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Second-Life Mobility: Thematic Insights Into Drivers and Barriers to Used EV Adoption

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Abstract

This study aims to explore the key factors influencing consumer adoption of used electric vehicles (UEVs), an area that remains under-researched despite its growing relevance in sustainable mobility. Integrating the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM), the research employs a qualitative thematic analysis based on the expert interviews to examine constructs such as attitude, subjective norm, perceived behavioral control, perceived usefulness, and perceived ease of use. The analysis reveals that, beyond these established constructs, UEV-specific concerns such as battery reliability, information asymmetry, and residual values influence consumer risk perception. In addition, psychological dimensions like environmental self-identity and trust in institutions are found to mediate behavioral intentions. Compared to new electric vehicles, UEV adoption involves more complex decision-making, with consumers factoring in retrospective evaluations, technological uncertainties, and secondary market dynamics. This study contributes novel insights by extending traditional behavioral models to include post-use transparency, lifecycle information, and ecosystem readiness. The findings offer practical implications for industry stakeholders and policymakers, highlighting the need for transparent pricing, standardized battery diagnostics, and reliable certification systems. Ultimately, this research enhances the understanding of behavioral mechanisms in the UEV market and supports the advancement of more inclusive and sustainable electric mobility solutions.

Keywords: UEVs; Electric Vehicle; Theory of Planned Behavior; Technology Acceptance Model; Adoption.

1. Introduction

The rapid growth of concerns regarding climate change, energy security, and urban air pollution has defined EVs as a crucial technological solution for decarbonizing the transportation sector. In comparison with traditional internal combustion engine vehicles, EVs offer significant environmental advantages by reducing greenhouse gas emissions and eliminating dependence on fossil fuels [1, 2]. Various governments worldwide recognized the potential of EVs and have initiated several policies to drive their adoption. The policies have been centered around subsidies, tax allowances, and funding for infrastructure and have contributed to a drastic increase in the electric vehicle market. For instance, the International Energy Agency (IEA) reports that in 2023, the number of electric vehicle sales exceeded 14 million units, which constitutes 18% of the total global automobile sales [3]. Based on this evidence, one can conclude

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that the role of electric transportation in the future presents itself in a favorable light, promising to contribute to a cleaner and sustainable environment.

The concept of the EV market has witnessed the development of a segment called used electric vehicles, which represents a specific sector that has recently gained significant attention. This sector has been expanding dramatically and thus has become an essential part of low-carbon transportation on a global level [4]. As reported by the IEA, the development of the UEV market is not only driven by the expansion of the EV market but is also a response to several current challenges. These challenges include the question of the affordability of new EVs, the increasing need to recycle batteries, and the growing consumer interest in affordable and sustainable transportation [5, 6]. Therefore, the growth of the UEV market is not just an opportunity; it is equally a solution to the existing sustainability challenges.

The rising perception of UEVs underlines their crucial influence on increasing consumer acceptance of sustainable mobility. In addition, UEVs are crucial for extending the lifespan of EVs and reducing resource loss [7]. As a result, UEVs are not only a derivative of the automotive sector, but rather an important mechanism in pursuing the sustainability of the environment and circular industrial economy in the long term. EVs are not only important for the environment but also offer a convenient and less expensive way for the underprivileged section of the population to own an electric vehicle [8]. They improve green mobility and support the circular economy by reducing carbon footprints and improving battery reuse [9]. So UEVs are not only a continuation of the EV market; more importantly, UEVs are an essential part of the world's green transformation.

Although the growing body of research on the EV market has delivered a multitude of quantitative insights, such as consumer preference modeling, market penetration analysis, or price sensitivity evaluation [10], the abovementioned investigations are mostly based on large-scale surveys, discrete choice experiments, and econometric modeling. While all these methods are instrumental in revealing statistical relationships and high-level patterns for large populations—providing empirical correlations between, for instance, income, environmental attitudes, and policy incentives, the understanding of UEVs from a systematic viewpoint remains relatively undeveloped [11, 12]. The level of analysis facilitated by quantitative methods is insufficient to reveal the intricate cognitive and emotional configurations underlying UEV adoption decisions, especially in relatively young, fast-growing, and culturally diverse markets. In this vein, this gap in provision suggests a need for more exploratory, qualitative methods to better analyze behaviors, perceptions, choices, and concerns of UEV consumers to complement quantitative initiatives. The usage of such methods could help generate more nuanced and contextualized findings that could offer practical advice for industry and policy action promoting sustainable mobility.

Currently, most studies on EV adoption rely heavily on quantitative methods such as structured surveys, regression analysis, and discrete choice models [13]. While these approaches are valuable for identifying statistical relationships and predicting broad behavioral patterns, they often fall short in capturing the cognitive, affective, and contextual factors that shape consumer decision-making. As noted by Liao et al. [10], much of the existing literature on EV adoption tends to emphasize observable and functional variables such as cost, driving range, and charging infrastructure. However, such models often neglect deeper psychological motivations and the influence of situational uncertainty, particularly in less mature markets.

Rezvani et al. [5] further critique the rational actor assumption common in quantitative models, arguing that consumer decisions are frequently shaped by emotion, habit, and perception of risk, rather than purely logical evaluations. This is particularly salient in the context of UEVs, where uncertainties surrounding battery degradation, vehicle history, and resale value introduce a layer of complexity not adequately addressed in current research. For example, Zou et al. [14] highlighted that trust in certification systems and information asymmetry significantly affect second-hand EV purchasing behavior—factors that are difficult to quantify through surveys alone.

