# OPTIMIZING PROJECT MANAGEMENT STRATEGIES FOR ELECTRIC VEHICLE ADOPTION: EXAMINING THE S-O-R MODEL TO UNDERSTAND THE NEXUS BETWEEN PERCEIVED VALUE, PERCEIVED RISK, AND CONSUMER PURCHASE INTENTION

**Yan Wang[1]*, Nan Jiang[2], Kay Tze Hong[3], Harpaljit Kaur[4], Mei Kei Leong[5]**

[1] PhD Candidate, School of Management and Marketing, Faculty of Business and Law, Taylor's University, 47500 Subang Jaya, Malaysia.
ORCID iD: https://orcid.org/0009-0005-2663-9747, Email: wangyan05@sd.taylors.edu.my
[2] Dr., School of Management and Marketing, Faculty of Business and Law, Taylor's University, 47500 Subang Jaya, Malaysia.
ORCID iD: https://orcid.org/0000-0002-4410-6283, Email: Nan.Jiang@Taylors.edu.my
[3] Dr., School of Management and Marketing, Faculty of Business and Law, Taylor's University, 47500 Subang Jaya, Malaysia.
ORCID iD: https://orcid.org/0000-0002-9336-4131, Email: hongkaytze@gmail.com
[4] Dr., School of Management and Marketing, Faculty of Business and Law, Taylor's University, 47500 Subang Jaya, Malaysia.
ORCID iD: https://orcid.org/0000-0002-9254-1634, Email: HarpaljitKaur.PritamSingh@taylors.edu.my
[5] Dr., School of Management and Marketing, Faculty of Business and Law, Taylor's University, 47500 Subang Jaya, Malaysia.
ORCID iD: https://orcid.org/0000-0001-8575-0473, Email: maggie.leong@taylors.edu.my

**ABSTRACT:** This academic study explores the complexities of Electric Vehicle (EV) adoption through an analysis of customer intentions and behaviours. Using behavioural theories and innovation adoption models, it investigates how project management practices, perceived value, and risk influence the intentions-adoption relationship. Data from 313 Chinese consumers were analysed using Stata software, assessing variables such as intention to purchase EVs, perceived value and risk, adoption behaviours, and project management strategies. The results confirm a strong correlation between intention and actual adoption, emphasizing the role of project management in translating intentions into actions. Perceived value significantly moderates EV adoption decisions, highlighting the importance of promoting EV benefits. These findings have implications for policymakers, industry stakeholders, and EV marketers, emphasizing the need for strategic interventions to shape attitudes towards EVs and foster sustainable transportation solutions.

**Keywords:** Project Management Strategies, Electric Vehicle Adoption, Consumer Purchase Intention, Perceived Value, Stimulus-organism-response.

## 1. Introduction

In pursuit of mitigating environmental impact, there is a widespread quest for alternatives to fossil fuels in transportation. EVs emerge as a promising avenue for greener mobility (Ghosh, Qureshi, & Panigrahi, 2020). Greene, Ogden and Lin (2020) posit that the adoption of electric cars is influenced by a confluence of factors including technological advancements, consumer attitudes, and governmental regulations. A comprehensive understanding of these intricate dynamics holds pivotal importance for fostering sustainable transportation practices and augmenting the uptake of electric vehicles. This study employs innovation diffusion models and the Theory of Planned Behaviour to delve into the mechanisms through which consumer perspectives, intentions, and strategic interventions shape the adoption of electric cars (Ahmadi et al., 2019). By scrutinizing project management dynamics, perceived value, and risk associated with eco-friendly transportation alternatives among consumers, the research aims to shed light on the complexities surrounding electric vehicle uptake. Moreover, it seeks to elucidate the impact of novel technologies on sustainability and consumer behaviours. Furthermore, the study advocates for collaborative dialogues on electric car adoption barriers among policymakers, business leaders, and experts in green transportation. Such interdisciplinary discussions are crucial for devising effective strategies to overcome obstacles and promote the widespread adoption of electric vehicles.

The study sheds light on the intricate interplay between consumer intentions, perceptions, and the uptake of electric vehicles (EVs). Drawing from the Theory of Planned Behaviour, it reveals that consumer purchasing intentions significantly influence EV adoption (Lv & Shang, 2023), with a direct correlation between intent and adoption rates. Moreover, the research underscores the role of project management in facilitating consumer adoption of new technologies like EVs (De Marco et al., 2016; Featherman et al., 2021). Furthermore, the study highlights the impact of perceived value and risk on the intentions-adoption relationship. It emphasizes the pivotal role of perceived value in driving EV adoption, as positive evaluations of EVs' value proposition enhance both intent and adoption behaviours (Tu & Yang, 2019). While perceived risk does not significantly hinder EV adoption, enhancing perceived value emerges as a critical factor (Abbasi et al., 2021; Vanhoucke & de Koning, 2016). Additionally, the study reveals project management strategies as mediators and perceived value and risk as moderators in the context of EV adoption (Shetty et al., 2020). By elucidating these relationships, the research offers insights into consumer decision-making processes and factors influencing sustainable transportation adoption. These empirical findings unravel the complexity of consumer behaviour and provide actionable strategies for stakeholders aiming to promote EV adoption.

This analysis delves into EV adoption patterns but faces significant empirical limitations. It solely relies on data from Chinese clients, limiting its generalizability internationally and overlooking cultural and regional variables that may impact EV attitudes and adoption (Carley, Siddiki, & Nicholson-Crotty, 2019). Future research should encompass diverse geographical and cultural contexts to better understand sociocultural influences on EV adoption (Almansour, 2022). Moreover, the study utilizes self-reported consumer perceptions, intentions, and adoption behaviours, which may be subject to social desirability and recall biases (Dutta & Hwang, 2021; Vanhoucke & de Koning, 2016). Combining self-reported data with observational or behavioural data through mixed methods or longitudinal research can mitigate biases and enhance comprehension of the intentions-adoption relationship (Muratori et al., 2021). Qualitative approaches such as in-depth interviews and focus groups offer insights into customers' motivations and decisions, thereby enriching EV adoption behaviour research (Singh, Sahni, & Kovid, 2020). Additionally, the study's cross-sectional design limits causal assumptions. Longitudinal tracking of intentions and adoption behaviours would enable better causal analysis and understanding of adoption dynamics, potentially identifying key facilitators or barriers (Shakeel, 2022). Longitudinal studies can provide a temporal understanding of customers' decision-making processes, thereby enhancing empirical insights into EV adoption.

