized theories for understanding consumer behavior (Lim & Weissmann, 2023), explaining behavioral intention through three core components: attitude toward the behavior, subjective norms, and PBC. Researchers have extensively applied TPB in green marketing and environmental psychology to investigate pro-environmental behaviors (Laheri et al., 2024). One of its primary strengths lies in uncovering the psychological mechanisms that guide individual decision making. As noted by Ajzen and Schmidt (2020), the TPB is not rigid, as it permits the integration of additional variables if they are theoretically justified and demonstrably influence behavioral intention. This flexibility, which is inherent in grand theories like the TRA, TPB, or the technology acceptance model (TAM) (Lim, 2018), in turn, enhances the theory's explanatory power across diverse behavioral contexts. Incorporating constructs such as moral norms, extrinsic religiosity, and intrinsic religiosity can therefore further enrich the TPB to reflect the complexity of human behavior in specific domains, in this case, EV purchases.

This study extends the TPB in several ways: first, by incorporating moral norms, which have been established as significant predictors of moral-related and sustainable consumption (Adnan et al., 2018; Razali et al., 2020; Shi et al., 2017); second, by including extrinsic and intrinsic religiosity, as religion has been found to influence individual behavior (Das et al., 2025; Minton et al., 2015; Minton et al., 2018); and third, by increasing the scope of control beliefs through two dimensions—covert and overt control beliefs (Lim & Weissmann, 2023)—which, in turn, captures the source and enhances the explanatory power of PBC in the TPB (Fig. 1).

### 2.2. Attitude

Behavioral beliefs refer to an individual's perceptions of the likely outcomes of performing a specific behavior (Ajzen, 1991). These beliefs form the cognitive foundation of attitude—an individual's overall evaluation of the advantages and disadvantages associated with that behavior. TPB posits that attitude equals the sum of each behavioral belief weighted by its outcome evaluation. In context of EV, behavioral beliefs encompass both positive outcomes, such as environmental benefits and cost savings, and negative outcomes, such as charging inconvenience and limited driving range. When individuals perceive favorable outcomes and assign them high importance, a positive attitude toward EV purchase emerges. Nimri et al. (2020) and Moon (2021) demonstrated this link between behavioral beliefs and attitude in pro-environmental domains while empirical research consistently affirms attitude as a crucial determinant of behavioral intention across contexts

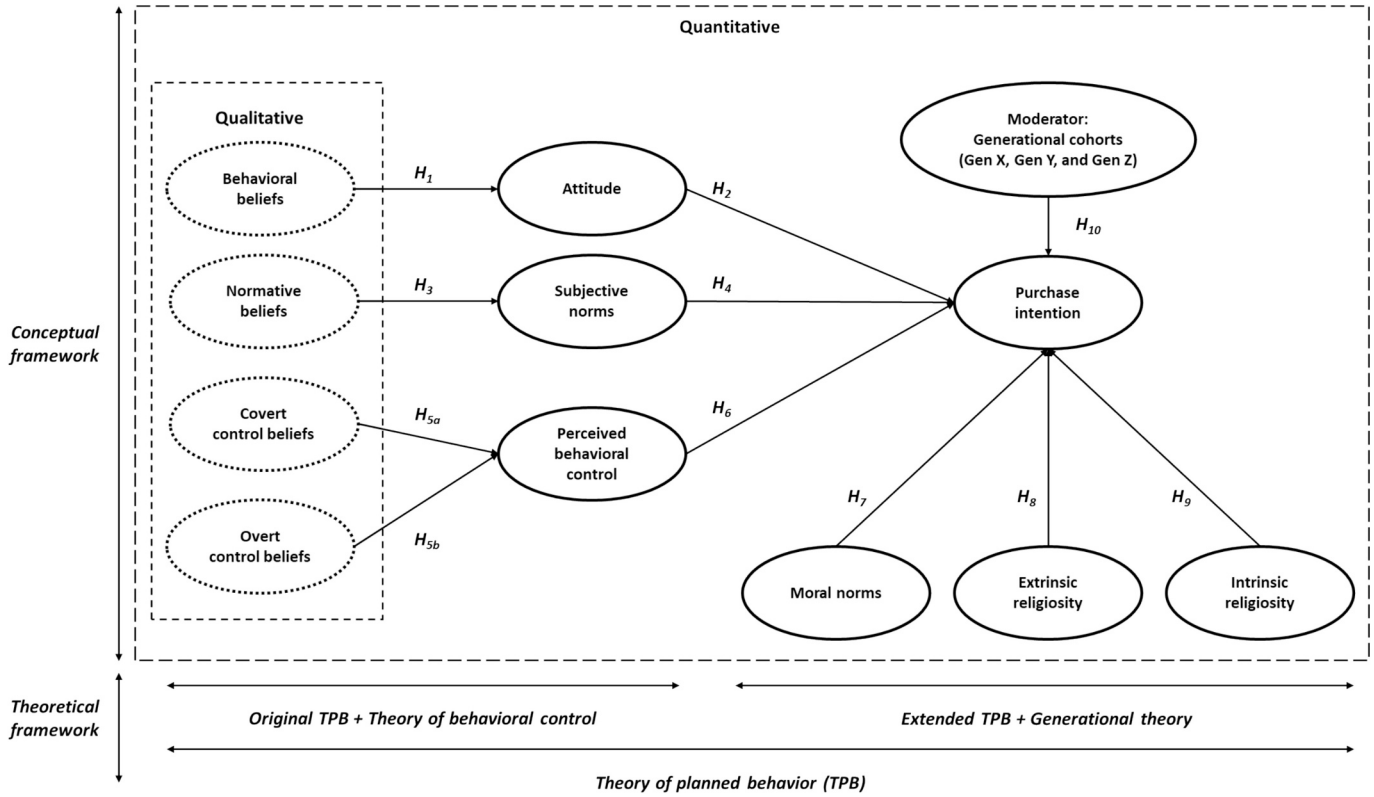


**Fig. 1.** Research framework
**Notes:** Context = Consumers' purchase of electric vehicle (EV).

(e.g., Koay et al., 2024). Kaur et al. (2022) found that favorable attitudes toward luxury sustainable products strongly predicted purchase intention and Chen (2020) reported similar effects in sustainable food consumption. Studies on hybrid vehicles (Bhutto et al., 2022), green hotels (Wang, 2022), and sustainable clothing (Kaur & Bhardwaj, 2021) further support a positive relationship between attitude and purchase intention in environmentally friendly domains. Accordingly, this article proposes:

**H1**. Behavioral beliefs of EV positively influence attitude toward purchasing EV.

**H2**. Attitude toward purchasing EV positively influences the intention to purchase EV.

### 2.3. Subjective norms

Normative beliefs refer to an individual's perception of whether significant referent groups support a behavior (Ajzen, 1991). TPB states that subjective norms—an individual's perception of social pressure from important referents to perform a behavior—are formed by normative beliefs and motivation to comply. In this regard, individuals who perceive that referent groups support a given purchase—in this case EVs—will therefore form positive subjective norms. Indeed, the work of Koay et al. (2024), Moon (2021), and Nimri et al. (2020) support this relationship between normative beliefs and subjective norms. More importantly, the strength of subjective norms depends on the extent to which individuals identify with and adhere to social expectations (Ajzen, 1991), and thus, implying that if referent groups endorse EV purchases, consumers' intentions to purchase EVs are likely to increase. This is supported by past studies (Adnan et al., 2018; Asadi et al., 2021; Xu et al., 2019) that have consistently reported a positive relationship between subjective norms and purchase intention. As such, this article proposes:

**H3**. Normative beliefs of EV positively influence subjective norms toward purchasing EV.

**H4**. Subjective norms toward purchasing EV positively influence the intention to purchase EV.

### 2.4. Perceived behavioral control

PBC refers to the perceived ease or difficulty of performing a behavior (Ajzen, 1991). PBC emerges from control beliefs (Ajzen, 1991), which the theory of behavioral control espouses as covert control beliefs and overt control beliefs (Lim & Weissmann, 2023). Covert control beliefs capture internal factors—such as abilities and skills—over which individuals have direct authority (Lim & Weissmann, 2023), and thus, when individuals perceive they possess the necessary competence, their PBC strengthens. Overt control beliefs concern external factors—such as product accessibility, availability, and affordability—that lie outside the individual's direct power (Lim & Weissmann, 2023), wherein stronger overt control beliefs enhance PBC by reinforcing perceived external support. Higher PBC, in turn, increases the likelihood of behavior performance, as individuals feel they have the resources and opportunities to translate intention into action (Ajzen, 1991; Madden et al., 1992). As a result, this article proposes:

**H5a**. Covert control beliefs of EV positively influence PBC toward purchasing EV.

**H5b**. Overt control beliefs of EV positively influence PBC toward purchasing EV.

**H6**. PBC toward purchasing EV positively influences the intention to purchase EV.

### 2.5. Moral norms

Moral norms represent individuals' internalized sense of moral obligation, reflecting judgments of right and wrong concerning a behavior (Ajzen, 1991). This personal standard guides ethical decision making and has demonstrated strong effects on intentions in morally salient contexts (Arvola et al., 2008; Botetzagias et al., 2015; Chan & Bishop, 2013). Including moral norms in the TPB captures obligations that extend beyond attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). In sustainable consumption research, moral norms reflect individuals' responsibility for environmental stewardship (Nguyen et al., 2017). When extrapolated to the context of EV purchases, moral norms lead consumers to view choosing an EV over a conventional car as an ethical choice to reduce environmental harm. Indeed, Liu et al. (2020) demonstrate that integrating moral norms into TPB significantly enhances its predictive power for pro-environmental purchase intentions. Consequently, this article proposes:

**H7**. Moral norms positively influence the intention to purchase EV.

### 2.6. Extrinsic religiosity

Extrinsic religiosity refers to using religion for personal benefits, such as protection or social acceptance (Allport & Ross, 1967; Raggiotto et al., 2018). Individuals high in extrinsic religiosity engage in religious practices for utilitarian reasons rather than spiritual ends (Smith et al., 2003). Research links this form of religiosity to sustainable behaviors motivated by social approval (Gao et al., 2017; Raggiotto et al., 2018). For instance, Wang, Wang, et al. (2020) found that extrinsic religiosity shapes attitudes toward pro-environmental hotel stays among Chinese tourists while Minton et al. (2018) observed a more general influence of religiosity on consumer attitudes. In the context of EV, those with extrinsic religious motives may view purchasing an EV as a way to gain social recognition, since EVs are socially endorsed for their environmental benefits (Dou et al., 2024), and thus, higher extrinsic religiosity should correspond to stronger EV purchase intentions. Hence, this article proposes:

**H8**. Extrinsic religiosity positively influences the intention to purchase EV.

### 2.7. Intrinsic religiosity

Intrinsic religiosity refers to engaging in religious practice for its own sake (Allport & Ross, 1967; Chang et al., 2019; Wang, Weng Wong & Elangkovan, 2020. This form of religiosity shapes individuals' intentions to perform sustainable behaviors, since most religious teachings advocate stewardship and environmental protection (Das et al., 2025; Kumar et al., 2022). Consequently, those with high intrinsic religiosity may form positive intentions to purchase EVs when their beliefs endorse sustainable consumption. Notably, Wang, Wang, et al. (2020) found that intrinsic religiosity significantly predicts pro-environmental intentions among hotel guests. Similarly, Minton and Geiger-Oneto (2020) and Raggiotto et al. (2018) report positive effects of intrinsic religiosity on sustainable behavior intentions. Therefore, this article proposes:

**H9**. Intrinsic religiosity positively influences the intention to purchase EV.

### 2.8. Generations

Generational theory, introduced by Mannheim (1952), posits that individuals born within the same period and exposed to similar historical events develop shared values, perceptions, and behaviors. Strauss and Howe (1991) further argue that each cohort's formative experiences shape its worldview and behavioral tendencies. This article adopts Pew Research Center's definitions of generational cohorts: Gen X (born 1965–1980), Gen Y or millennials (1981–1996), and Gen Z or zoomers (1997–2012) (Dimock, 2019).

Gen X comprises digital immigrants who adopted technology in adulthood (Park et al., 2024). Characterized as career-focused, pragmatic, and self-reliant (Ivanova et al., 2019)—shaped in part by economic recessions (Sirias et al., 2007)—Gen X shows mixed sustainable behaviors: Bulut et al. (2017) found lower sustainability engagement among Gen X while Casalegno et al. (2022) report the opposite by revealing their strong willingness to purchase sustainable products.

Gen Y, known as adaptable, resourceful idealists (Montana & Petit, 2008), exhibits high environmental consciousness and hedonic consumption patterns (Bulut et al., 2017; Williams et al., 2010). Heo and Muralidharan (2017) describe this cohort as the most environmentally educated while Harmon et al. (2022) label them "the green generation," noting their susceptibility to social influence in sustainability contexts.

Gen Z—true digital natives—grew up immersed in technology (McKinsey & Company, 2024; Van Den Berg et al., 2024). They combine individualism with pragmatism and display strong awareness of climate change (Casalegno et al., 2022; Tewari et al., 2022) and tendencies to purchase green products (Lopes et al., 2023).

Empirical evidence confirms generational differences in sustainable behaviors (Casalegno et al., 2022; Ivanova et al., 2019; Kapferer & Michaut-Denizeau, 2020; Kim et al., 2016; Zhang et al., 2020). Bulut et al. (2017) find that Gen Z engages less in unnecessary consumption than older cohorts while Lee and Kim (2024) report that perceived youthfulness correlates with stronger preferences for sustainable products. Ham et al. (2022) demonstrate that predictors of sustainable purchase intention vary by generation, with baby boomers showing the highest of such intention. Such inconsistencies, in turn, underscore the need to examine generational moderation in the present study on EV purchases. Thus, this article proposes:

**H10**. Generational cohorts (Gen X, Gen Y and Gen Z) moderate the relationships between TPB constructs and the intention to purchase EV.

## 3. Methodology

### 3.1. Qualitative study: Elicitation of belief constructs

A qualitative approach was used to elicit underlying beliefs via semi-structured interview questions adapted from Ajzen (2006). Thirty-three consumers were recruited through non-probability purposive and quota sampling, wherein data saturation (Lim, 2025a) was reached at the 30th interview and reaffirmed through three more interviews, where no new beliefs emerge. Interviews were transcribed verbatim and beliefs were coded and categorized using the NVivo software. Participants were Malaysian residents aged 18 and above, selected to ensure balanced representation across age, gender, and ethnicity. They represented the three main ethnic groups—Chinese, Indian, and Malay—and ranged in age from 26 to 68 years (Table 1).

A frequency count ranked beliefs from highest to lowest frequency. Following Ajzen and Fishbein (1980), the top four or five beliefs mentioned by at least 20 % of participants were included in the modal salient, balancing comprehensiveness and practicality in item selection.

### 3.2. Quantitative study: Statistical testing of consumers' motivation to purchase electric vehicles

#### 3.2.1. Instrumentation

Belief measures emerge from the qualitative semi-structured interviews herein this study (Appendix) while the other measures were adapted from past studies (Table 3). Attitude was measured using five items adapted from Koay et al. (2022), whereas subjective norm and PBC were each assessed with three items adapted from Huang and Ge (2019), moral norms with three items adapted from Rezvani et al. (2018), extrinsic religiosity with four items and intrinsic religiosity with

**Table 1**
Profile of interviewees.

| Demographic | *N* (33) | % (100) |
|---|---|---|
| **Gender** | | |
| Female | 17 | 51.5 |
| Male | 16 | 48.5 |
| Other | 0 | 0.0 |
| **Education** | | |
| High school or lower | 0 | 0.0 |
| Diploma | 2 | 6.1 |
| Bachelor's degree | 14 | 42.4 |
| Master's degree | 14 | 42.4 |
| Doctorate degree | 3 | 9.1 |
| **Age range (years)** | | |
| 18–25 | 0 | 0.0 |
| 26–30 | 3 | 9.1 |
| 31–35 | 7 | 21.2 |
| 36–40 | 3 | 9.1 |
| 41–45 | 5 | 15.2 |
| 46–50 | 3 | 9.1 |
| 51–55 | 2 | 6.1 |
| 56–60 | 5 | 15.2 |
| Above 60 | 5 | 15.2 |
| **Race** | | |
| Chinese | 12 | 36.4 |
| Indian | 11 | 33.3 |
| Malay | 10 | 30.3 |
| **Household income (monthly)** | | |
| Less than RM 4850 | 0 | 0.0 |
| RM 4850 - RM 10,959 | 11 | 33.3 |
| RM 10,960 and above | 22 | 66.7 |

**Notes:** Income categories per Department of Statistics Malaysia: B40 (< RM 4850), M40 (RM 4850–10,959), T20 (> RM 10,959). Exchange rate: USD 1 = RM 4.20 (May 5, 2025).

three items adapted from Wang, Weng Wong, and Elangkovan (2020), and intention to purchase with three items adapted from Vafaei-Zadeh et al. (2022). All constructs employed a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

### 3.2.2. Sampling

Survey data were collected via a self-administered online questionnaire using non-probability purposive sampling methods to ensure population relevance and representation across generational cohorts for multigroup analysis. G*Power analysis indicated a minimum of 118 respondents per cohort to achieve adequate statistical power for moderation tests (Hair et al., 2021). Recruitment targeted Malaysian car owners aged 18 or older who drive regularly. The survey link was shared on social media platforms (Facebook, Instagram) and distributed to customers at car service centers. The questionnaire opened with study details and screening questions, followed by measurement items and demographic questions.

The choice of Malaysia as a context is strategic. In Malaysia, particulate matter ($PM_{2.5}$) averages 12.27 μg/$m^3$—more than twice the World Health Organization's recommendation (Siddharta, 2024)—and the country ranks among the highest $CO_2$ emitters in the Asia-Pacific region (Statista, 2024). Although global EV adoption has surged in developing economies like China and developed markets such as Norway (Jaeger, 2023), Malaysia's EV market accounts for only 2.4 % of Southeast Asia's total (Counterpoint., 2023)—a surprising figure given Malaysia ranks as the region's second-largest automotive market and twenty-third globally (ASEAN Automotive Federation, 2024; Asian Insiders, 2024)—yet this gap also underscores significant growth potential. Understanding Malaysian consumers' perceptions and purchase intentions is therefore essential.

A total of 472 usable responses were obtained (Table 2). Gender is nearly balanced, with 50.4 % male, 49.4 % female, and 0.1 % identifying as other. Age cohorts lean toward younger consumers: 40.0 % are Gen Z, 34.8 % Gen Y, and 25.2 % Gen X. Ethnicity is predominantly Chinese (58.3 %), followed by Malay (32.8 %), Indian (6.4 %), and others (2.5 %). Education levels show almost half holding a bachelor's degree (48.1 %), with 18.9 % master's, 9.5 % doctorate, 11.9 % diploma, and 7.0 % high school or lower. Occupation is diverse: employed for wages (31.8 %), students (29.9 %), professionals (22.0 %), self-employed (11.2 %), with small shares of homemakers, unemployed, and retired. Location is heavily urban: Selangor (48.9 %) and Kuala Lumpur (30.5 %) account for nearly 80 % of respondents; the remainder are spread across other states. Household income falls mostly in the M40 bracket (RM 4850–10,959; 40.3 %) and T20 (≥ RM 10,960; 26.3 %), with a third in the B40 category (< RM 4850; 33.5 %).