Although survey-based methods are effective for identifying broad trends, they rarely illuminate the nuanced mental models, beliefs, and contextual pressures that guide individual choices, especially in developing markets with fast-evolving EV ecosystems [15]. In such environments, consumer perceptions are influenced not only by economic considerations but also by social norms, identity signaling, and institutional trust [16].

To address this gap, this study adopts a qualitative research design using expert interviews and thematic analysis to explore the latent concerns, perceptions, and emotional drivers influencing UEV adoption. Qualitative methods, such as semi-structured interviews, are particularly suited to unpacking the underlying motivations, contextual constraints, and psychological barriers that cannot be captured by standardized instruments [17]. These approaches are especially valuable in the second-hand EV market, where factors such as battery anxiety, distrust in seller information, and lack of transparent standards play a central role in shaping consumer choices.

Building on this methodological shift, this study integrates the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM) to provide a structured yet flexible lens for interpreting the data. The TPB framework considers behavioral intentions as a function of attitudes, subjective norms, and perceived behavioral control [18], while the TAM emphasizes perceived usefulness and perceived ease of use [19]. Although both models have been widely applied in new EV adoption research [20, 21], they have rarely been extended to the used EV market or tested using qualitative data.

This research thus makes a dual contribution. First, it empirically enriches TPB and TAM by incorporating UEV-specific risk factors, such as trust in certification, battery transparency, and long-term value retention, into these established frameworks. Second, it provides practical insights for stakeholders by identifying the psychological and contextual barriers that hinder consumer adoption. By doing so, this study not only fills a methodological gap in literature but also offers actionable recommendations to enhance market readiness and consumer confidence. Thus, the research questions are as follows:

RQ1: What themes about UEV competitiveness can be summarized from the expert interviews?

RQ2: How do experts view the challenges and opportunities in the current UEV marketing?

This study seeks to enhance our understanding of consumer behavior in emerging automotive markets by examining the emotional, psychological, and contextual motivators behind UEV adoption. By using in-depth expert interviews, it offers a qualitative complement to the dominant quantitative discourse, producing richer, and more actionable insights. Ultimately, the findings will help refine behavioral models of EV adoption, guide more empathetic and effective marketing strategies, and support the development of a sustainable and inclusive UEV ecosystem.

The remaining sections of this study are organized as follows: Section 2 presents a comprehensive literature review related to UEV adoption and consumer behavior. Section 3 outlines the research methodology, including data collection and analysis methods. Section 4 reports the key findings derived from expert interviews. Section 5 provides an in-depth discussion of the results considering existing theories and empirical studies. Section 6 highlights the theoretical contributions of the study. Section 7 outlines practical implications for stakeholders and UEV companies. Section 8 summarizes the main conclusions. Finally, Section 9 discusses the limitations of the research and proposes directions for future studies.

2. Literature Review

2.1. Theory of Planned Behavior (TPB) and Technology Acceptance Model (TAM)

2.1.1. Core Constructs of TPB and TAM

Behavioral and marketing research has long been concerned with identifying the reasons for the early adoption of technology by individuals. TPB and TAM are two of the most widely used models for exploring people's decision-making processes related to technology acceptance and usage [18]. Overall, both models help expand current understanding of the intricate mechanisms behind the processes of acceptance of new technology systems. Whereas TPB, on the ground of Theory of Reasoned Action (TRA), was developed by Ajzen and annexing the concept of perceived behavioral control, TAM is based on the concept of perceiving use in general and following an innovative system. More specifically, TPB, as Profile/Relevance Theory, focuses on perceived relevance while including perceived behavioral control, which has parallels to Bandura's self-efficacy, a person's belief in their capability to engage in a specific course of action [18, 22]. Despite its inherent limitations, the elaborate aspect and optimism of the TPB are invaluable in the research of pro-environmental behavior, sustainable consumption, and acceptance of some new technologies.

The Technology Acceptance Model, conceptualized by Davis [19], serves as the fundamental theory of users' acceptance of computer and IT technology. Based on TAM, the perceived usefulness and the perceived ease of use are two significant determinants of user's attitude and intention toward using a new technology. PU refers to a user's belief "that using a particular system would enhance his or her job performance within an organizational context," and PEOU is a measure of how easy it is to use the system. Previous research by Davis [19] found that PU and PEOU are significantly related to behavioral intention and actual system usage, which then was further strengthened in TAM2. TAM2 was expanded from the original model by incorporating additional factors [23], such as the subjective norm, image, voluntariness of use, job relevance, output quality, result demonstrability, and experience. All these factors are essential to obtain a more comprehensive understanding of how external variables shape the users' perception and intention in organizational settings. In 2008, Venkatesh improved and expanded the model to create the third generation of TAM. TAM3 improved TAM2 by combining it "with determinants of the PEOU construct [23], and incorporated anchors and adjustments that allow for the prediction of user acceptance in complex and dynamic computer and IT environments." Due to its versatility, TAM has been applied in various domains outside its original context, such as smart home devices, mobile applications, and EVs [24]. For example, in the case of UEVs, TAM can help identify how consumers perceive the benefit of owning a used electric vehicle and how easily they are able to adapt to its technology [25], such as the usage of regenerative braking, charging interface, or dashboard systems.