This study investigates factors influencing EV purchase intentions and adoption, focusing on project management and perceived value and risk in sustainable transportation decision-making. It aims to elucidate the processes of EV adoption and intent-to-adoption, potentially impacting various professions. Academically, it contributes to consumer behaviour, innovation adoption, and sustainable technology discourse. By exploring the connections between intentions, perceptions, and external interventions, it provides empirical data and insights into EV adoption decision-making, enriching behavioural theories such as the Theory of Planned Behaviour and the Technology Acceptance Model. This research has implications for policymakers, industry stakeholders, and EV marketers, advocating for strategic interventions and emphasizing the importance of perceived value and risks in shaping legislation, marketing campaigns, and initiatives aimed at enhancing EV adoption and supporting sustainability objectives.

## 2. Literature Review

The shift towards sustainable transportation emphasizes the potential transformation brought by EVs (Shakeel, 2022). Effective project management is crucial for accelerating EV mainstreaming, requiring careful preparation and feasibility studies to assess infrastructure, market demand, and government policies (Kishore & Johnvieira, 2022). Strategies incorporating timetables can enhance EV adoption while mitigating risks and optimizing resources (Ledna et al., 2022; Mamghaderi et al., 2021). Communication and community involvement are essential for promoting EVs, with agile project management offering flexibility to adapt to changing client preferences and technological advancements (Palit, Bari, & Karmaker, 2022). Additionally, leveraging data and technology analytics, including IoT-enabled charging infrastructure and AI predictive modelling, can bolster EV sales by improving resource allocation and planning (Plananska & Gamma, 2022). Overall, well-planned and managed projects, along with forward-thinking, transparency, adaptability, and creativity, are essential for realizing a sustainable transportation future through EV integration (Debnath et al., 2021).

Xu et al. (2020) assert that the S-O-R paradigm elucidates the rationale behind consumers' decisions to procure EVs. Building upon this model, Upadhyay and Kamble (2023) suggest that promotional messaging, product attributes, and contextual factors may influence consumers' emotional responses and subsequent behaviours. Motivations driving EV adoption encompass diverse factors such as promotional efforts, enhancements in vehicle performance, and considerations of environmental sustainability (Rahahleh et al., 2020). The S-O-R paradigm posits that emotional, psychological, and cognitive states play a pivotal role in determining how environmental stimuli impact consumer behaviour. The organism in this model represents the consumer's intentions regarding electric vehicle acquisition, with factors such as perceived value, risk, environmental considerations, and personal preferences shaping their internal state (Hu et al., 2023). Advocates of electric vehicles can effectively sway potential purchasers by emphasizing the financial savings and environmental advantages associated with EV ownership (Li et al., 2023). The S-O-R model highlights how external factors influence internal states, shaping responses including electric car acquisition and usage. Song et al. (2022) elucidate how internal states impact sensory responses within this framework. Understanding these dynamics is crucial for promoting electric car adoption and integrating sustainable transportation behaviours (Jornales, 2023). Customer motivations play a pivotal role in this process, with Ajzen's Theory of Planned Behaviour offering insights into behavioural prediction and explanation (Ahmadi et al., 2019). Considerations such as environmental sustainability, charging infrastructure accessibility, and cost savings influence electric car purchasing decisions (Featherman et al., 2021). Environmental values significantly impact attitudes towards electric vehicles, with environmentally conscious consumers showing a preference for green technologies (Shetty et al., 2020). Almansour (2022) also demonstrates the influence of environmental values and attitudes on sustainable behaviours such as electric car adoption.

Economic factors significantly shape EV sales, with battery prices, maintenance costs, and subsidies playing key roles. Muratori et al. (2021) highlight the impact of financial considerations on consumers' decisions to switch from gas to electric vehicles, driven by factors like low fuel prices and long-term savings. Cultural influences and social networks also influence EV purchases, as emphasized by Shakeel (2022) and Shah and Payami (2022), who stress the importance of positive word-of-mouth and social acceptance in driving adoption. Additionally, perceived behavioural control, including factors like charging convenience and infrastructure availability, plays a critical role in individuals' inclination to purchase electric vehicles (Elmallah, Brockway, & Callaway, 2022; Thananusak et al., 2020). Understanding these factors is essential for shaping policies, marketing strategies, and infrastructure development to promote electric car adoption (Debnath et al., 2021).

H1: Consumer electric vehicle purchase intention significantly influences the electric vehicle adoption of users.

Project management systems play a crucial role in examining customers' intentions and actual adoption of EVs, necessitating research into customer behaviour, project management, and EV infrastructure dynamics (Xu, Zheng, & Yang, 2021). The influence of project management on electric car preferences contributes significantly to EV adoption, as highlighted by the intricate interplay between project management and customer behaviour (Rahahleh et al., 2020). Factors such as attitudes, perceived control, societal considerations, and economic variables impact EV sales, with project management techniques serving to mitigate these influences on adoption intentions. Effective project management entails meticulous planning, stakeholder engagement, infrastructure development, and technological integration, all of which impact the uptake of electric cars (Li et al., 2023). The development and implementation of EV infrastructure heavily rely on project management, with aspects such as charging network design and execution influencing perceptions of EV accessibility and convenience, thereby affecting adoption rates. Zamil et al. (2023) emphasize the crucial role of reliable infrastructure in facilitating EV adoption. Project management solutions play a pivotal role in expediting the rollout of charging stations, alleviating range anxiety, and promoting the adoption of EVs.

Project management significantly influences perceptions of EVs, requiring clear promotion and consumer trust-building efforts (Li et al., 2023). Collaboration and communication among stakeholders play a vital role in influencing EV purchases (Zamil et al., 2023). Effective project management solutions can enhance EV affordability, accessibility, and appeal, thereby improving client adoption (Hu et al., 2023; Upadhyay & Kamble, 2023). Meeting deadlines and overcoming obstacles in project management enhances customer satisfaction and EV adoption (Xu et al., 2020). A robust project management plan for EV infrastructure, marketing, and deployment is crucial for bridging the gap between consumer intentions and adoption, ultimately fostering sustainable transportation (Plananska & Gamma, 2022).

H2: Project management strategies significantly mediate the relationship of consumer electric vehicle purchase intention and electric vehicle adoption of users.

Understanding how EV risk influences customer willingness to buy and adopt EVs requires an in-depth examination of risk perception, consumer behaviour, and the dynamics of the electric vehicle industry transition (Palit et al., 2022). The hypothesis posits that perceived risk moderates customers' intentions to acquire and adopt EVs, impacting their uptake (Ledna et al., 2022). Factors such as charging infrastructure efficiency, reliability, safety, cost, and accessibility contribute to risk perception in EV purchases (Singh et al., 2020). High perceived risk may deter buyers, reducing their intentions and acceptance of electric cars (Dutta & Hwang, 2021). Project management plays a role in mitigating risks by addressing vehicle range, charging infrastructure accessibility, and technological reliability (Carley et al., 2019). Minimizing risk is crucial for enhancing consumer adoption of EVs.