**Table 2**
Profile of survey respondents.

| Demographic | | *N* (472) | % (100) |
|---|---|---|---|
| Gender | Female | 233 | 49.4 |
| | Male | 238 | 50.4 |
| | Other | 1 | 0.1 |
| Age | Gen X (1965–1980) | 119 | 25.2 |
| | Gen Y (1981–1996) | 164 | 34.8 |
| | Gen Z (1997–2012) | 189 | 40.0 |
| Ethnicity | Chinese | 275 | 58.3 |
| | Indians | 30 | 6.4 |
| | Malay | 155 | 32.8 |
| | Others | 12 | 2.5 |
| Education | High school | 33 | 7.0 |
| | Diploma | 56 | 11.9 |
| | Bachelor's degree | 227 | 48.1 |
| | Master's degree | 89 | 18.9 |
| | Professional degree | 22 | 4.6 |
| | Doctorate degree | 45 | 9.5 |
| Occupation | Employed for wages | 150 | 31.8 |
| | Self-employed | 53 | 11.2 |
| | Professional | 104 | 22.0 |
| | Homemaker | 8 | 1.7 |
| | Student | 141 | 29.9 |
| | Retired | 2 | 0.4 |
| | Unemployed | 14 | 2.9 |
| Residing state | Johor | 18 | 3.8 |
| | Kedah | 9 | 1.9 |
| | Kelantan | 4 | 0.9 |
| | Kuala Lumpur | 144 | 30.5 |
| | Melaka | 2 | 0.4 |
| | Negeri Sembilan | 6 | 1.3 |
| | Pahang | 4 | 0.9 |
| | Penang | 24 | 5.1 |
| | Perak | 7 | 1.5 |
| | Putrajaya | 10 | 2.1 |
| | Sabah | 2 | 0.4 |
| | Sarawak | 7 | 1.5 |
| | Selangor | 231 | 48.9 |
| | Terengganu | 4 | 0.9 |
| Household income | Less than RM4,850 | 158 | 33.5 |
| | RM4,850–RM 10,959 | 190 | 40.3 |
| | RM10,960 and above | 124 | 26.3 |

**Notes:** Household income (monthly) as per Department of Statistics Malaysia. B40 represents the bottom-tier households that have an income of below RM4,850. M40 represents the middle-tier households whose income falls between RM4,850 to RM10,959. T20 represents the top-tier households whose income is higher than RM10,959. USD 1 = RM 4.20 as on May 5, 2025.

### 3.2.3. Analysis

PLS-SEM was applied to the survey data, following a two-stage procedure: assessing the measurement model and then the structural model (Anderson & Gerbing, 1988). To test generational moderation, multigroup analysis was conducted, which evaluates the same model across distinct cohorts (Henseler & Chin, 2010). Measurement invariance was assessed via permutation tests, a conservative approach that controls type I error (Hair et al., 2023). Establishing partial measurement invariance—evidenced by configural and composite invariance—permitted valid comparisons across generations.

## 4. Results

### 4.1. Common method bias assessment

Common method bias (CMB)—the distortion of relationships between variables when data are collected using a single method (Jakobsen & Jensen, 2015; Reio, 2010)—was assessed using Harman's single-factor test and full-collinearity diagnostics. Harman's test indicated that the first factor accounted for 46 % of the total variance, below the 50 % threshold, suggesting CMB is not a concern. The full-collinearity diagnostics showed that all variance inflation factor (VIF) values remained below the threshold of 3.3, confirming no CMB issues (Lim, 2025b).

### 4.2. Measurement model assessment

With CMB ruled out, the measurement model was evaluated for internal consistency, convergent validity, and discriminant validity (Lim, 2024a, 2025b). Internal consistency was assessed using composite reliability (CR), wherein all constructs exceeded the minimum threshold of 0.70 (Table 3). Convergent validity was then evaluated, requiring item loadings above 0.708 and average variance extracted (AVE) above 0.50,

**Table 3**
Measurement model statistics.

| Construct | Item | All generations | | | Gen X | | | Gen Y | | | Gen Z | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Loading | AVE | CR | Loading | AVE | CR | Loading | AVE | CR | Loading | AVE | CR |
| Attitude | ATT1. I think that buying an EV is wise. | 0.915 | 0.854 | 0.967 | 0.924 | 0.854 | 0.967 | 0.901 | 0.870 | 0.971 | 0.922 | 0.841 | 0.964 |
| | ATT2. I think that buying an EV is positive. | 0.931 | | | 0.934 | | | 0.943 | | | 0.918 | | |
| | ATT3. I think that buying an EV is good. | 0.939 | | | 0.948 | | | 0.950 | | | 0.922 | | |
| | ATT4. I think that buying an EV is satisfactory. | 0.929 | | | 0.939 | | | 0.942 | | | 0.911 | | |
| | ATT5. I think that buying an EV is pleasant. | 0.908 | | | 0.875 | | | 0.926 | | | 0.912 | | |
| Subjective norms | SN1. Many people who are important to me are considering to purchase an EV. | 0.899 | 0.830 | 0.936 | 0.856 | 0.791 | 0.919 | 0.915 | 0.858 | 0.948 | 0.904 | 0.821 | 0.932 |
| | SN2. Many people who are important to me would approve of me to purchase an EV. | 0.898 | | | 0.898 | | | 0.916 | | | 0.878 | | |
| | SN3. Many people who are important to me would want me to purchase an EV. | 0.936 | | | 0.913 | | | 0.947 | | | 0.935 | | |
| Perceived behavioral control | PBC1. I can largely decide whether or not to buy an EV. | 0.789 | 0.717 | 0.884 | 0.786 | 0.720 | 0.885 | 0.752 | 0.721 | 0.881 | 0.821 | 0.714 | 0.882 |
| | PBC2. I will have the ability to buy an EV in the future. | 0.875 | | | 0.866 | | | 0.898 | | | 0.850 | | |
| | PBC3. I am confident that if I want to, I will definitely be able to choose an EV for my next purchase. | 0.874 | | | 0.890 | | | 0.874 | | | 0.862 | | |
| Moral norms | MN1. I feel a moral obligation to drive an EV. | 0.943 | 0.874 | 0.954 | 0.937 | 0.889 | 0.960 | 0.950 | 0.868 | 0.952 | 0.939 | 0.866 | 0.951 |
| | MN2. If I were to replace my vehicle today, I would feel a moral obligation to replace it with an EV. | 0.962 | | | 0.968 | | | 0.966 | | | 0.955 | | |
| | MN3. I feel a moral obligation to conserve fossil fuels no matter what other people do. | 0.899 | | | 0.924 | | | 0.877 | | | 0.897 | | |
| Extrinsic religiosity | ER1. I make financial contributions to my religious organization. | 0.882 | 0.853 | 0.959 | 0.791 | 0.823 | 0.949 | 0.894 | 0.870 | 0.964 | 0.911 | 0.856 | 0.960 |
| | ER2. I enjoy spending time with others of my religious affiliation. | 0.922 | | | 0.942 | | | 0.943 | | | 0.895 | | |
| | ER3. I enjoy working in the activities of my religious organization. | 0.954 | | | 0.970 | | | 0.953 | | | 0.947 | | |
| | ER4. I keep myself well-informed about my local religious group and have some influence in its decisions. | 0.935 | | | 0.914 | | | 0.939 | | | 0.946 | | |
| Intrinsic religiosity | IR1. I often read books and magazines about my faith. | 0.949 | 0.882 | 0.957 | 0.941 | 0.866 | 0.951 | 0.967 | 0.888 | 0.960 | 0.945 | 0.876 | 0.955 |
| | IR2. I spend time trying to grow in understanding my faith. | 0.959 | | | 0.962 | | | 0.954 | | | 0.951 | | |
| | IR3. Religion is especially important to me because it answers many questions about the meaning of life. | 0.910 | | | 0.887 | | | 0.905 | | | 0.911 | | |
| Intention to purchase EV | PI1: When I have/need to buy a new car, I'm willing to buy an EV. | 0.936 | 0.914 | 0.970 | 0.942 | 0.937 | 0.978 | 0.936 | 0.910 | 0.968 | 0.933 | 0.903 | 0.965 |
| | PI2: When I have/need to buy a new car, I'm planning to buy an EV. | 0.974 | | | 0.984 | | | 0.970 | | | 0.970 | | |
| | PI3: When I have/need to buy a new car, I'm going to buy an EV | 0.959 | | | 0.977 | | | 0.956 | | | 0.947 | | |

with the results confirming that all constructs met these criteria (Table 3). Discriminant validity was assessed using the heterotrait–monotrait (HTMT) ratio, all of which were within the acceptable thresholds of <0.85 (Henseler et al., 2015) (Table 4). Therefore, internal consistency, convergent validity, and discriminant validity were reasonably established for the measurement model.

### 4.3. Structural model assessment

The bootstrapping procedure was conducted using 10,000 re-samples.