Recent studies continue to validate and extend TAM and TPB in emerging technology contexts. For instance, Quaglieri [26] found that in smart mobility solutions, perceived ease of use significantly mediates the effect of perceived trust on adoption intention, highlighting the evolving role of trust in user acceptance. Similarly, Nafees & Sujood [27] integrated affective factors into TAM, showing that emotional responses to new technology interfaces can influence both perceived usefulness and ease of use, thereby refining predictive capabilities of the model.

2.1.2. Applications of TPB and TAM in EV and UEV Adoption

TPB and TAM have been two major theories used to discuss the adoption of EVs. Previous studies found a positive correlation between TPB constructs and the intention of individuals to adopt EVs. For instance, Haustein & Jensen [28] found that concern for the environment and various control beliefs, including charging station providers in Denmark, encouraged people to buy EVs. Likewise, Rezvani et al. [5] enhanced environmental attitudes and perception of innovation, as well as a peer group and social norms, are drivers of EV adoption. It means that the relationships between persuasion, social influence, and behavior control are complex in the context of EV adoption. TAM also made a significant contribution to research on EV. Pang et al. [29] proved that PU and PEOU positively affect the intention of Chinese consumers to purchase an EV. They argued that saving energy and convenient charging stations play a vital role in behavior. Schuitema et al. [30] also argued that TAM, in their case, the expanded TAM, and symbolic values, such as status, which are also supportive for EV usage, are relative. It suggests that the roles have shifted, and symbolic meaning prevails over functional characteristics.

Although there is extensive research on the TAM and TPB models in new EVs, the application in UEVs remains low. However, there is an increasing trend in the understanding of how UEV adoption can be ascertained using these models. Thilina & Gunawardane [31] used the TPB model combined with the TAM to analyze the purchasing weaving pattern of consumers. The study revealed that certain risks such as battery power loss risks, lack of warranties, and antecedent vehicle history were potential factors eroding the level of trust in UEV market. Therefore, the study found that trust was a determinant of the effect of the TPB model in explaining perceived behavioral control. Similarly, Lin & Filieri [32] reported the same indication, citing that distrust in the seller of used vehicles would outweigh the good willingness to preserve the environment by the consumer and significantly alter the online car purchase. Based on the findings from Thilina & Gunawardane [31], it can be argued that UEV buying behavior is surrounded by challenges and hence factors such as risk perception, information asymmetry, and market transparency play a significant role in psychological aspects. Therefore, to explain UEV adoption behavior, models as from the TPB and TAM should consider context-specific factors.

More recent investigations highlight additional nuances in EV and UEV adoption behavior. Günther & Lantz [33] found that trust in after-sales services significantly moderates the relationship between perceived behavioral control and purchase intention for used EVs, underscoring the importance of post-purchase support in the UEV market. Meanwhile, Kant et al. [34] demonstrated that social identity and environmental self-identity function as key mediators between subjective norms and adoption intentions, adding a social-psychological dimension to TPB applications in electric vehicle contexts.

2.1.3. Model Extensions and Integration Trends

There has been an extension of the TPB and TAM models by adding other elements to improve their predictability on the behavior. The major extension done is the incorporation of emotional factors; as indicated by a study by Thilina & Gunawardane [31]. The study revealed that expected emotional outcomes could act as a mediator between attitude and the decision to adopt certain behaviors. This is important mostly for the promotion of sustainable action as in the EV market. For instance, the pride of the people doing something environmental-friendly, worry about the durability of the batteries, and the societal value gesture used would contribute significantly to the adoption decisions of the individuals, considering the sustainable behaviors [35].

Given this perspective, it is essential to consider both the TAM and the TPB when discussing user attitudes and behaviors. Relying solely on a single framework would limit the understanding of the broader problem. For instance, while TAM includes two primary determinants, such as perceived usefulness and perceived ease of use, it fails to account for the strength of social influences and the control-related factors. These concepts are critical to make sense of phenomena associated with societal norms and the inability of certain groups to access basic resources [36]. In turn, the TPB includes a social influence and perceived control constructs but disregards technological determinants. Therefore, the integration of the TAM and the TPB allows for a more comprehensive view of user behaviors, integrating the internal beliefs about technology and the external social-contextual factors. Schuitema et al. [30] argued that integrating the TPB with the TAM allows for a broader understanding of consumer behavior. In this way, combining the functional benefits and social influences, as TAM and the TPB tend to suggest, would be most beneficial for informational models based on green technology and sustainability. Schuitema et al. [30] successfully combined the integrated framework to predict consumer choices and implement it in UEV market contexts. Other studies in green technology research chose a similar approach to integrate the TPB and the TAM. The integrated models demonstrated high effectiveness in empirical studies regarding consumer behavior in purchasing green products, ride sharing, and attitudes towards electric vehicles. Indeed, several studies highlighted the direction of the integrated models' synergy [37-39]. This existing literature identifies the high potential of such integrated models for green technology.

Moreover, as further described by Dwivedi et al. [40], tailoring the models to specific context and demography along with technological factors is important. For instance, a significant proportion of factors to consider while discussing UEVs include resale value, post-purchase services, and battery life. This makes factors such as perceived

risk, trust, and market reputation critical to include comprehensively into the theoretical model [41]. More recent studies have unveiled new factors, such as the role of trust and open certification and diagnostics for the battery, which are proven to affect customers' predisposition and/or actions and reactions. By adjusting the models in such a manner, it is possible to ensure that the behavioral theories stay relevant and applicable across the contexts, adjusting to the situational factors and disruptions.