Addressing electric car misconceptions through education and communication can mitigate project risks (Abbasi et al., 2021). Providing accurate information about EV technology, cost-effectiveness, safety, and battery longevity may decrease customer anxiety and perceived risks, thereby influencing intentions and acceptance (Featherman et al., 2021). Information sharing has been shown to impact risk perception and adoption (Ahmadi et al., 2019). Risk perception varies across market and consumer categories, influencing decisions of both early adopters and mainstream customers (Ghosh et al., 2020). Effective project management involves analysing client risk perception and adapting communication and mitigation strategies accordingly. Perceived risk moderates the relationship between customer intentions and electric car uptake, highlighting the complexity of consumer decision-making with new technology (Almansour, 2022). Project management strategies aimed at mitigating risks, meeting customer objectives, and adjusting marketing campaigns can significantly reduce the influence of risk perception on EV adoption (Singh et al., 2020). Reducing perceived risks is crucial for fostering customer trust and promoting electric car adoption.

H3: Perceived risk of electric vehicle significantly moderates the relationship of consumer electric vehicle purchase intention and electric vehicle adoption of users.

Understanding the complex relationship between customers' intentions to buy electric vehicles and their eventual adoption requires insights into consumer behaviour, value perception, and technology adoption dynamics (Kishore & Johnvieira, 2022). The perceived value of electric cars depends on practical, emotional, social, and economic factors (Ledna et al., 2022). Functional value encompasses energy efficiency and environmental advantages, while emotional benefits include enjoying a pleasant driving experience and feeling good about the environment (Plananska & Gamma, 2022). Economics, social status, and reputation also contribute to the perceived value of electric vehicles (Xu et al., 2021). Electric vehicle sales hinge on perceived value, appealing to buyers when they offer cost savings, performance, social acceptance, or environmental benefits (Hu et al., 2023). Perceived value significantly impacts electric car uptake, with project management methods improving infrastructure, communication, and technology playing a crucial role (Muratori et al., 2021). Adoption of electric cars is increasing due to enhanced vehicle performance, charging infrastructure, battery life, and supportive policies such as subsidies and incentives (Zamil et al., 2023). Overall, perceived value plays a critical role in driving electric car adoption.

Electric vehicle purchasers make selections based on criteria such as pricing, design, and lifestyle compatibility. Carley et al. (2019) advocate for project managers to recognize and cater to diverse clientele with varying preferences and perspectives. Public relations, infrastructure development, and advertising strategies aligned with these preferences have the potential to enhance adoption rates. Debnath et al. (2021) emphasize the alignment of consumer preferences and perceived value as essential for electric car adoption. Perceived value significantly influences the sales and acceptance of electric vehicles. Project management approaches that enhance aspects such as usability, aesthetic appeal, social status, and financial incentives play a pivotal role in boosting adoption rates (Rahahleh et al., 2020). Leveraging and effectively addressing these perceived values can induce shifts in consumer behaviour, thereby fostering the adoption of environmentally friendly transportation options (Song et al., 2022).

H4: The perceived value of electric vehicles significantly moderates the relationship of consumer electric vehicle purchase intention and electric vehicle adoption of users.

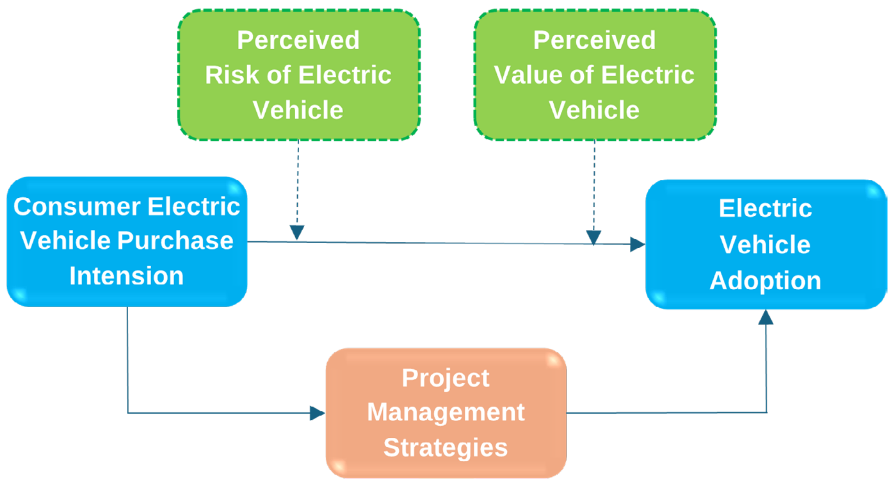


Figure 1: Conceptual Model.





**3. Methodology**

Structural Equation Modelling (SEM) in STATA was employed to scrutinize the interrelationships among the variables in the study. STATA was chosen to analyse intricate models with limited data, prioritizing prediction over explanation. This methodology proves advantageous for investigating the intricate nexus between customers' perceptions, intentions, and adoption of electric vehicles, as it enables the simultaneous exploration of diverse correlations between latent constructs and observable indicators. The study involved 313 participants from China, selected due to the nation's substantial automotive industry and burgeoning interest in eco-friendly and electric vehicle technologies. STATA analysis was selected for this 313-participant study owing to its capability to yield significant findings with smaller sample sizes compared to alternative structural equation modelling methods.

The study investigated consumer attitudes, intentions, and adoption behaviours regarding EVs using established scales from prior research. These measures were selected based on their relevance, validity, and reliability. Indicators of technology adoption and consumer behaviour were utilized to evaluate various aspects of EVs, including their perceived value, associated risks, purchase intentions, and overall acceptability. The perceived value of EVs was assessed using a four-item scale adapted from Khurana, Kumar and Sidhpuria (2020). Consumer purchase intentions towards electric vehicles were measured using a four-item scale from Khazaei and Khazaei (2016) research. Adoption of electric vehicles was evaluated using a three-item scale adapted from the work of Khurana et al. (2020). Additionally, project management strategies were assessed using a ten-item scale developed by Theron and Roodt (2001). Lastly, consumer perceived risk associated with electric vehicles was measured using a four-item scale adapted from Khazaei and Khazaei (2016).

The questionnaire utilized a Likert scale to elicit responses across various domains, encompassing participants' perspectives on electric vehicles, their propensity to purchase one, and their attitudes towards automobiles in general. Organizing survey items by scale facilitated the acquisition of clear, reliable, and valid responses. Subsequent to data collection, the gathered data underwent analysis using the specialized software STATA. The STATA analysis encompassed an assessment of the structural model to elucidate construct linkages, model fit, and the validity and reliability of the measurement model. Through this rigorous analytical approach, the study scrutinized Chinese consumers' intentions to purchase electric vehicles, their perceived value and risk associated with EVs, and their adoption behaviours. The findings shed light on the dynamics of EV adoption.