To begin, behavioral beliefs of EV have a significant positive impact on the attitude toward EV purchases across generations ($\beta = 0.582$, $p < 0.001$), including Gen X ($\beta = 0.623$, $p < 0.001$), Gen Y ($\beta = 0.620$, $p < 0.001$), and Gen Z ($\beta = 0.521$, $p < 0.001$), supporting H1 (Table 5). This attitude, in turn, has a significant positive impact on the intention to purchase EV across generations ($\beta = 0.390$, $p < 0.001$), including Gen X ($\beta = 0.484$, $p < 0.001$), Gen Y ($\beta = 0.383$, $p < 0.001$), and Gen Z ($\beta = 0.311$, $p < 0.001$), supporting H2.

Likewise, normative beliefs have a significant positive impact on the subjective norms toward EV purchases across generations ($\beta = 0.527$, $p < 0.001$), including Gen X ($\beta = 0.527$, $p < 0.001$), Gen Y ($\beta = 0.620$, $p < 0.001$), and Gen Z ($\beta = 0.446$, $p < 0.001$), supporting H3. These subjective norms, in turn, have a significant positive impact on the intention to purchase EV in general ($\beta = 0.150$, $p < 0.001$), and in particular, Gen Y ($\beta = 0.141$, $p < 0.05$) and Gen Z ($\beta = 0.187$, $p < 0.001$), but not Gen X ($\beta = 0.001$, $p > 0.05$), supporting H4 and H10.

Similarly, covert control beliefs have a significant positive impact on the PBC toward EV purchases in general ($\beta = 0.407$, $p < 0.001$), and in particular, Gen Y ($\beta = 0.497$, $p < 0.001$) and Gen Z ($\beta = 0.430$, $p < 0.001$), but not Gen X ($\beta = 0.234$, $p > 0.05$), supporting $H_{5a}$ and H10, whereas overt control beliefs have a significant positive impact on the PBC toward EV purchases in general ($\beta = 0.157$, $p < 0.01$), and in particular, Gen X ($\beta = 0.249$, $p < 0.05$), but not Gen Y ($\beta = 0.122$, $p > 0.05$) and Gen Z ($\beta = 0.127$, $p > 0.05$), supporting $H_{5b}$ and H10. This PBC, in turn, has significant positive impact on the intention to purchase EV across generations ($\beta = 0.261$, $p < 0.001$), including Gen X ($\beta = 0.137$, $p < 0.05$), Gen Y ($\beta = 0.393$, $p < 0.001$), and Gen Z ($\beta = 0.180$, $p < 0.01$), supporting H6.

Lastly, moral norms have a significant positive impact on the intention to purchase EV across generations ($\beta = 0.220$, $p < 0.001$), including Gen X ($\beta = 0.339$, $p < 0.001$), Gen Y ($\beta = 0.137$, $p < 0.01$), and Gen Z ($\beta = 0.298$, $p < 0.001$), supporting H7. However, extrinsic religiosity ($\beta = 0.167$, $p < 0.05$) and intrinsic religiosity ($\beta = -0.208$, $p <$

**Table 4**
Heterotrait-monotrait (HTMT) ratio of correlations.

| Panel A. All generations | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Attitude | | | | | | | | | | | |
| 2. Behavioral beliefs | 0.594 | | | | | | | | | | |
| 3. Covert control beliefs | 0.602 | 0.428 | | | | | | | | | |
| 4. Extrinsic religiosity | 0.283 | 0.112 | 0.182 | | | | | | | | |
| 5. Intrinsic religiosity | 0.248 | 0.139 | 0.194 | 0.808 | | | | | | | |
| 6. Moral norms | 0.653 | 0.482 | 0.365 | 0.378 | 0.354 | | | | | | |
| 7. Normative beliefs | 0.454 | 0.338 | 0.342 | 0.308 | 0.302 | 0.501 | | | | | |
| 8. Overt control beliefs | 0.452 | 0.292 | 0.654 | 0.126 | 0.143 | 0.203 | 0.219 | | | | |
| 9. Perceived behavioral control | 0.524 | 0.359 | 0.569 | 0.272 | 0.234 | 0.356 | 0.277 | 0.473 | | | |
| 10. Purchase intention | 0.761 | 0.532 | 0.541 | 0.310 | 0.244 | 0.660 | 0.430 | 0.363 | 0.629 | | |
| 11. Subjective norms | 0.589 | 0.392 | 0.387 | 0.374 | 0.278 | 0.614 | 0.554 | 0.148 | 0.368 | 0.616 | |
| **Panel B. Gen X** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1. Attitude | | | | | | | | | | | |
| 2. Behavioral beliefs | 0.635 | | | | | | | | | | |
| 3. Covert control beliefs | 0.711 | 0.535 | | | | | | | | | |
| 4. Extrinsic religiosity | 0.224 | 0.046 | 0.171 | | | | | | | | |
| 5. Intrinsic religiosity | 0.220 | 0.120 | 0.186 | 0.862 | | | | | | | |
| 6. Moral norms | 0.599 | 0.481 | 0.438 | 0.369 | 0.360 | | | | | | |
| 7. Normative beliefs | 0.444 | 0.267 | 0.280 | 0.318 | 0.290 | 0.531 | | | | | |
| 8. Overt control beliefs | 0.471 | 0.334 | 0.609 | 0.113 | 0.150 | 0.223 | 0.224 | | | | |
| 9. Perceived behavioral control | 0.441 | 0.359 | 0.419 | 0.087 | 0.150 | 0.350 | 0.088 | 0.433 | | | |
| 10. Purchase intention | 0.758 | 0.608 | 0.592 | 0.240 | 0.242 | 0.686 | 0.449 | 0.437 | 0.483 | | |
| 11. Subjective norms | 0.604 | 0.337 | 0.338 | 0.373 | 0.362 | 0.692 | 0.565 | 0.140 | 0.181 | 0.542 | |
| **Panel C. Gen Y** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1. Attitude | | | | | | | | | | | |
| 2. Behavioral beliefs | 0.632 | | | | | | | | | | |
| 3. Covert control beliefs | 0.606 | 0.434 | | | | | | | | | |
| 4. Extrinsic religiosity | 0.306 | 0.165 | 0.245 | | | | | | | | |
| 5. Intrinsic religiosity | 0.221 | 0.098 | 0.187 | 0.884 | | | | | | | |
| 6. Moral norms | 0.642 | 0.485 | 0.336 | 0.403 | 0.347 | | | | | | |
| 7. Normative beliefs | 0.509 | 0.399 | 0.360 | 0.408 | 0.339 | 0.540 | | | | | |
| 8. Overt control beliefs | 0.382 | 0.246 | 0.638 | 0.185 | 0.163 | 0.146 | 0.212 | | | | |
| 9. Perceived behavioral control | 0.569 | 0.399 | 0.645 | 0.148 | 0.089 | 0.307 | 0.343 | 0.497 | | | |
| 10. Purchase intention | 0.786 | 0.526 | 0.554 | 0.269 | 0.112 | 0.582 | 0.479 | 0.311 | 0.773 | | |
| 11. Subjective norms | 0.631 | 0.488 | 0.473 | 0.360 | 0.192 | 0.597 | 0.644 | 0.149 | 0.475 | 0.673 | |
| **Panel D. Gen Z** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1. Attitude | | | | | | | | | | | |
| 2. Behavioral beliefs | 0.532 | | | | | | | | | | |
| 3. Covert control beliefs | 0.573 | 0.348 | | | | | | | | | |
| 4. Extrinsic religiosity | 0.309 | 0.102 | 0.111 | | | | | | | | |
| 5. Intrinsic religiosity | 0.317 | 0.184 | 0.149 | 0.712 | | | | | | | |
| 6. Moral norms | 0.700 | 0.501 | 0.420 | 0.400 | 0.430 | | | | | | |
| 7. Normative beliefs | 0.411 | 0.351 | 0.404 | 0.235 | 0.310 | 0.451 | | | | | |
| 8. Overt control beliefs | 0.527 | 0.310 | 0.681 | 0.067 | 0.084 | 0.289 | 0.242 | | | | |
| 9. Perceived behavioral control | 0.564 | 0.311 | 0.569 | 0.462 | 0.359 | 0.465 | 0.348 | 0.462 | | | |
| 10. Purchase intention | 0.742 | 0.476 | 0.519 | 0.396 | 0.385 | 0.736 | 0.378 | 0.370 | 0.604 | | |
| 11. Subjective norms | 0.549 | 0.381 | 0.436 | 0.432 | 0.387 | 0.578 | 0.467 | 0.199 | 0.443 | 0.631 | |