2.2. Empirical Research on EV and UEV Adoption

2.2.1. Quantitative Trends in EV Adoption

The field of quantitative research on EV adoption has seen significant growth, frequently utilizing survey methods, structural equation modeling (SEM), and regression analysis based on the TPB or the TAM. Research conducted by Egbue & Long [42] demonstrated that factors such as environmental concern and perceived cost savings played a crucial role in predicting EV adoption. Similarly, a meta-analysis conducted by Li et al. [43] revealed that perceived usefulness consistently emerged as the most vital predictor, while subjective norms had a comparatively lesser impact, especially in individualistic societies. These findings shed light on the key drivers of EV adoption.

Research has identified obstacles hindering the widespread adoption of EVs. Studies by Khaleghikarahrodi et al. [44] and Helveston et al. [45] highlighted that factors such as range anxiety and inadequate charging infrastructure negatively impact consumers' perception of EVs. Additionally, the influence of policy incentives and technological advancement on adoption behavior was emphasized. These barriers must be addressed to encourage greater EV adoption rates.

Economic factors are key in shaping consumer perceptions of electric vehicles. Research by Beresteanu & Li [46] found that changes in fuel and electricity costs impact consumers' decision-making processes and their perception of value. Building on this, Mersky & Samaras [47] discovered that consumers are more likely to view EVs as environmentally friendly when considering life-cycle emissions.

Recent studies have reinforced these trends. For example, Zhan et al. [48] found that dynamic fuel cost modeling significantly affects the economic attractiveness of EVs under volatile energy markets. Furthermore, recent research has demonstrated that the provision of transparent charging infrastructure data significantly strengthens users' sense of control over electric vehicle usage. For instance, Pei et al. [49] conducted a survey-based study in China, revealing that detailed, real-time information on charger availability positively influences perceived behavioral control and reduces range anxiety among potential adopters.

2.2.2. UEV Adoption

Emerging research on the adoption of UEV is gaining traction as a solution to sustainable transportation challenges. Studies by Loh & Noland [50] emphasized that concerns about battery performance and warranties are key barriers to UEV adoption. Furthermore, Thilina & Gunawardane [31] discovered a significant decline in interest in UEVs when labeled as "used", even among environmentally conscious consumers. These findings highlight the importance of addressing perceived risks and consumer perceptions to promote wider adoption of UEVs in the quest for environmentally friendly transportation options.

Trust and information transparency play a crucial role in consumer decision-making processes. Studies by Günther & Lantz [33] and Yildiz [51] highlighted the impact of credible information, standardized certification, and clear after-sales policies on perceived behavioral control and market growth. Lack of reliable third-party assessments for UEVs also hinders consumer trust and market expansion. Ensuring transparency and trustworthiness remains essential for businesses to thrive in competitive market environments.

Chu et al. [52] discovered that factors like prior experience with EVs and social influence greatly influenced consumer adoption behavior. Surprisingly, individuals did not base their decisions solely on financial factors but also factored in subjective risk perception and peer opinions in their decision-making process. This suggests that psychological and experiential aspects play a significant role in shaping UEV adoption behavior.

2.2.3. Behavioral Lag in the UEV Market

Although individuals may express strong intentions to adopt certain behaviors, the actual rates of adoption often fall short due to external factors. Plötz et al. [53] has highlighted that limitations in policy incentives, vehicle availability, and infrastructure can contribute to this intention–behavior gap. Despite widespread intentions, these constraints hinder widespread adoption of desired behaviors.

In the UEV market, this gap is even more pronounced. Consumers may support sustainability in principle yet hesitate due to lack of trust, unclear warranty policies, or residual value concerns. Turrentine et al. [54] termed this a "behavioral lag", where favorable attitudes do not immediately translate into action. This lag is especially visible in the Chinese used EV context, where insufficient institutional trust and limited vehicle history transparency create friction between intention and actual behavior [42].

Bridging this gap requires multifaceted strategies: improving market transparency, establishing third-party certification, enhancing after-sales services, and developing trust-building mechanisms. Additionally, consumer education initiatives and government-backed awareness campaigns can help reduce perceived risk and correct misinformation [55].

From a theoretical standpoint, behavioral lag directly relates to the limitations of TPB and TAM in explaining post-intentional behavior. While TPB emphasizes behavioral intention as the immediate antecedent to action, it does not sufficiently account for external or situational constraints—such as battery reliability or information asymmetry—that may inhibit execution. Similarly, TAM focuses on PU and PEOU but lacks constructs to model post-decision uncertainty and emotional hesitation.

2.3. Framework of the Present Study

This research is theoretically grounded in the integration of the TPB and the TAM, both of which are widely applied in studies of sustainable technology adoption, including EVs. The TPB emphasizes attitude, subjective norms, and perceived behavioral control, while TAM contributes perceived usefulness and perceived ease of use as core constructs. By combining these models, the present study constructs a comprehensive framework to explore the psychological and contextual factors that influence UEV adoption in China. This integrated framework enables a nuanced understanding of both individual decision-making processes and the influence of external conditions such as policy support, market transparency, and social norms.

The current study builds upon previous theoretical advancements by contextualizing them in the specific domain of the UEV market, which presents distinct challenges and behavioral uncertainties. This approach allows for a theoretically rich exploration of user intentions, trust, risk perceptions, and infrastructure readiness, thereby filling an important gap in the existing body of literature.