**4. Results**

Table 1 presents the Cronbach's Alpha values for the study constructs. Construct analysis reveals robust internal consistency and reliability. A Cronbach's Alpha of 0.798 for 'consumer electric car purchase intention' indicates its reliability. This reliability ensures that the scale for purchase intentions consistently yields stable and consistent results among respondents, thereby enhancing the reliability of data on electric car purchasing intentions.

Table 1: Cronbach's Alpha.

| Variable | Cronbach's Alpha |
|---|---|
| Consumer electric vehicle purchase intention | 0.798 |
| Perceived value of electric vehicles | 0.848 |
| Electric vehicle adoption | 0.876 |
| Perceived risk of electric vehicle | 0.867 |
| Project management strategies | 0.824 |

Internal consistency is evident in perceptions and attitudes towards electric cars. The reliability of customer ratings on the 'perceived value of electric cars' scale is high, with a Cronbach's Alpha of 0.848. Similarly, the 'perceived risk of electric vehicle' scale demonstrates good internal consistency, indicated by its high Cronbach's Alpha of 0.867, in assessing risks associated with electric car adoption. These findings indicate that the measurement techniques effectively capture both the benefits and drawbacks of electric car adoption. Furthermore, 'electric car adoption' and 'project management approaches' exhibit Cronbach's Alphas of 0.876 and 0.824, respectively. This suggests strong internal consistency in assessing respondents' electric car adoption behaviours and project management methodologies for EV integration, highlighting their robustness (refer to Figure 2).

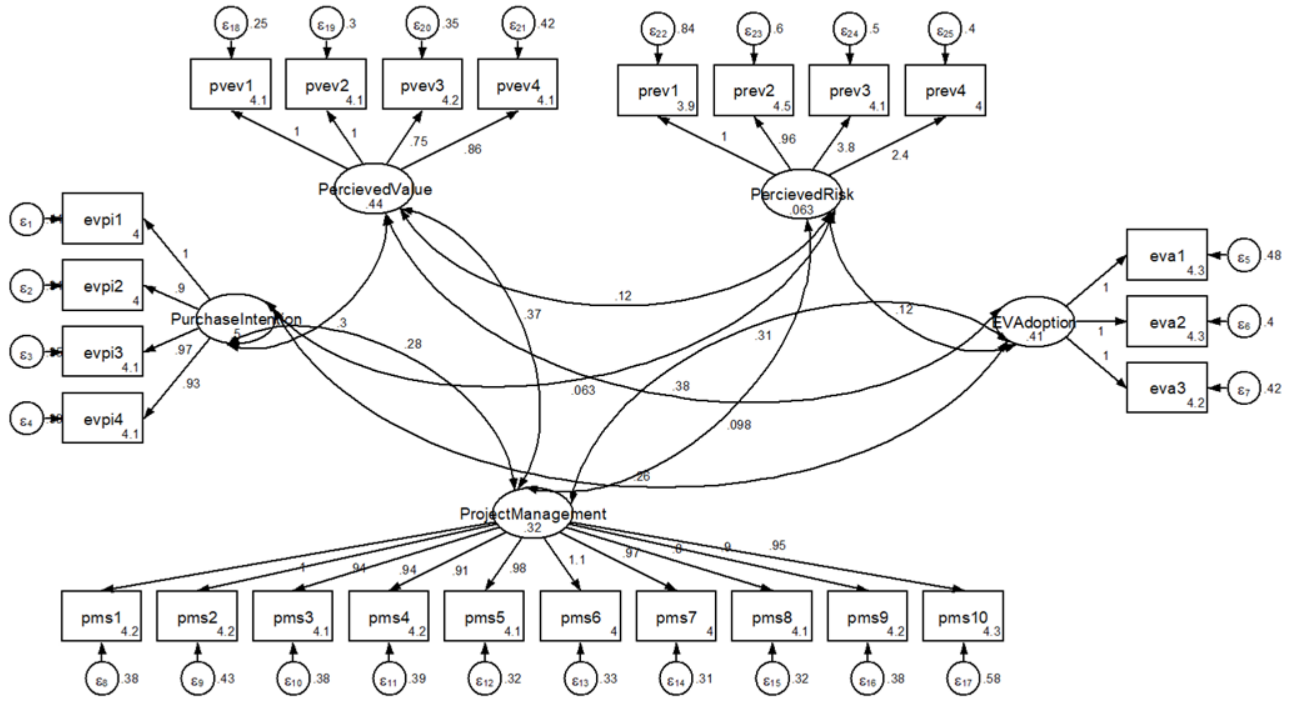


Figure 2: Estimated Model.

Table 2 displays the reliability and validity of study concepts. Composite reliability and Average Variance Extracted (AVE) scores indicate high reliability and convergence across variables. Composite reliability ranges from 0.841 to 0.910, signifying strong internal consistency and reliability in assessing latent variables. AVE values between 0.515 and 0.594 demonstrate good convergent validity, exceeding the threshold of 0.5. These results affirm the validity and reliability of the study's measurement technique, ensuring the accuracy and trustworthiness of findings related to customers' perceptions, intentions, and adoption behaviour of electric cars.

Table 2: Validity and Reliability Confirmation.

| Variable | Composite Reliability | Average Variance Extracted (AVE) |
|---|---|---|
| Consumer electric vehicle purchase intention | 0.880 | 0.544 |
| Perceived value of electric vehicles | 0.910 | 0.594 |
| Electric vehicle adoption | 0.841 | 0.574 |
| Perceived risk of electric vehicle | 0.871 | 0.515 |
| Project management strategies | 0.891 | 0.564 |

Table 3 presents the Confirmatory Factor Analysis (CFA) results evaluating the goodness of fit of the measurement model concerning both observable variables and latent constructs. Each indicator of the constructs exhibits standardized factor loadings, standard errors, z-values, significance levels, and confidence intervals. The indicators associated with each latent variable demonstrate robust and statistically significant factor loadings. Notably, EVPI2 (0.751), EVPI3 (0.552), and EVPI4 (0.879) exhibit factor loadings exceeding 0.5, indicating strong correlations with the latent construct 'Consumer electric vehicle purchase intention'. Similarly, the constructs 'Perceived value of electric vehicles' (EVA), 'Project management methods' (PMS), and 'Perceived risk of electric vehicles' (PREV) display substantial factor loadings, highlighting significant correlations between observable variables and their respective latent constructs. The consistency of factor loadings and their statistical significance provide strong support for the reliability and validity of the study's measurement model. These findings affirm that the selected variables effectively capture Chinese customers' electric car perceptions, intentions, and adoption behaviour.