**Table 5**
Structural model statistics.

| Hypothesis | Relationship | Standard beta | Standard error | *t*-value | Remark | Effect size | 95 % confidence interval | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower bound | Upper bound |
| Panel A. All generations | | | | | | | | |
| H1 | Behavioral beliefs → Attitude | 0.582 | 0.036 | 16.309*** | Supported | 0.511 | 0.519 | 0.637 |
| H2 | Attitude → Purchase Intention | 0.390 | 0.051 | 7.647*** | Supported | 0.221 | 0.307 | 0.475 |
| H3 | Normative beliefs → Subjective norms | 0.527 | 0.041 | 12.98*** | Supported | 0.385 | 0.455 | 0.589 |
| H4 | Subjective norms → Purchase intention | 0.150 | 0.043 | 3.483*** | Supported | 0.038 | 0.078 | 0.220 |
| $H_{5a}$ | Covert control beliefs → Perceived behavioral control | 0.407 | 0.063 | 6.446*** | Supported | 0.130 | 0.299 | 0.507 |
| $H_{5b}$ | Overt control beliefs → Perceived behavioral control | 0.157 | 0.067 | 2.343** | Supported | 0.019 | 0.047 | 0.267 |
| H6 | Perceived behavioral control → Purchase intention | 0.261 | 0.039 | 6.607*** | Supported | 0.150 | 0.195 | 0.326 |
| H7 | Moral norms → Purchase intention | 0.220 | 0.049 | 4.496*** | Supported | 0.073 | 0.141 | 0.303 |
| H8 | Extrinsic religiosity → Purchase intention | 0.036 | 0.046 | 0.759 | Not supported | 0.001 | −0.042 | 0.109 |
| H9 | Intrinsic religiosity → Purchase intention | −0.050 | 0.044 | 1.100 | Not supported | 0.003 | −0.121 | 0.025 |
| **Panel B. Gen X** | | | | | | | | |
| H1 | Behavioral beliefs → Attitude | 0.623 | 0.071 | 8.819*** | Supported | 0.633 | 0.490 | 0.726 |
| H2 | Attitude → Purchase Intention | 0.484 | 0.098 | 4.955*** | Supported | 0.360 | 0.323 | 0.643 |
| H3 | Normative beliefs → Subjective norms | 0.527 | 0.059 | 8.952*** | Supported | 0.383 | 0.418 | 0.612 |
| H4 | Subjective norms → Purchase intention | 0.001 | 0.085 | 0.089 | Not supported | 0.000 | −0.160 | 0.121 |
| $H_{5a}$ | Covert control beliefs → Perceived behavioral control | 0.234 | 0.139 | 1.593 | Not supported | 0.038 | −0.016 | 0.443 |
| $H_{5b}$ | Overt control beliefs → Perceived behavioral control | 0.249 | 0.127 | 1.998* | Supported | 0.050 | 0.030 | 0.450 |
| H6 | Perceived behavioral control → Purchase intention | 0.137 | 0.076 | 1.725* | Supported | 0.038 | 0.010 | 0.258 |
| H7 | Moral norms → Purchase intention | 0.339 | 0.100 | 3.461*** | Supported | 0.167 | 0.188 | 0.521 |
| H8 | Extrinsic religiosity → Purchase intention | −0.001 | 0.109 | 0.045 | Not supported | 0.000 | −0.182 | 0.175 |
| H9 | Intrinsic religiosity → Purchase intention | 0.006 | 0.100 | 0.091 | Not supported | 0.000 | −0.157 | 0.175 |
| **Panel C. Gen Y** | | | | | | | | |
| H1 | Behavioral beliefs → Attitude | 0.620 | 0.054 | 11.439*** | Supported | 0.624 | 0.520 | 0.700 |
| H2 | Attitude → Purchase Intention | 0.383 | 0.075 | 5.145*** | Supported | 0.267 | 0.261 | 0.506 |
| H3 | Normative beliefs → Subjective norms | 0.620 | 0.052 | 11.806*** | Supported | 0.623 | 0.524 | 0.698 |
| H4 | Subjective norms → Purchase intention | 0.141 | 0.068 | 2.032* | Supported | 0.039 | 0.025 | 0.248 |
| $H_{5a}$ | Covert control beliefs → Perceived behavioral control | 0.497 | 0.082 | 6.046*** | Supported | 0.220 | 0.360 | 0.628 |
| $H_{5b}$ | Overt control beliefs → Perceived behavioral control | 0.122 | 0.092 | 1.337 | Not supported | 0.014 | −0.024 | 0.277 |
| H6 | Perceived behavioral control → Purchase intention | 0.393 | 0.053 | 7.514*** | Supported | 0.434 | 0.312 | 0.486 |
| H7 | Moral norms → Purchase intention | 0.137 | 0.057 | 2.419** | Supported | 0.039 | 0.045 | 0.231 |
| H8 | Extrinsic religiosity → Purchase intention | 0.167 | 0.093 | 1.987* | Supported | 0.036 | 0.031 | 0.335 |
| H9 | Intrinsic religiosity → Purchase intention | −0.208 | 0.084 | 2.706** | Supported | 0.059 | −0.361 | −0.095 |
| **Panel D. Gen Z** | | | | | | | | |
| H1 | Behavioral beliefs → Attitude | 0.521 | 0.061 | 8.483*** | Supported | 0.371 | 0.408 | 0.611 |
| H2 | Attitude → Purchase Intention | 0.311 | 0.078 | 4.089*** | Supported | 0.137 | 0.193 | 0.447 |
| H3 | Normative beliefs → Subjective norms | 0.446 | 0.077 | 5.739*** | Supported | 0.247 | 0.305 | 0.562 |
| H4 | Subjective norms → Purchase intention | 0.187 | 0.073 | 2.509** | Supported | 0.059 | 0.057 | 0.297 |
| $H_{5a}$ | Covert control beliefs → Perceived behavioral control | 0.430 | 0.101 | 4.304*** | Supported | 0.139 | 0.263 | 0.594 |
| $H_{5b}$ | Overt control beliefs → Perceived behavioral control | 0.127 | 0.112 | 1.072 | Not supported | 0.011 | −0.067 | 0.302 |
| H6 | Perceived behavioral control → Purchase intention | 0.180 | 0.070 | 2.503** | Supported | 0.057 | 0.055 | 0.283 |
| H7 | Moral norms → Purchase intention | 0.298 | 0.082 | 3.633*** | Supported | 0.122 | 0.162 | 0.432 |
| H8 | Extrinsic religiosity → Purchase intention | 0.018 | 0.063 | 0.251 | Not supported | 0.000 | −0.091 | 0.118 |
| H9 | Intrinsic religiosity → Purchase intention | 0.014 | 0.064 | 0.254 | Not supported | 0.000 | −0.090 | 0.123 |

*** **Notes:** $p < 0.001$.
** $p < 0.01$.
* $p < 0.05$.

0.01) only exert a significant—positive and negative—impact on the intention to purchase EV for Gen Y, but not Gen X or Gen Z, and thus, supporting H10, and to a certain extent, H8 and H9.

### 4.4. Multigroup analysis

Prior to examining generational differences, measurement invariance was tested via permutation procedures (Table 6). Configural and compositional invariance were established for all constructs—confirming that each cohort interpreted the measures equivalently—while equality of means and variances held fully for a subset of constructs. This partial measurement invariance meets the threshold for valid multigroup comparisons.

The multigroup analysis (Table 7) reveals that several relationships differ significantly across cohorts, providing partial support for H10. First, intrinsic religiosity's effect on purchase intention varies markedly between Gen Y and Gen Z: it exerts a significant negative influence for Gen Y ($\beta = -0.228$, $p < 0.01$) but is nonsignificant for Gen Z ($\beta = 0.016$, $p > 0.05$), with a significant difference in path coefficients (permutation $p = 0.007$). Second, perceived behavioral control more strongly predicts intention for Gen Y ($\beta = 0.395$, $p < 0.001$) than for Gen Z ($\beta = 0.175$, $p < 0.01$), with a significant difference in path coefficients (permutation $p = 0.007$). Third, comparisons between Gen X and Gen Z show that subjective norms drive intention only for Gen Z ($\beta = 0.183$, $p < 0.01$) and not for Gen X ($\beta = -0.008$, $p > 0.05$), with a significant difference in path coefficients (permutation $p = 0.044$). Finally, covert control beliefs influence PBC significantly for Gen Y ($\beta = 0.495$, $p < 0.001$) but not for Gen X ($\beta = 0.221$, $p > 0.05$), with this difference reaching significance (permutation $p = 0.045$). These results indicate that generational cohort moderates certain—but not all—relationships in the extended TPB model, thereby providing partial support for H10.

## 5. Discussion

### 5.1. General observations

To begin, behavioral, normative, and control beliefs shaped the core constructs of TPB. Noteworthily, consumers' beliefs about EV benefits and drawbacks translated directly into their attitudes, confirming that positive perceptions, such as environmental impact and long-term savings, drive favorable evaluations of EV purchases. This mirrors Moon (2021), who similarly found that salient behavioral beliefs underpin pro-environmental attitudes. Likewise, normative beliefs, or perceptions of referent approval, significantly informed subjective norms, demonstrating that social endorsement cultivates perceived pressure to adopt EVs. Nimri et al. (2020) and Moon (2021) likewise documented this linkage, underscoring the potency of collective expectations in a context where communal approval carries weight. Both covert control beliefs (internal efficacy) and overt control beliefs (external facilitators) shaped perceived behavioral control (Lim & Weissmann, 2023), yet internal factors, such as confidence in one's ability to operate and maintain an EV, exerted a stronger influence, reflecting Ajzen's (1991) emphasis on self-efficacy for complex, high-involvement decisions. This disparity in impact between internal and external control beliefs points to an opportunity for future research to test moderators, such as cultural context or market maturity, which might shift the relative influence of these belief types.

Turning to intention formation, attitude emerged as the strongest driver of consumers' willingness to purchase EVs, aligning with TPB research (Asadi et al., 2021; Shi et al., 2017) that attitudinal evaluations are critical when large financial commitments are involved. Subjective norms also contributed positively to intention, although to a lesser degree, suggesting that while social pressures matter, personal evaluations and anticipated outcomes often carry more weight in major purchase decisions. Perceived behavioral control further reinforced intention, indicating that confidence in having the means and opportunities to acquire an EV solidifies the intention-formation process. Given the hierarchy of antecedents, interventions that target attitudes (e.g., tailored persuasive messaging), leverage community endorsement (e.g., peer testimonials), and address practical barriers (e.g., charging-infrastructure guarantees, test-drive initiatives) should outperform single-focus approaches.