3. Research Methodology

3.1. Research Design

This study focused on the determinants of UEV purchase in China. Using qualitative research methods, rich perspectives on the drivers and barriers of adopting UEVs were collected from industry specialists. This method enabled an in-depth investigation of viewpoints which can be overlooked by quantitative surveys [56]. The study adopted both deductive and the inductive analysis method to provide a holistic understanding of the behavioral motivations and situational constraints pertaining UEV adoption in China.

The deductive coding procedure was derived from the TPB and TAM theoretical frameworks. The critical constructs included perceived usefulness, ease of use, subjective norm and behavioral intention. Furthermore, inductive coding identified themes are not present in the extant literature or conceptual models. This twofold process ensured that not only was the study theoretically robust, but it was also open to new insights from industry professionals. Through the synthesis of these methods the study offers an in-depth insight into the subject which is theoretically as well as empirically grounded.

3.2. Sampling and Participants

3.2.1. Expert Selection Criteria

The paper targeted stakeholders with close professional proximity to the EV and UEV worlds to establish a holistic view on the factors that affect the adoption decision-makers. Three primary categories of experts were intentionally recruited to offer diverse viewpoints on EV and UEV adoption. We first selected academic researchers who have experience in the field of consumer behavior and/or sustainable mobility based on their published research on EV and/or UEV adoption. The perspectives of third-party market actors and front-line industrial stakeholders helped provide lessons from the market, including buyer preferences and barriers to adoption. Finally, technology experts, responsible for EV battery integration architects and charging infrastructure design, provided information on how best to apply EV and UEV technical performance, reliability and lifecycle attributes. This multidisciplinary team possessed the background to achieve a holistic view on the considerations affecting UEV adoption in the Chinese context. Their research findings have contributed greatly to uncover the complexity of the adoption of EVs and UEVs in the Chinese market.

Experts from different disciplines played a key role in obtaining on-site views on vehicle-uptake behavior. Their varying insights such as academic knowledge, market knowledge and technological understanding enriched the thematic pattern of the interviews. This comprehensive method complemented analysis with strategic and operational implications.

3.2.2. Sampling Procedure

We used a mixture of purposive and snowball sampling to recruit a sample of diverse, knowledgeable participants for our study. Our recruitment strategies began with institutions connected with EV and UEV industry players,

including professional associations such as the Jiangsu Automobile Dealers Association, academic department specializing in consumer studies, and EV manufacturers' networks. We also asked previous interviewees about other experts in their respective fields, who could refer us to more potential interviewees. This purposive sampling approach enabled us to select target participants who had experienced the EV/UEV industries, who were able to establish direct contact with us, such as university teachers who specialized in consumer behavior, sales managers working in the EV market, technical engineers who were familiar with electric vehicle technology, and so forth. Eligibility criteria addressed domain expertise, professional role and years of experience which was consistent with established expert participant sampling guidelines in qualitative studies [57]. In addition to capturing this narrow population, the snowball sampling ensured that our sample drew in individuals who might be more difficult to contact though routine research channels. Professional referrals enabled us to enrich the credibility, context sensitivity and theoretical saturation of the data we gained [58]. This dual sampling approach contributed to the balance of the participant group, which included both more developed expertise and a broader range of views on the topic.

The decision to conduct 10 expert interviews was based on the principle of thematic saturation, a widely accepted criterion in qualitative research. We systematically monitored the emergence of new themes during data collection and analysis. By the tenth interview, no substantially new concepts or categories emerged, suggesting that further interviews would likely yield diminishing returns in terms of novel insights. Guest et al. [59] proposed that data saturation often occurs within the first 6 to 12 interviews, particularly when participants are relatively homogeneous in their experience or expertise relevant to the research question.

Furthermore, the expert sample was purposefully selected to maximize variation in professional background and perspective, thereby enhancing information richness [60]. This diverse input contributed to the robustness of the thematic structure and reinforced the conclusion that saturation had been adequately reached. Table 1 outlines the anonymized codes and key attributes of the interviewed experts, demonstrating the strategic breadth of the sample.

Table 1. Background Information for Experts Interviewed on UEV Adoption

Expert Code	Profession/Title	Area of Expertise	Organization Type
EXP01	Professor of Marketing	Sustainable Mobility Policy	University
EXP02	EV Dealership Manager	Sales Strategy	Private EV Dealership
EXP03	Product Development Engineer	EV Technology	National EV Manufacturer
EXP04	Senior Policy Consultant	Sustainable Mobility Policy	Government Think Tank
EXP05	Head of Used Car Operations	UEV Pricing and Sales	National Dealer Network
EXP06	Automotive Market Analyst	Industry Trends and Forecasting	Private Research Firm
EXP07	Lecturer in Green Innovation	Environmental Attitudes	Technical University
EXP08	Regional Sales Director	EV Market Penetration	Foreign EV Brand in China
EXP09	Technical Inspection Supervisor	Battery Performance & Safety	Used EV Certification Center
EXP10	Executive Director	EV Dealer Association	Jiangsu Automobile Assoc

3.3. Data Collection

3.3.1. Criteria Interview Process

Data for the present study was collected through semi-structured interviews. To create uniformity, an interview guide was developed to structure the discussions; this approach, however, permitted the informants to elaborate on their ideas. The questions on the guide were intended to correspond to key constructions of the TPB and TAM. For instance, the participants were questioned as to what they think are the advantages of the electric and ultra-efficient car sharing program and what are the challenges they face when thinking of purchasing such cars. They were also asked how social and governmental influences affect their purchasing mindset toward electric vehicles.