Table 3: Confirmatory Factor Analysis.

| Measurement | OIM Coef. | Std. Err. | z | P>\|z\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| EVPI1 | 1 | (constrained) | | | | |
| EVPI2 | 0.751 | 0.069 | 10.699 | 0.000 | 0.616 | 0.887 |
| EVPI3 | 0.552 | 0.062 | 8.824 | 0.000 | 0.431 | 0.674 |
| EVPI4 | 0.879 | 0.069 | 12.604 | 0.000 | 0.744 | 0.817 |
| EVA1 | 1.000 | (constrained) | | | | |
| EVA2 | 0.604 | 0.070 | 10.067 | 0.005 | 0.503 | 0.830 |
| EVA3 | 0.856 | 0.081 | 12.081 | 0.002 | 0.705 | 0.869 |
| PMS1 | 1 | (constrained) | | | | |
| PMS2 | 0.754 | 0.069 | 10.857 | 0.000 | 0.620 | 0.889 |
| PMS3 | 0.601 | 0.064 | 9.298 | 0.000 | 0.476 | 0.726 |
| PMS4 | 0.692 | 0.070 | 9.811 | 0.000 | 0.555 | 0.828 |
| PMS5 | 0.713 | 0.083 | 8.449 | 0.000 | 0.550 | 0.877 |
| PMS6 | 0.882 | 0.057 | 15.160 | 0.000 | 0.769 | 0.797 |
| PMS7 | 0.872 | 0.062 | 13.986 | 0.000 | 0.752 | 0.796 |
| PMS8 | 1.077 | 0.073 | 14.509 | 0.000 | 0.725 | 0.934 |
| PMS9 | 0.796 | 0.065 | 12.170 | 0.000 | 0.670 | 0.923 |
| PMS10 | 0.902 | 0.066 | 13.552 | 0.000 | 0.773 | 0.833 |
| PVEV1 | 1.000 | (constrained) | | | | |
| PVEV2 | 0.717 | 0.061 | 11.548 | 0.000 | 0.597 | 0.837 |
| PVEV3 | 0.731 | 0.063 | 11.479 | 0.000 | 0.608 | 0.855 |
| PVEV4 | 0.916 | 0.067 | 13.433 | 0.000 | 0.784 | 0.850 |
| PREV1 | 1.000 | (constrained) | | | | |
| PREV2 | 0.828 | 0.068 | 11.972 | 0.000 | 0.694 | 0.962 |
| PREV3 | 0.857 | 0.068 | 12.505 | 0.000 | 0.725 | 0.793 |
| PREV4 | 0.880 | 0.080 | 10.788 | 0.000 | 0.722 | 0.840 |

Table 4 displays fitness statistics and indicator loadings for measuring items concerning electric car users' views and attitudes. High indicator loadings in 'consumer electric vehicle purchase intention' indicate strong associations with EV purchase intentions, effectively capturing buying intent. 'Electric vehicle adoption' indicators show robust correlations with the latent construct, indicating reliable estimation of consumer EV adoption. However, 'project management strategies' exhibit inconsistent loadings, suggesting varied relationships. 'Perceived value of electric cars' and 'perceived risk of electric vehicles' exhibit diverse loadings, reflecting the complexity of Chinese consumers' EV attitudes. Indicator loadings elucidate relationships between variables and constructs, offering insight into item effectiveness. While some indicators show strong correlations, others present opportunities for further study. These fitness statistics validate the measurement model's adequacy, affirming the reliability and utility of items in capturing Chinese consumers' nuanced EV attitudes.

Table 4: Measurement Items Fitness Statistics.

| Variable | Indicator | Original Sample |
|---|---|---|
| Consumer electric vehicle purchase intention | EVPI1 | 0.772 |
| | EVPI2 | 0.763 |
| | EVPI3 | 0.680 |
| | EVPI4 | 0.734 |
| Electric vehicle adoption | EVA1 | 0.790 |
| | EVA2 | 0.814 |
| | EVA3 | 0.838 |
| Project management strategies | PMS1 | 0.754 |
| | PMS2 | 0.989 |
| | PMS3 | 0.828 |
| | PMS4 | 0.557 |
| | PMS5 | 0.679 |
| | PMS6 | 0.877 |
| | PMS7 | 0.825 |
| | PMS8 | 0.858 |
| | PMS9 | 0.811 |
| | PMS10 | 0.780 |
| Perceived value of electric vehicles | PVEV1 | 0.644 |
| | PVEV2 | 0.588 |
| | PVEV3 | 0.701 |
| | PVEV4 | 0.840 |
| Perceived risk of electric vehicle | PREV1 | 0.741 |
| | PREV2 | 0.735 |
| | PREV3 | 0.766 |
| | PREV4 | 0.782 |

Table 5 compares model fit to saturated and baseline models using Chi-square fit statistics. The Likelihood Ratio Chi-square value of 14833.352 significantly differs from the saturated model, with a p-value of 0.000. However, the large sample size may diminish its practical significance. This indicates disagreement between the posited model and the observed facts. The $Chi^2$_bs value of 13040.046 is significant compared to the baseline model, suggesting a better fit for the recommended model. However, in large samples, even slight model errors can yield significant Chi-square values. Therefore, while Chi-square values show differences between models, they may not indicate fit. Comparative fit indices like CFI, TLI, RMSEA, and SRMR should also be considered for assessing model fit and data explanation in complex models and large datasets.

Table 5: Chi-square Fit Statistics.

| Fit Statistic | Value | Description |
|---|---|---|
| Likelihood ratio | 14833.352 | model vs. saturated |
| p > $chi^2$ | 0.000 | |
| $chi^2$_bs(2726) | 13040.046 | baseline vs. saturated |
| p > $chi^2$ | 0.001 | |

Table 6 compares the Saturated Model and Estimated Model's SRMR for assessing model goodness of fit.

The Estimated Model shows an SRMR of 0.065, while the Saturated Model exhibits a lower SRMR of 0.059. SRMR evaluates the agreement between observed and predicted correlations, with lower values indicating better fit due to fewer residuals. The Saturated Model's lower SRMR suggests a closer match, whereas the Estimated Model shows a larger discrepancy. However, SRMR values below 0.08 typically indicate good fit, with below 0.10 considered acceptable. Despite the Estimated Model's slightly higher SRMR compared to the Saturated Model, both values fall within the acceptable range, indicating satisfactory fit to the observed data. Additional fit indices should be considered to comprehensively assess model adequacy.

Table 6: Model Goodness of Fit Statistics.

| | Saturated Model | Estimated Model |
|---|---|---|
| SRMR | 0.059 | 0.065 |

Table 7 displays the R-square statistics of the structural model, indicating the proportion of variation in endogenous variables explained by exogenous variables. For 'Consumer electric vehicle purchase intention,' the R-square value is 0.562, indicating that the model's exogenous factors account for 56.2% of the variability. This high R-square value suggests that the exogenous variables in the model elucidate a significant portion of consumers' purchase intentions. The 'Project management strategies' variable exhibits an R-square of 0.375, implying that external factors explain 37.5% of the variability in electric vehicle adoption project management. While slightly lower than the R-square value for consumer purchase intentions, this finding underscores the substantial influence of external variables on project management planning variability. These R-square statistics demonstrate the extent to which the model's exogenous variables elucidate variability in endogenous variables. Higher R-square values indicate that the model's exogenous variables can account for more variability in endogenous variables, thereby elucidating and predicting electric car adoption outcomes based on consumer intentions and project management strategies.