Extending the TPB, moral norms added meaningful explanatory power beyond the original constructs. The sense of ethical obligation to choose environmentally responsible options nudged purchase intentions upward, highlighting that framing EV adoption as a moral imperative can strengthen consumer commitment. In contrast, neither extrinsic nor intrinsic religiosity significantly influenced intention. This divergence from findings in other sustainable domains (e.g., Das et al., 2025; Minton et al., 2015; Wang, Wang, et al., 2020) suggests that religious motivations may not translate into technologically oriented, high-investment decisions like EV purchases, which consumers appear to frame more in terms of environmental and functional considerations than of faith-based imperatives. The stronger influence of moral norms over religiosity in the context of EVs also contrasts with research in domains such as cosmetics, fashion, finance, food, pharmaceutical, and travel, where faith-based motivations (e.g., Halal) often dominate (Rafiki et al., 2024), underscoring how domain specificity can shape value drivers. This suggests that, for high-investment purchases like EVs, universal ethical messaging may resonate more broadly than faith-oriented appeals.

### 5.2. Generational observations

***Gen X.*** Gen X's decision to purchase an EV hinges primarily on overt control beliefs, such as practical, external factors (e.g., affordability and charging infrastructure), rather than covert control beliefs. This finding underscores Gen X's tendency to weigh functional considerations before making a high-cost purchase. Although Gen X's positive attitude and moral norms foster an intention to buy EVs, subjective norms show no influence on their intention, suggesting that Gen X prioritizes tangible product attributes over the opinions of reference groups. Given that Gen X typically values practicality (Ramírez-Herrero et al., 2024), it is reasonable that economic and infrastructural conditions shape their sense of behavioral control more than personal competencies. This contrast with Generation Y, where covert control beliefs hold equal sway, highlights how Gen X's focus on external enablers reflects life-stage stability and signals that cost incentives and infrastructure improvements will speak more directly to this cohort than messages emphasizing user competencies.

***Gen Y.*** Gen Y's intention to purchase EV is driven by both internal and external factors. Covert control beliefs, such as self-efficacy and confidence in one's knowledge about EVs, show a strong link to PBC for this cohort, indicating that Gen Y's sense of "I can do it" resonates powerfully in their decision-making. They also exhibit significant relationships between both moral norms and religiosity (especially extrinsic religiosity) with EV intention, though intrinsic religiosity surprisingly has a negative influence. This pattern suggests that while Gen Y recognizes the ethical imperative of environmentally friendly consumption and may be attuned to social approval from religious groups, certain spiritually driven convictions (e.g., seeing EVs as unnecessary luxury items) can dampen enthusiasm. Moreover, Gen Y's substantial life experience with finances (Fan & Henager, 2025), yet ongoing sensitivity to peer and social cues, positions them to assess EV ownership in a balanced way: they appreciate intangible benefits (moral considerations, personal efficacy) but also gauge how external validation or disapproval might affect them. The mixed influence of moral norms and religiosity for Gen Y, which was absent in Gen X and Gen Z, reveals a complex value sensitivity that calls for messaging balancing ethical appeals with social validation and addressing perceptions of exclusivity.

***Gen Z.*** Gen Z, in turn, stands out for placing notable emphasis on subjective norms in shaping their EV purchase intentions. They appear

**Table 6**
Permutation test.

| | Configural invariance | Compositional invariance | | | Equal mean assessment | | | | Equal variance assessment | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Panel A. Gen Z and Gen Y | | | | | | | | | | | | | |
| | | C = 1 | 5.0 % | Partial measurement invariance achieved | Difference | 5.0 % | 95.0 % | Equal | Difference | 5.0 % | 95.0 % | Equal | Full measurement invariance achieved |
| Attitude | Yes | 1.000 | 1.000 | Yes | 0.121 | −0.176 | 0.173 | Yes | −0.081 | −0.259 | 0.273 | Yes | Yes |
| Behavioral beliefs | Yes | 1.000 | 1.000 | No | 0.001 | −0.182 | 0.181 | Yes | −0.255 | −0.266 | 0.264 | Yes | No |
| Covert control beliefs | Yes | 1.000 | 1.000 | No | −0.355 | −0.171 | 0.176 | No | 0.187 | −0.209 | 0.214 | Yes | No |
| Extrinsic religiosity | Yes | 1.000 | 0.998 | Yes | −0.154 | −0.176 | 0.178 | Yes | 0.056 | −0.202 | 0.202 | Yes | Yes |
| Intrinsic religiosity | Yes | 0.996 | 0.994 | Yes | −0.315 | −0.173 | 0.175 | No | −0.023 | −0.175 | 0.176 | Yes | No |
| Moral norms | Yes | 1.000 | 0.999 | Yes | 0.329 | −0.178 | 0.180 | No | −0.046 | −0.185 | 0.187 | Yes | No |
| Normative beliefs | Yes | 1.000 | 1.000 | No | 0.099 | −0.171 | 0.174 | Yes | 0.023 | −0.245 | 0.241 | Yes | No |
| Overt control beliefs | Yes | 1.000 | 1.000 | Yes | −0.267 | −0.174 | 0.175 | No | 0.149 | −0.242 | 0.237 | Yes | No |
| Perceived behavioral control | Yes | 1.000 | 0.997 | Yes | −0.205 | −0.169 | 0.178 | No | −0.051 | −0.259 | 0.258 | Yes | No |
| Purchase intention | Yes | 1.000 | 1.000 | Yes | 0.015 | −0.177 | 0.177 | Yes | −0.198 | −0.212 | 0.212 | Yes | Yes |
| Subjective norms | Yes | 1.000 | 0.999 | Yes | 0.268 | −0.180 | 0.175 | No | 0.008 | −0.210 | 0.207 | Yes | No |
| **Panel B. Gen Z and Gen X** | | | | | | | | | | | | | |
| Attitude | Yes | 1.000 | 1.000 | Yes | 0.025 | −0.193 | 0.194 | Yes | −0.058 | −0.298 | 0.311 | Yes | Yes |
| Behavioral beliefs | Yes | 1.000 | 1.000 | Yes | −0.212 | −0.191 | 0.194 | No | −0.438 | −0.269 | 0.289 | No | No |
| Covert control beliefs | Yes | 1.000 | 1.000 | No | −0.351 | −0.193 | 0.191 | No | 0.018 | −0.219 | 0.237 | Yes | No |
| Extrinsic religiosity | Yes | 0.998 | 0.996 | Yes | −0.191 | −0.193 | 0.190 | Yes | 0.183 | −0.219 | 0.233 | Yes | Yes |
| Intrinsic religiosity | Yes | 0.999 | 0.996 | Yes | −0.319 | −0.189 | 0.194 | No | 0.042 | −0.196 | 0.204 | Yes | No |
| Moral norms | Yes | 1.000 | 1.000 | Yes | 0.123 | −0.197 | 0.193 | Yes | −0.087 | −0.202 | 0.213 | Yes | Yes |
| Normative beliefs | Yes | 1.000 | 1.000 | Yes | 0.144 | −0.185 | 0.188 | Yes | 0.172 | −0.244 | 0.256 | Yes | Yes |
| Overt control beliefs | Yes | 1.000 | 1.000 | Yes | −0.183 | −0.194 | 0.193 | Yes | 0.093 | −0.257 | 0.285 | Yes | Yes |
| Perceived behavioral control | Yes | 0.998 | 0.995 | Yes | −0.378 | −0.197 | 0.194 | No | 0.223 | −0.294 | 0.317 | Yes | No |
| Purchase intention | Yes | 1.000 | 1.000 | Yes | −0.037 | −0.196 | 0.194 | Yes | −0.204 | −0.230 | 0.252 | Yes | Yes |
| Subjective norms | Yes | 1.000 | 0.998 | Yes | 0.305 | −0.195 | 0.192 | No | 0.279 | −0.226 | 0.242 | No | No |
| **Panel C. Gen Y and Gen X** | | | | | | | | | | | | | |
| Attitude | Yes | 1.000 | 1.000 | Yes | −0.095 | −0.196 | 0.200 | Yes | 0.026 | −0.279 | 0.297 | Yes | Yes |
| Behavioral beliefs | Yes | 1.000 | 1.000 | No | −0.197 | −0.198 | 0.202 | Yes | −0.184 | −0.274 | 0.288 | Yes | Yes |
| Covert control beliefs | Yes | 1.000 | 1.000 | Yes | −0.009 | −0.194 | 0.200 | Yes | −0.169 | −0.263 | 0.282 | Yes | Yes |
| Extrinsic religiosity | Yes | 0.999 | 0.993 | Yes | −0.033 | −0.199 | 0.201 | Yes | 0.119 | −0.240 | 0.256 | Yes | Yes |
| Intrinsic religiosity | Yes | 0.998 | 0.929 | Yes | 0.002 | −0.199 | 0.201 | Yes | 0.058 | −0.223 | 0.234 | Yes | Yes |
| Moral norms | Yes | 1.000 | 0.999 | Yes | −0.202 | −0.195 | 0.201 | No | −0.038 | −0.196 | 0.212 | Yes | No |
| Normative beliefs | Yes | 1.000 | 1.000 | Yes | 0.044 | −0.192 | 0.199 | Yes | 0.149 | −0.264 | 0.270 | Yes | Yes |
| Overt control beliefs | Yes | 1.000 | 1.000 | Yes | 0.085 | −0.198 | 0.203 | Yes | −0.056 | −0.303 | 0.325 | Yes | Yes |

(*continued on next page*)