The adaptable nature of the interview style meant that the respondents could leverage the knowledge and experiences of their own career, and thus unanticipated but worthwhile themes returned naturally. Piloting questions with external experts contributed to the clarity and relevance of the final interview script, and the data was of higher quality.

3.3.2. Interview Settings and Recording

The interviews were spread out over three weeks & conducted via multiple formats (in-person at participants' offices, Zoom video, phone). In total, ten interviews were conducted, each of which lasted between 45 and 70 minutes. Before starting the interviews, oral consent was asked for from each interviewee for recording and noting the conversation. All interviews were transcribed verbatim in Mandarin, then translated into English. The wide variety of formats employed facilitated a deep investigation of specialized participants' viewpoints and experiences in the interest area.

3.4. Data Analysis

3.4.1. Coding Strategy

In this study, the data analysis applied a systematic technique, which involved both deductive and inductive coding. First, deductive codes derived from established theories such as TPB and TAM were used to the data and compared across the first two transcripts. As the analysis proceeded, new inductive codes were created to accommodate novel patterns and themes that were not previously coded. Such codes included battery warranty uncertainty and peer resale experience that did not directly map onto initial constructs but were deemed to be important for making sense of the data. This offered a more in-depth exploration, and a richer and newer view of the data.

A thematic approach was chosen to interpret the data, where codes form into themes such as trust, technology maturity, policy incentives, and resale transparency. Coding was done by hand, using Microsoft Excel to support comparisons and memoing. For credibility purposes, two investigators coded 30% of the transcripts independently, with over 85% agreement. Differences were resolved by discussion, which resulted in increased reliability of the findings.

3.4.2. Triangulation and Validation

A triangulation technique of multiple data types and methodologies was employed to establish the trustworthiness of the qualitative data in this research. Triangulation of methods was done through a comparison of themes from expert interviews and findings from the previous quantitative phase, which confirmed convergence of main constructs such as perceived usefulness and perceived behavioral control [61]. A form of data source triangulation was used through cross-experts (scholars, sales personnel, technical experts) panel rendering a multifaceted analysis of the findings [62, 63], a panel whose distribution of members could reflect diverse stakeholders involved in the software industry.

In addition, the validity of interpretations of the themes was established through member checking with three participants where they had the opportunity to assess the thematic output [64]. Moreover, reflexive notes and analytical diaries were kept during coding to record the reasoning and minimize potential bias [65, 66]. These steps collectively ensured that the results were well-founded in data and analytically valid.

4. Findings

4.1. Overview of Emergent Themes

Customers' acceptance of UEVs was investigated in a consumer survey and several factors were found to affect the acceptance of this vehicle category. By means of expert interviews, researchers identified relevant factors leading to driving and restricting forces of consumer behavior. Coding used both deductive, theory-driven code systems (theoretical frameworks) and inductive, data-driven analysis to identify key themes from the data. Findings reveal that beyond traditional factors such as perceived usefulness and ease of use, contextual factors (i.e., trust, market transparency, and emotional risk perception) are vital in influencing consumers to make decisions in the used EV market. More insight into these complex processes is important to advance sustainable mobility options and lift barriers for UEV penetration.

The findings also presented three components that influence consumers' UEV-related decisions in different ways. The first conceptual theme, Perceived Value and Functional Utility, addresses consumers' perception of the cost-effectiveness, technology suitability, and the durability of the battery. The second motif, Trust and Market Transparency, involves apprehensions about product dependability, dealer trustworthiness, and access to trustworthy information. The third theme, Policy and Infrastructure Influence, focuses on government policies, economic incentives, and infrastructure deployment as factors supporting or obstructing UEV adoption. These topics illustrate a myriad of reasons that consumer demand is shaped in the electric vehicle market.

The topics in the paragraph cover different elements of driving consumer decisions in the changing marketplace. Quotes from experts support sub-themes while pointing out complexities. Synopsis detailed attention is paid to these issues of consumer behavior in the following chapters.

4.2. Theme 1: Value Recognition and Functional Practically

The experts' interviews revealed one important concept, Perceived Value and Functional Utility. It is an important notion in theories such as TAM or consumer decision making. The specialists emphasized that consumers' attitudes toward UEV are finally not only determined by the environmental or symbolic dimension but also based on cost/benefit consideration. Unlike new EVs that may make do with reputation or novelty, UEVs are evaluated based on long-term economic viability, reliability, and sustained technology value. Focusing on the possibility and value for UEVs is essential to understand consumer acceptability.

Deciding to buy UEV for consumers is both objective and subjective. Practical factors, such as gas-mileage, battery life, and servicing costs, go together with irrational emotional reactions to perceived dangers and uncertainties. According to industry observers, uncertainties regarding the performance and gradual costs of UEVs serve as obstacles in the way of the large-scale prevalence of these vehicles. Navigating these fears will be no small step as consumers continue to weigh the economic advantages and practicality of purchasing a used electric vehicle.