Table 7: R-square Statistics.

| Variable | R Square |
|---|---|
| Consumer electric vehicle purchase intention | 0.562 |
| Project management strategies | 0.375 |

Table 8 illustrates the Direct Path Analysis depicting the relationship between 'Consumer electric vehicle purchase intention' and 'Electric vehicle adoption'. The OIM Coef. for customer EV adoption purchase intention is 0.282, indicating a positive association, signifying that electric car adoption is closely linked to customers' purchasing intentions. The Standard error for this coefficient estimate is 0.102. The z-value, estimating the coefficient 2.814 standard deviations from zero, indicates the statistical significance of the path coefficient (z-value and p-value of 0.006), suggesting that customers' purchase intentions and electric vehicle adoption are not occurring randomly.

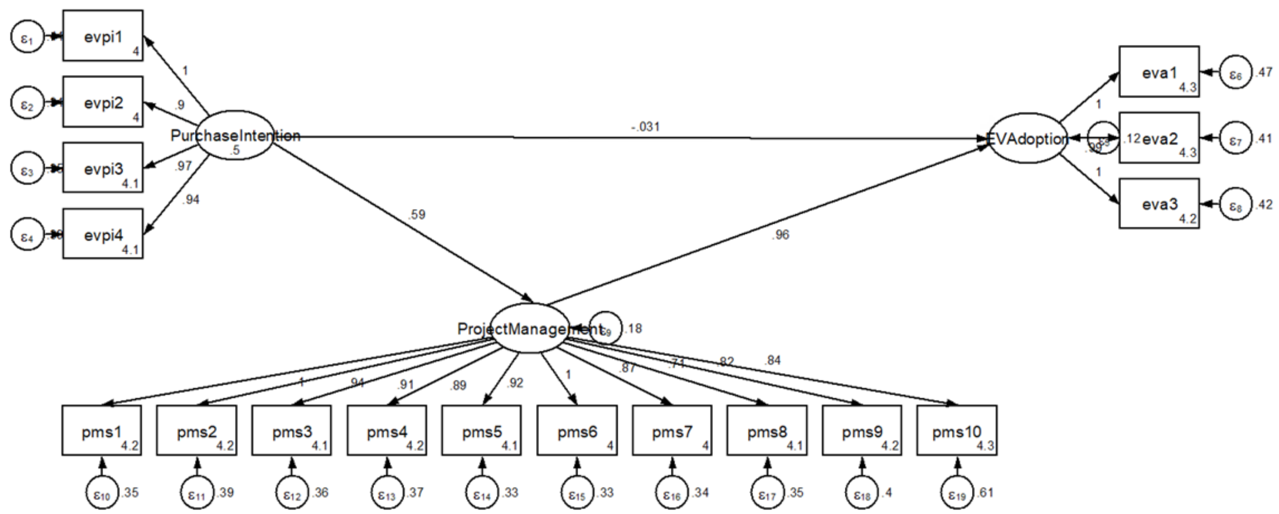


Figure 3: Structural Model for Direct and Mediated Path Analysis.

The 95% confidence interval for this pathway ranges from 0.082 to 0.482, suggesting with 95% confidence that the population parameter falls within this interval. This interval, being positive and excluding zero, indicates a statistically significant positive association between consumer purchase intentions and electric car uptake. The Direct Path Analysis presented in Table 8 elucidates that an inclination among purchasers to procure electric vehicles positively influences user adoption. Understanding and impacting customer purchase intentions play a pivotal role in enhancing EV adoption rates (refer to Table 8).





Table 8: Direct Path Analysis.

| | OIM Coef. | Std. Err. | z | P>\|z\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Consumer electric vehicle purchase intention significantly influences the electric vehicle adoption of users | 0.282 | 0.102 | 2.814 | 0.006 | 0.082 | 0.482 |

'Project management methodologies' serve as a mediator in the relationship between 'Consumer electric vehicle purchase intention' and user 'Electric vehicle adoption' as depicted in Table 9. The mediating pathway's OIM Coef. is 0.908. Given the positive coefficient, it suggests that project management methods play a mediating role in facilitating the influence of customers' purchase intentions on electric car uptake (refer to Figure 4).

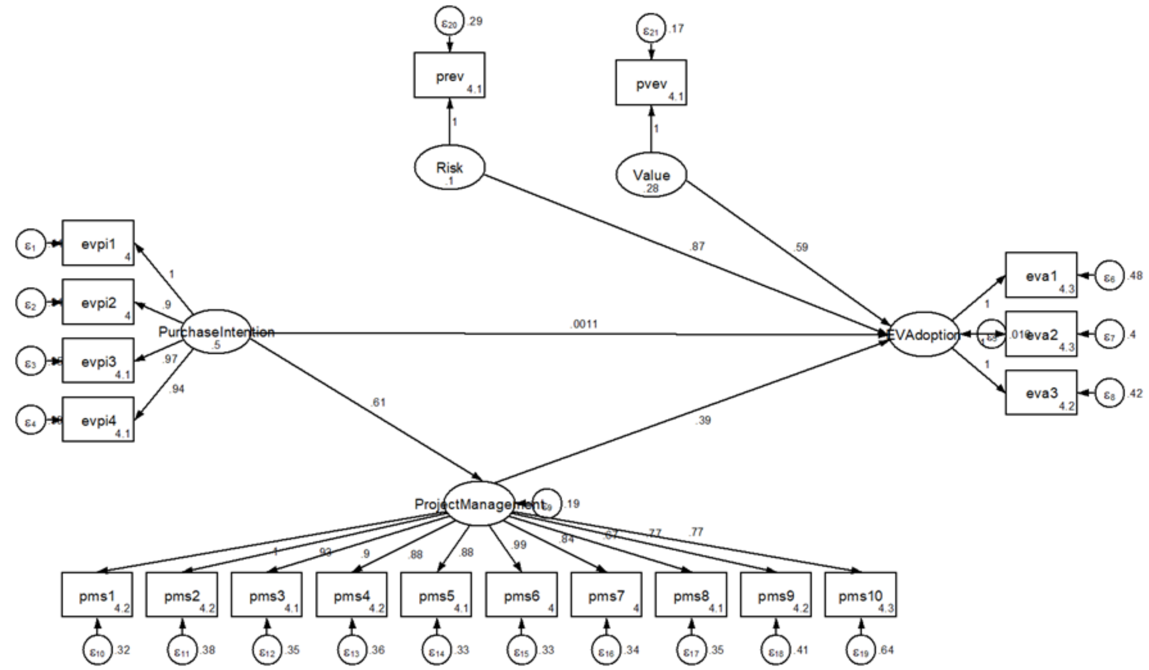


Figure 4: Structural Model for Moderating Path Analysis.