**Table 6** (*continued*)

| Panel A. Gen Z and Gen Y | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Configural invariance | Compositional invariance | | | Equal mean assessment | | | | Equal variance assessment | | | | |
| | | C = 1 | 5.0 % | Partial measurement invariance achieved | Difference | 5.0 % | 95.0 % | Equal | Difference | 5.0 % | 95.0 % | Equal | Full measurement invariance achieved |
| Perceived behavioral control | Yes | 0.997 | 0.996 | Yes | −0.153 | −0.200 | 0.193 | Yes | 0.261 | −0.284 | 0.315 | Yes | Yes |
| Purchase intention | Yes | 1.000 | 1.000 | No | −0.050 | −0.203 | 0.197 | Yes | −0.006 | −0.212 | 0.228 | Yes | Yes |
| Subjective norms | Yes | 1.000 | 0.999 | Yes | 0.025 | −0.194 | 0.203 | No | 0.273 | −0.233 | 0.253 | No | No |

**Table 7**
Multigroup analysis.

| Panel A. Gen Z and Gen Y | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Relationship | Standard beta | | Standard error | | *t*-value | | *p*-value | | Path coefficient difference | Henseler's MGA | Permutation p-value | Remark |
| | Gen Y | Gen Z | Gen Y | Gen Z | Gen Y | Gen Z | Gen Y | Gen Z | | | | |
| Attitude → Purchase intention | 0.384 | 0.318 | 0.075 | 0.078 | 5.145 | 4.093 | 0.000 | 0.000 | −0.065 | 0.728 | 0.286 | Not significant |
| Extrinsic religiosity → Purchase intention | 0.185 | 0.016 | 0.093 | 0.063 | 1.987 | 0.251 | 0.023 | 0.401 | −0.169 | 0.926 | 0.053 | Not significant |
| Intrinsic religiosity → Purchase intention | −0.228 | 0.016 | 0.084 | 0.064 | 2.706 | 0.254 | 0.003 | 0.400 | 0.244 | 0.017 | 0.007 | Significant |
| Moral norms → Purchase intention | 0.137 | 0.299 | 0.057 | 0.082 | 2.419 | 3.633 | 0.008 | 0.000 | 0.162 | 0.053 | 0.064 | Not significant |
| Overt control beliefs → Perceived behavioral control | 0.124 | 0.120 | 0.092 | 0.112 | 1.337 | 1.072 | 0.091 | 0.142 | −0.003 | 0.509 | 0.494 | Not significant |
| Perceived behavioral control - > Purchase intention | 0.395 | 0.175 | 0.053 | 0.070 | 7.514 | 2.503 | 0.000 | 0.006 | −0.221 | 0.995 | 0.007 | Significant |
| Subjective norms → Purchase intention | 0.138 | 0.183 | 0.068 | 0.073 | 2.032 | 2.509 | 0.021 | 0.006 | 0.045 | 0.326 | 0.329 | Not significant |
| **Panel B. Gen X and Gen Z** | | | | | | | | | | | | |
| Attitude → Purchase intention | 0.486 | 0.318 | 0.098 | 0.078 | 4.955 | 4.093 | 0.000 | 0.000 | −0.167 | 0.909 | 0.101 | Not significant |
| Behavioral beliefs → Attitude | 0.623 | 0.520 | 0.071 | 0.061 | 8.819 | 8.483 | 0.000 | 0.000 | −0.103 | 0.864 | 0.151 | Not significant |
| Extrinsic religiosity → Purchase Intention | −0.005 | 0.016 | 0.109 | 0.063 | 0.045 | 0.251 | 0.482 | 0.401 | 0.021 | 0.432 | 0.431 | Not significant |
| Intrinsic religiosity → Purchase Intention | 0.009 | 0.016 | 0.100 | 0.064 | 0.091 | 0.254 | 0.464 | 0.400 | 0.007 | 0.478 | 0.472 | Not significant |
| Moral norms → Purchase intention | 0.347 | 0.299 | 0.100 | 0.082 | 3.461 | 3.633 | 0.000 | 0.000 | −0.048 | 0.645 | 0.353 | Not significant |
| Normative beliefs → Subjective norms | 0.526 | 0.445 | 0.059 | 0.077 | 8.952 | 5.739 | 0.000 | 0.000 | −0.082 | 0.799 | 0.250 | Not significant |
| Overt control beliefs→ Perceived behavioral control | 0.254 | 0.120 | 0.127 | 0.112 | 1.998 | 1.072 | 0.023 | 0.142 | −0.134 | 0.786 | 0.251 | Not significant |
| Perceived behavioral control→ Purchase intention | 0.131 | 0.175 | 0.076 | 0.070 | 1.725 | 2.503 | 0.042 | 0.006 | 0.044 | 0.332 | 0.339 | Not significant |
| Subjective norms → Purchase intention | −0.008 | 0.183 | 0.085 | 0.073 | 0.089 | 2.509 | 0.465 | 0.006 | 0.190 | 0.044 | 0.044 | Significant |
| **Panel C. Gen X and Gen Y** | | | | | | | | | | | | |
| Behavioral beliefs → Attitude | 0.623 | 0.620 | 0.071 | 0.054 | 8.819 | 11.439 | 0.000 | 0.000 | −0.003 | 0.519 | 0.496 | Not significant |
| Covert control beliefs → Perceived behavioral control | 0.221 | 0.495 | 0.139 | 0.082 | 1.593 | 6.046 | 0.056 | 0.000 | 0.274 | 0.046 | 0.045 | Significant |
| Normative beliefs → Subjective norms | 0.526 | 0.619 | 0.059 | 0.052 | 8.952 | 11.806 | 0.000 | 0.000 | 0.093 | 0.117 | 0.122 | Not significant |
| Overt control beliefs → Perceived behavioral control | 0.254 | 0.124 | 0.127 | 0.092 | 1.998 | 1.337 | 0.023 | 0.091 | −0.131 | 0.799 | 0.219 | Not significant |

more responsive to peer and social influences than Gen X, aligning with prior observations that younger cohorts are strongly guided by collective approval (Loechner, 2018). At the same time, Gen Z's PBC hinges more on covert control beliefs than on overt factors like accessibility or cost, suggesting that if these young consumers feel personally capable, despite being in earlier career or education stages, they are inclined to form favorable purchase intentions toward EVs. Religiosity, however, shows no discernible effect for this generation. In contrast to Gen Y, Gen Z may regard EV ownership primarily as a socially endorsed environmental practice rather than a religiously motivated one, which further supports the view that Gen Z's sustainable choices emerge more from a blend of social acceptance and self-efficacy than from faith-based imperatives. This combination of social endorsement and self-efficacy distinguishes Gen Z from both older cohorts and indicates that peer-led initiatives and empowerment campaigns will most effectively drive their adoption of EVs.

***Gen X, Gen Y, and Gen Z.*** Comparing these three cohorts indicates that internal self-confidence (covert control beliefs) is especially potent for Gen Y but plays a lesser role for Gen X, who instead prioritize tangible, external enablers. Gen Z looks to peer support and a sense of moral responsibility yet is less swayed by religious motivations. These patterns, in turn, reveal distinct generational mindsets, wherein Gen X remains practical and infrastructure-focused, Gen Y blends moral and social drivers with self-belief, and Gen Z is highly conscious of social cues and personal capability but places less weight on religiosity. Understanding these different motivational underpinnings is vital for tailoring strategies to increase EV adoption across generations.

## 6. Conclusion

Governments and organizations worldwide are increasingly supporting initiatives to electrify the automotive industry in response to growing environmental problems associated with greenhouse gas emissions. Conventional vehicles remain a significant contributor to these emissions, prompting the introduction of EVs as an alternative capable of potentially lowering carbon footprints. While practical measures—such as research and development, subsidies, and incentives—play a pivotal role in making EVs more affordable, non-monetary approaches focused on consumer behavior can also bolster EV adoption. Such approaches, however, require careful investigation of the latent factors that shape consumers' decision to purchase EVs.

In this study, we examined these latent factors by first conducting semi-structured interviews to elicit context-specific behavioral, normative, and control beliefs—addressing prior calls to capture the building blocks behind the TPB (Ajzen, 1991; Ajzen, 2006; Fishbein & Ajzen, 2010). We then extended the TPB by incorporating moral norms, extrinsic religiosity, and intrinsic religiosity, recognizing that sustainable consumption often involves personal ethics and values beyond cost considerations. Adopting a mixed-methods design allowed us to integrate qualitative insights into a subsequent survey that measured how attitudes, subjective norms, perceived behavioral control, and moral and religious factors collectively influence EV purchase intentions.

We also considered the moderating effect of generational cohorts (Gen X, Gen Y, and Gen Z), given evidence that generational groups differ in their perspectives due to varying life experiences (Lim et al., 2023). Hence, by capturing these differences, this study contributes new insights into whether and how generational variations affect EV purchase behaviors. This holistic view not only underscores the importance of identifying context-specific beliefs in driving pro-environmental behavior but also suggests that moral and religious dimensions can either reinforce or attenuate individuals' decisions, depending on how they intersect with generational experiences.

### 6.1. Theoretical contributions

This article makes several meaningful theoretical contributions at the intersection of high-involvement sustainable consumption through the lens of EVs and the TPB.

Firstly, this study addresses a longstanding oversight in TPB-based research by eliciting the specific behavioral, normative, and control beliefs that shape consumers' decision-making (Koay et al., 2024), in this case, EV purchases. While past studies often rely on pre-established items or generic assumptions (Adnan et al., 2018; Asadi et al., 2021; Dou et al., 2024), this study's qualitative component furnishes a tailored set of beliefs directly tied to the EV context. This belief-elicitation process not only refines the core TPB constructs of attitude, subjective norms, and PBC but also demonstrates that the absence of such context-specific insights can lead to incomplete explanations of how purchase decisions are formed, thereby reaffirming the call and observations by Homer and Lim (2024) for context-driven theory development.