4.2.1. Sub-Theme 1: Economic Value and Total Cost of Ownership

A recurring insight across interviews was that consumers perceive value primarily through the lens of total cost of ownership (TCO), which includes the purchase price, maintenance costs, energy consumption, and expected resale value. Since UEVs already carry a lower upfront cost than new EVs, they are attractive to price-sensitive consumers—but only if the long-term savings are clear and calculable.

"For most second-hand EV buyers, it's a budget decision. They're looking for something cheap but still dependable, especially in urban areas where they just need it for daily commuting" (EXP03).

However, this price sensitivity also leads to increased scrutiny. Unlike buyers of new cars who might rely on brand reputation or showroom assurances, EV used buyers often demand clear proof that the vehicle remains cost-effective over time. This includes understanding the remaining battery life, expected maintenance cycles, insurance premiums, and whether charging is cheaper than fueling a traditional car.

Experts pointed out that many consumers are not aware of the actual operational savings of EVs, especially regarding reduced maintenance. This knowledge gap weakens perceived usefulness, a core TAM construct, and highlights the need for better communication from sellers and platforms.

"We often find that people don't realize how little it costs to maintain an EV compared to a gasoline car. If they knew, they'd be more confident in buying used" (EXP05).

Some experts suggested that visual tools or digital calculators showing cost breakdowns could help demystify the financial aspects of UEVs, especially for first-time buyers unfamiliar with EV technology.

4.2.2. Sub-Theme 2: Battery Health and Performance Uncertainty

Despite potential economic benefits, concerns over battery degradation were identified as a critical barrier across all expert categories. The battery is the most expensive component in an electric vehicle, and in the absence of transparent data or standardized health reporting, consumers often default to risk-averse behavior.

"The number one question we get is: 'How do I know this battery still works like it should?' People assume a used EV is like a used phone—the battery's probably going to fail soon" (EXP01).

This comparison to personal electronics reflects how consumers project everyday battery experiences onto vehicle purchases, often unfairly. However, the lack of battery health certificates, standardized diagnostics, or third-party verification exacerbates these concerns. Several experts noted that even technically sound UEVs are rejected by consumers simply because sellers cannot credibly demonstrate battery condition.

"You can't expect trust if all you say is 'Trust me, it's good.' You need numbers, tests, warranties, something concrete" (EXP07).

Experts highlighted that while some certified pre-owned programs and leasing companies offer battery warranties or diagnostic reports, these are not yet widespread in the Chinese UEV market. The result is a credibility vacuum, where consumers doubt override even favorable pricing.

In addition, psychological factors such as the fear of being stranded due to reduced driving range further increase consumer hesitation. This concern reflects the concept of range anxiety found in previous studies on new electric vehicle adoption. However, in the context of used electric vehicles, it is more accurately described as battery anxiety, which focuses on long-term battery performance rather than immediate travel distance. To address these concerns, experts recommended several measures. These include requiring third-party battery health assessments, offering affordable extended warranties for used EV batteries, and establishing official certification schemes in collaboration with industry organizations. These interventions aim to strengthen consumer confidence and reduce doubts about battery reliability in the secondhand market.

4.3. Theme 2: Trust and Market Transparency

A second main theme identified from expert interviews is Trust and Market Transparency, which is of crucial importance for UEV consumer perceptions and decision-making. Not as is the case with new electric vehicles, where trust in the brand and dealership is relatively high. New vehicle purchases are relatively predictable; with trust in the product brand, the sale is a matter of transferring title. Based on assurances made at the time of purchase, the buyer makes a big leap of faith. In stark contrast, with used electric vehicles, trust in the processes is low, as pre-owned vehicles can have many problems. For all involved parties in a used vehicle transaction, there are knowledge gaps and uneven playing fields. UEV sales are riskier, with less to go on.

The system creates loopholes and incentives for some to take advantage of them. Small citrus is being made constantly, given a posted speed limit, yet speeders are viewed as cherry-picking paying customers. To raise the trust level, validity of fact needs to increase, fraud needs to be reduced, and misinformation needs to be limited to intentional and malicious acts.

Processes need to provide a path to correct misstatements, unjust enrichment, and fraud for all parties involved. Include a path from the existing to better information for all the post-spection and pre-spection (future-looking) categories of information to have higher confidence of confirmation. UEVs have even larger gaps between observations, facts, and truth—even more than new car sales. In an anarchic world, it is essential to have more facing the right way in the to-and-from sales portion of the sales process.

As it is, used car sales are ripe with opportunities for bad actors because of the asymmetrical information and the fact that cars look so similar. No one can pick out the bad one without a data-driven system. Enabled data rates need to at least have a chance at showing all the behaviors in support of a transaction, so changes need to benefit all and meet the needs of the task at hand. For the proposed solution, there is one actor who will stand out clearly.

This theme links well to both the subjective norms and perceived behavioral control of the TPB, as individuals may look to others for validation when faced with uncertainty.

As one of the interviewed experts points out, a lack of trust in the seller, product condition, or transaction process, respectively, is mentioned as one of the major psychological and behavioral barriers in UEV use by the identified experts. Such mistrust is informed not only by the makers' disregard for their interests, but also by the country's fragmented and laxly regulated second-hand EV market, for which consumers must navigate with limited information and few guarantees.

This theme is supported by two closely linked sub-themes: (1) Seller Credibility and Platform Reputation, and (2) Information Transparency and Certification Mechanisms.