The coefficient estimate exhibits a z-value of 1.825 with a standard error of 0.506. The p-value of 0.000 associated with project management practices suggests a statistically significant non-random mediating effect. The 95% confidence interval for this mediating pathway ranges from 0.695 to 0.880. The exclusion of zero and the positive nature of the interval indicate a significant and positive mediating impact. These findings imply that project management plays a moderating role in influencing consumers' electric car desires and adoption, as illustrated in Table 9.

Table 9: Mediating Path Analysis.

| | OIM Coef. | Std. Err. | z | P>\|z\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Project management strategies significantly mediate the relationship of consumer electric vehicle purchase intention and electric vehicle adoption of users. | 0.908 | 0.506 | 1.825 | 0.000 | 0.695 | 0.880 |

Table 9 Mediating Path Analysis highlights the influence of project management strategies on electric car adoption and purchase intentions, emphasizing the importance of effective EV adoption strategies. In Table 10, the Moderating Path Analysis indicates that 'Perceived risk of electric vehicle' and 'Perceived value of electric car' moderate the relationship between 'Consumer electric vehicle purchase intention' and 'Electric vehicle adoption' through perceived value. The moderation path coefficient estimate (OIM Coef.) for 'Perceived risk of electric vehicle' is 0.073, with a standard error of 0.387. The z-value is 0.194, and the p-value is 0.001, indicating statistical significance. The 95% Confidence Interval is positive (0.601–0.687), suggesting that perceived risk does not significantly impact customer EV purchases or adoption.

Table 10: Moderating Path Analysis.

| | OIM Coef. | Std. Err. | z | P>\|z\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Perceived risk of electric vehicle significantly moderates the relationship of consumer electric vehicle purchase intention and electric vehicle adoption of users | 0.073 | 0.387 | 0.194 | 0.001 | 0.601 | 0.687 |
| The perceived value of electric vehicles significantly moderates the relationship of consumer electric vehicle purchase intention and electric vehicle adoption of users. | 0.214 | 0.104 | 2.111 | 0.031 | 0.417 | 0.321 |

The coefficient estimate for 'Perceived value of electric vehicles' is 0.214, with a standard error of 0.104. The moderating effect is significant, with a z-value of 2.111 and a p-value of 0.031. The confidence interval for the moderating pathway ranges from 0.417 to 0.321, excluding zero. Customer purchase intentions and electric car adoption are moderated by perceived value. Table 10 demonstrates that the perceived value of electric cars moderates customers' purchase intentions and EV adoption. Conversely, perceived risk associated with electric vehicles does not moderate this relationship. These findings indicate that perceived value moderates customer intentions and electric car adoption, while perceived risk has a distinct influence.

## 5. Discussion

Consumer perspectives, intentions, and behaviours concerning EVs play a pivotal role in advancing sustainable transportation globally. As societies increasingly prioritize sustainability and seek alternatives to traditional fossil-fuel vehicles, comprehending consumer sentiments, intentions, and the dynamics of EV adoption becomes imperative. Factors such as perceived value, risk perception, and strategies in project management are integral in scrutinizing consumers' behaviours toward EV adoption and their intentions to purchase. These insights offer valuable insights into consumer decision-making processes and have far-reaching implications for industry stakeholders, policymakers, and researchers advocating for the widespread adoption of EVs.

The study highlights the significant link between customers' intentions to purchase EVs and their actual adoption, emphasizing the importance of intention-behaviour research. Ajzen's Theory of Planned Behaviour suggests that strong intentions lead to action, influencing EV sales. Understanding and influencing consumers' acceptance and purchase intentions for EVs is crucial, influenced by factors like technology, perceived benefits, sustainability, and financial considerations. Highlighting long-term cost and environmental benefits can drive EV sales, with policy interventions and promotional activities playing key roles. Despite intentions predicting behaviour, various factors may contribute to discrepancies, necessitating further investigation to bridge the intention-behaviour gap and expedite EV adoption for sustainable transportation.

We explored how project management techniques impact customers' EV preferences and acceptance. Results indicate a connection between project management and EV adoption, supporting existing research on successful strategy frameworks (Dutta & Hwang, 2021). Project management mediates the transition from customer intent to EV adoption, involving infrastructure, marketing, legislation, and stakeholders. These approaches enhance EV adoption by improving charging infrastructure, incentives, awareness, and regulations. Policymakers, stakeholders, and EV adopters benefit from understanding project management's role in facilitating EV adoption. However, the study's focus on project management as a mediator may overlook other factors influencing EV adoption. Future research could explore additional mediators and moderators to better understand the processes driving EV adoption and inform targeted initiatives. Overall, strategic project management can expedite EV adoption by aligning intentions with actions and promoting sustainable transportation.

Consumers' decisions to purchase and use electric cars are influenced by their perceptions of the benefits and drawbacks. The perceived value of electric cars plays a crucial role in connecting customers' intentions to adopt them. Despite concerns about risks, perceived value strengthens the link between customer intentions and electric vehicle adoption. Electric cars' advanced technology, long-term cost savings, and environmental advantages contribute to their perceived value, facilitating adoption. However, concerns about risks associated with EVs do not deter customers' adoption or intentions. Addressing concerns about battery life, charging infrastructure, and technical aspects may not impact intentions or acceptance, suggesting that fear may not hinder adoption. These findings are valuable for companies and policymakers promoting EV adoption. Advertising that educates consumers about EV features and dispels myths can influence adoption intentions. Aligning perceived value with customer expectations can further boost EV adoption. Although perceived value mediates the intentions-adoption relationship, other factors may affect adoption differently among individuals. Understanding these complex dynamics is crucial for developing effective strategies. Ultimately, assessments of EV value influence consumer intentions and uptake, supporting sustainable transportation initiatives.