Secondly, this study advances the theoretical concept of PBC by distinguishing between covert and overt control beliefs, drawing on Lim and Weissmann's (2023) theory of behavioral control. The findings show that both internal capacities (covert beliefs) and external enablers (overt beliefs) shape consumers' sense of control, yet covert beliefs exert a stronger influence across most samples. Hence, by empirically demonstrating that internal self-efficacy considerations outweigh certain practical barriers or infrastructural supports in shaping PBC, this study contributes to ongoing discussions on how multi-faceted perceptions of control operate in high-involvement, sustainable consumption decisions.

Thirdly, the incorporation of moral norms, extrinsic religiosity, and intrinsic religiosity—coupled with generational comparisons—pushes the TPB into more ethically and contextually diverse territory. While moral norms systematically bolster pro-environmental intentions, religiosity emerges as generationally contingent, indicating that sustainable behaviors may not always align with faith-driven motivations. These results underscore how personal ethics and spiritual orientations, though typically absent from EV adoption studies, can influence—or fail to influence—major purchase decisions. Moreover, the discovery that some generational cohorts weigh internal abilities or social pressures more heavily than others clarifies the role of generational theory (Mannheim, 1952; Strauss & Howe, 1991) in explaining heterogeneous behavioral patterns within the same society.

Taken collectively, these theoretical contributions provide a clearer theoretical understanding of the complex factors driving EV adoption by demonstrating how context-specific beliefs, dual-faceted control perceptions, and both generational and value considerations intertwine to expand the conceptual and empirical reach of TPB-based research on sustainable behavior. Such insights enrich TPB scholarship and extant inquiries into pro-environmental consumerism, and thus, offering a stronger foundation for future studies that integrate moral, religious, and generational dimensions within their theoretical frameworks.

### 6.2. Practical implications

The study's findings provide clear, actionable guidance for both EV manufacturers and policymakers by pinpointing the specific beliefs and generational nuances that underlie consumers' decision-making of EV purchases.

Firstly, emphasizing key behavioral beliefs—such as environmental friendliness and cost savings—can contribute to fostering and strengthening positive attitudes toward EVs. Given that attitude emerges as the strongest predictor across all generational cohorts, advocacy endorsements or testimonials can be leveraged to present EVs as an impactful solution for reducing carbon footprints and saving on long-term fuel expenses.

Secondly, highlighting social validation strategies can be effective, especially for Gen Z consumers who place considerable weight on peer and reference-group approval. Campaigns could incorporate visible demonstrations—such as influencer testimonies or shared user experiences on social media—to showcase EV ownership as both modern and

environmentally responsible. In contrast, Gen X appears relatively unaffected by social norms, which, in turn, underscores the importance of tailoring messages that emphasize practical, external considerations for this segment.

Thirdly, enhancing PBC calls for addressing both covert and overt control beliefs. Although covert control beliefs—such as personal confidence and self-efficacy—generally have a stronger influence on PBC, Gen Y in particular benefits from clear, consistent information on financing options, maintenance, and after-sales support. These measures can help Gen Y consumers see EV ownership as realistic, aligning with their tendency to value internal ability over external support. EV manufacturers can therefore partner with financial institutions to offer flexible payment schedules that elevate consumers' sense of control. Whereas, Gen X consumers respond more strongly to overt control factors, highlighting the need for tangible infrastructural support like widespread charging stations, reliable maintenance services, and transparent cost-of-ownership details. Policymakers can collaborate with industry players to enhance infrastructure in areas where Gen X typically reside or work, thereby improving perceptions of daily usability.

Fourthly, moral norms consistently shape EV purchase intentions across all generations, indicating that framing EVs as an ethical choice remains a widely viable strategy. Engaging messaging that underscores environmental stewardship can resonate with consumers who regard carbon reduction as a moral imperative. Whereas, the study's multigroup analysis shows that religiosity exerts little influence on most cohorts, yet Gen Y reports a negative relationship between intrinsic religiosity and purchase intention of EVs. EV manufacturers targeting intrinsically religious Gen Y buyers can therefore present EVs as a pragmatic, eco-friendly product rather than a status symbol—emphasizing modest, functional designs over luxury attributes.

Taken together, these practical strategies reflect the precise dimensions measured in the study—attitude, subjective norms, perceived behavioral control, and moral norms—while accounting for significant generational distinctions in how consumers navigate a high-involvement purchase like an EV.

### 6.3. Limitations and future directions

Although this study offers comprehensive insights into the beliefs and factors influencing EV purchases through both qualitative and quantitative methods, several limitations warrant attention.

Firstly, this study centers on the context of Malaysia, which, though well-justified, remains limited in generalizability. Future research can replicate this study in other countries to examine whether variations in infrastructure, subsidies, and fuel costs produce divergent results. For instance, in markets like China—where extensive charging facilities and government incentives exist—PBC could become more influential, whereas charging infrastructure may be less critical in shaping EV purchases. Conversely, in regions where fuel is not subsidized, cost concerns may manifest differently, underscoring the need for cross-cultural comparisons of EV adoption drivers.

Secondly, the extended TPB that guided this investigation included generational analyses, but further demographic or psychographic factors remain unexplored. Future research can investigate whether gender (female versus male), location (urban versus rural), or varying levels of openness to new experiences, innovativeness, or risk adverseness explain potential variability in EV purchase decisions.

Thirdly, longitudinal studies are encouraged to address the cross-sectional limitation of this study. Such studies could capture how evolving infrastructure, marketing practices, policy changes, and technological advancements alter consumer attitudes, PBC, and by extension, inclinations to (continue to) make EV (and other high-involvement sustainable) purchases, which, in turn, can also lead to field insights on actual behavior that can supplement the intention-proxied insights of behavior herein this study.

In conclusion, the main findings show that attitude, subjective norms, and PBC serve as primary predictors of EV purchase intention, with attitude emerging as the strongest driver. Among the extended TPB constructs, moral norms bolster purchase intentions, whereas extrinsic and intrinsic religiosity do not significantly affect all generations, while covert control beliefs exhibit a stronger impact on PBC than overt control beliefs. Generational differences further highlight that Gen X responds strongly to overt control beliefs, Gen Y is shaped by covert control beliefs and religiosity, and Gen Z relies on subjective norms. Therefore, these results underscore the importance of adapting both theoretical models and practical interventions to match specific belief structures and generational values in the context of EV adoption.

## CRediT authorship contribution statement

**Shun Mya Thwe:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Weng Marc Lim:** Writing – review & editing, Writing – original draft, Validation, Supervision, Conceptualization. **Kian Yeik Koay:** Writing – review & editing, Writing – original draft, Validation, Supervision, Conceptualization. **Derek Ong:** Writing – review & editing, Writing – original draft, Validation, Supervision, Conceptualization.

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## Declaration of competing interest

None.

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## Appendix A. Belief measures

Guided by Fishbein and Ajzen (2010) and Koay et al. (2024), we conducted a belief elicitation study using semi-structured interviews to develop measurable scales for behavioral, normative, covert, and overt beliefs. Given these beliefs were represented by composite scores, we did not assess internal consistency, convergent validity, or discriminant validity, and thus, those metrics are reported in a separate table below rather than in Table 3.

**Table A1**
Belief elicitation results.

| Key salient beliefs | Number of participants (*N*: 33) | Percentage of participants (%: 100) | Mean composite score |
|---|---|---|---|

(*continued on next page*)

**Table A1** (*continued*)

| Key salient beliefs | | Number of participants (*N*: 33) | Percentage of participants (%: 100) | Mean composite score |
|---|---|---|---|---|
| **Panel A. *Behavioral beliefs* on the outcomes of purchasing electric vehicles** | | | | 18.134 |
| Advantages | Save fuel cost. | 21 | 63 | |
| | Environmentally friendly. | 19 | 57 | |
| Disadvantages | Expensive. | 17 | 51 | |
| | Long charging time. | 12 | 36 | |
| **Panel B. *Normative beliefs* on supporters and non-supporters of purchasing electric vehicles** | | | | 18.400 |
| Non-supporters | Older generations least likely to purchase. | 16 | 48 | |
| Supporters | Younger generations most likely to purchase. | 11 | 33 | |
| | My friends will approve and support electric vehicles purchase. | 9 | 27 | |
| | People who can afford most likely to purchase. | 9 | 27 | |
| | People who are exposed to electric vehicles and technology are most likely to purchase. | 9 | 27 | |
| **Panel C. *Covert control beliefs* on barriers and enablers to purchase electric vehicles** | | | | 30.273 |
| Barriers | Uncertainty will make it difficult for me to purchase. | 9 | 27 | |
| Enablers | Feeling comfortable to use EVs. | 8 | 24 | |
| | Knowledge on electric vehicles will make it easy for me to purchase. | 8 | 24 | |
| | Financial capability will make it easy for me to purchase. | 7 | 21 | |
| **Panel D. *Overt control beliefs* on barriers and enablers to purchase electric vehicles** | | | | 36.028 |
| Barriers | Lack of charging facilities will make it difficult for me to purchase. | 29 | 87 | |
| | Expensive prices will make it difficult for me to purchase. | 12 | 36 | |
| | Charging inconvenience will make it difficult for me to purchase. | 17 | 51 | |
| Enablers | Affordable prices will make it easy for me to purchase. | 15 | 45 | |
| | Government subsidies will make it easy for me to purchase. | 12 | 36 | |

**Notes:** Salient belief constructs were calculated by multiplying each belief strength with its corresponding evaluation (i.e., behavioral beliefs × outcome evaluations, normative beliefs × motivation to comply, and control beliefs × power of control factors). The mean of these was computed per construct and used as composite scores for analysis in partial least squares structural equation modeling (PLS-SEM).

## Data availability

Data can be made available upon reasonable request.

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