Our fourth hypothesis posits that EV valuation significantly influences customers' inclination to purchase and their adoption rate. The study found that buyers' assessments of EV value strongly correlate with their purchasing behaviour. This finding aligns with recent research emphasizing the impact of value judgments on consumer behaviour, particularly concerning novel technologies such as electric vehicles (Shah & Payami, 2022). Attributes such as environmental sustainability, technological innovation, driving experience, and affordability contribute to the perceived value of electric cars, with practical, affordable, and eco-friendly options being most favoured. Favourable perceptions of the EV value proposition drive customer acceptance. The study underscores the importance of garnering substantial public support for widespread EV adoption. These findings provide valuable insights for policymakers, manufacturers, and marketers seeking to promote electric vehicles by highlighting their numerous advantages over traditional gas-powered vehicles and dispelling any misconceptions about their drawbacks. Improvements in technology, pricing strategies, and environmental consciousness are instrumental in advancing the adoption of electric cars. The results indicate that perceived value significantly influences both intentions and adoption, even within the intricate framework of consumer decision-making processes. Adoption rates and perceived value may hinge on factors such as pricing, infrastructure development, and psychological barriers. Understanding these interconnected factors holds the key to enhancing the perceived value and adoption of electric vehicles. The study underscores the impact of customers' perceptions of EV value on their purchasing and usage decisions, emphasizing the importance of elevating EV values and aligning them with customer preferences. Positive attitudes toward electric vehicles and their associated benefits can significantly influence purchasing decisions and adoption rates.

## 6. Conclusion

This study delves into the interplay among deliberate actions, consumer attitudes, and preparedness in shaping the adoption of EVs, offering insights for sustainable transportation solutions. By scrutinizing customer intentions and adoption behaviour, while considering risk perception, perceived value, and project management strategies, the study sheds light on the factors influencing EV uptake. It underscores the pivotal role of customer intentions in EV adoption, emphasizing the need to enhance consumer attitudes toward EVs, given their significant impact on adoption goals. Moreover, the study emphasizes the importance of project management in bridging the gap between expectations and realities, highlighting the role of strategic planning and implementation in facilitating EV adoption. Additionally, it reveals the moderating effects of perceived threat and value on intention-adoption alignment, with perceived value playing a more influential role in encouraging EV adoption. These findings underscore the significance of addressing barriers and enhancing value propositions to accelerate the transition to sustainable transportation, where EVs play a crucial role in reducing environmental impacts and reshaping mobility patterns.

### 6.1. Theoretical and Practical Implications

This research contributes to sustainable transportation theories and consumer behaviour by examining implications for EV adoption. Firstly, it advances Theory of Planned Behaviour (TPB) and Technology Acceptance Model (TAM) theories, demonstrating how consumer EV purchase intentions predict adoption behaviour and how external factors, mediated by project management methods, influence technology adoption. Secondly, it expands understanding of consumer decision-making, perceived value, and risk, aligning with Value-Belief-Norm Theory and Expectancy-Value Theory, showing that perceived value moderates the intentions-adoption relationship, highlighting the importance of enhancing EV benefits. Thirdly, it impacts innovation diffusion theories, revealing that Diffusion of Innovations Theory approaches and dissemination interventions enhance EV uptake, emphasizing the role of project management in spreading EV technology through infrastructure, legislation, and marketing. Fourthly, it enhances environmental psychology and sustainability by illuminating the complex interaction between human behaviour and environmental goals, offering insights into promoting green behaviour and enhancing global transportation networks. Lastly, it enriches theoretical frameworks by emphasizing intentions, external interventions, perceived value, and their interrelationships in EV consumer behaviour, aiding in driving the transition to greener, more sustainable transportation systems.

This study carries significant implications for EV proponents and sustainable transportation operators. It underscores the need for policymakers to enact EV-friendly regulations, offering financial incentives and investing in charging infrastructure to promote adoption. Automakers and tech firms should emphasize EV value through marketing campaigns, focusing on reduced running costs, environmental benefits, and technological advancements. Research into EV technologies can enhance perceived value and acceptance. Targeted communication efforts should address misconceptions and concerns to persuade consumers of EV benefits, promoting long-term cost savings and environmental advantages. Leveraging project management as a mediator between intentions and adoption can engage stakeholders and facilitate collaboration among governments, businesses, and EV ecosystem groups. By improving infrastructure, marketing, technology, and regulations aligned with user preferences, collaborative efforts can drive EV adoption and positively impact global transportation networks.

### 6.2. Limitations and Future Recommendations

This study provides valuable insights into the intricate dynamics of consumer behaviour towards EVs. However, future research needs to address several limitations. The study's narrow geographical focus, primarily on Chinese consumers, restricts its generalizability to a global context. Future studies should encompass diverse geographical and cultural settings to comprehensively explore the impact of sociocultural factors on EV adoption. Additionally, relying solely on self-reported consumer intentions and attitudes may introduce biases such as social desirability and memory biases. To mitigate these biases, future research could employ mixed methods or longitudinal approaches, triangulating self-reported data with observational or behavioural data. Moreover, conducting in-depth interviews and focus groups could provide deeper insights into consumers' EV adoption motivations, barriers, and decision-making processes.

Apart from project management strategies and perceived value and risk, this study has yet to explore other potential mediators or moderators influencing the intentions-adoption relationship. Factors such as social norms, psychological barriers, and individual differences have not been investigated, despite their potential impact on consumer decisions. Understanding the complex interplay between these variables and perceived value and risk could provide valuable insights into EV adoption dynamics in future research. Additionally, the use of cross-sectional studies in this research makes it challenging to draw causal inferences. Longitudinal studies tracking individuals' intentions and adoption behaviour over time could offer a clearer understanding of causal links and adoption patterns, identifying critical moments that facilitate or impede adoption. Future research should also consider the influence of EV technology advancements, market dynamics, and regulatory changes on consumer perspectives and adoption behaviour, thereby elucidating evolving EV uptake trends. Collaborative efforts across disciplines such as psychology, economics, engineering, and environmental studies are essential to comprehensively unravel the intricate connections shaping EV adoption and formulate sustainable transportation strategies.

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## About Authors

**Yan Wang***
PhD Candidate, School of Management and Marketing, Faculty of Business and Law, Taylor's University, 47500 Subang Jaya, Malaysia.
ORCID iD: https://orcid.org/0009-0005-2663-9747
Email: wangyan05@sd.taylors.edu.my

**Nan Jiang**
Dr., School of Management and Marketing, Faculty of Business and Law, Taylor's University, 47500 Subang Jaya, Malaysia.
ORCID iD: https://orcid.org/0000-0002-4410-6283
Email: Nan.Jiang@Taylors.edu.my

**Kay Tze Hong**
Dr., School of Management and Marketing, Faculty of Business and Law, Taylor's University, 47500 Subang Jaya, Malaysia.
ORCID iD: https://orcid.org/0000-0002-9336-4131
Email: hongkaytze@gmail.com

**Harpaljit Kaur**
Dr., School of Management and Marketing, Faculty of Business and Law, Taylor's University, 47500 Subang Jaya, Malaysia.
ORCID iD: https://orcid.org/0000-0002-9254-1634
Email: HarpaljitKaur.PritamSingh@taylors.edu.my

**Mei Kei Leong**
Dr., School of Management and Marketing, Faculty of Business and Law, Taylor's University, 47500 Subang Jaya, Malaysia.
ORCID iD: https://orcid.org/0000-0001-8575-0473
Email: maggie.leong@taylors.edu.my