4.3.1. Sub-Theme 1: Seller Credibility and Platform Reputation

Experts noted that consumers are significantly influenced by the reputation of the seller or platform from which the UEV is purchased. Unlike traditional used cars, which may be bought from familiar dealers or individual sellers, UEVs are often sold through emerging digital platforms, many of which lack standardization or transparency. As a result, trust in the seller becomes a proxy for trust in the vehicle.

"The trust issue isn't just about the car—it's about who you're buying it from. If the platform or dealership doesn't have a good reputation, no one will take the risk" (EXP02).

Several participants noted that platforms affiliated with well-known OEMs or large dealerships tend to fare better, as consumers believe these entities have more to lose from reputational damage. Conversely, platforms without recognizable brands or those lacking after-sales service networks are viewed with skepticism.

"We've had cases where people walk away from a good deal just because they've never heard of the seller" (EXP04).

To address these concerns, some experts proposed the development of platform-based review systems, seller ratings, and formalized grievance mechanisms. These measures, they argued, could create a feedback loop of accountability, increasing consumer confidence over time.

4.3.2. Sub-Theme 2: Information Transparency and Certification Mechanisms

A lack of reliable, standardized information on used EV conditions, especially related to battery health, accident history, and repair records, was universally cited as a critical barrier. While internal combustion engine (ICE) vehicles typically come with odometer readings and visible engine diagnostics, UEVs require a different set of metrics, many of which are not readily accessible to the average consumer.

"Buyers want to know: How old is the battery? Has it ever been fast charged? What's the estimated remaining range? But there's no standard report that answers these questions" (EXP06).

Several experts advocated for the establishment of a battery certification system, comparable to a standardized health report, to enhance trust in UEV. They suggested that such a certification could be issued by independent third-party agencies or governed by official standards. Ideally, this report would provide a comprehensive assessment of the battery's condition, including the State of Health (SOH) as a percentage, the total number of charging cycles completed, any history of over-discharge or frequent fast charging, and the estimated remaining driving range under standardized test conditions. This form of transparent, technical documentation is seen as vital for reducing information asymmetry and supporting informed purchasing decisions.

"If we could hand a certified report to every customer, adoption rates would double. Right now, they're guessing" (EXP08).

In addition to technical metrics, experts also highlighted the need for transactional transparency, including warranties, return policies, and full disclosure of previous ownership and accident history. The absence of these protections causes consumers to perceive high risk, which in turn lowers adoption intention—even when pricing is favorable.

Importantly, this sub-theme directly intersects with perceived behavioral control in TPB: the easier and safer consumers perceive the decision-making process to be, the more likely they are to proceed with the purchase.

4.4. Theme 3: Symbolic Value and Social Influence

Beyond technical considerations and trust mechanisms, the third key theme to emerge from the expert interviews is the role of symbolic value and social influence in shaping consumers' decisions to adopt UEVs. This theme draws upon both attitudinal and normative components of the TPB, as well as the extended constructs of TAM such as image and subjective norm introduced in later iterations of the model [67].

Experts pointed out that electric vehicles, including used ones, carry not only utilitarian value, but also significant symbolic meaning related to innovation, sustainability, and social status. However, in the case of UEVs, this symbolic capital can be ambiguous or even diminished, depending on consumers' perception of second-hand products.

4.4.1. Sub-Theme 1: Green Identity and Environmental Signaling

Many consumers today seek to express their green values and personal identity through product choices. Experts noted that owning an EV—particularly in urban areas—has become a way to signal environmental awareness, especially among younger and educated demographics.

"Owning an EV is like saying: I care about the planet. But when it's a used EV, the signal gets blurred—it might say: I care, but I can't afford too carefully" (EXP03).

This quote illustrates the perception gap that can emerge while some buyers view UEVs as economical yet sustainable, others may worry about the perceived inconsistency between second-hand consumption and eco-conscious branding.

Nonetheless, several interviewees stressed that strategic marketing could reshape this narrative by highlighting the circular economy, resource efficiency, and reduced carbon footprint of reusing instead of replacing. By reframing UEVs as part of a sustainable lifestyle rather than a budget constraint, marketers can help consumers retain the symbolic appeal of going electric.

"If you position UEVs as an extension of eco-minimalism or smart consumption, the symbolism becomes powerful again" (EXP10).

4.4.2. Sub-theme 2: Peer Influence and Social Norms

A second, closely related sub-theme is the effect of peer opinions and social norms. According to the experts, Chinese consumers—especially in second- and third-tier cities—are highly influenced by what others think, particularly when it comes to novel purchases like electric vehicles. This aligns with the subjective norm concept from TPB.

"If no one in your circle has driven a UEV, you feel like a guinea pig. If two or three people already have, it becomes a smart move" (EXP05).

This finding suggests that diffusion of UEV adoption is partly driven by visibility and social endorsement. Once early adopters are seen enjoying the benefits of UEVs—without major reliability or maintenance issues—others are more likely to follow. Conversely, if someone hears a negative anecdote, it can discourage several potential adopters.

Several experts recommended leveraging user-generated content, community forums, and social media influences to create positive narratives and peer endorsements. These could help normalize UEV purchases and reduce hesitation among mainstream consumers.

"We need UEV owners to speak up—on Xiaohongshu, WeChat, Douyin—so their experiences become the new norm" (EXP09).

In short, the role of social reference groups—whether friends, family, or online influencers—emerged as a powerful determinant of adoption behavior, particularly in contexts where consumers face uncertainty and a lack of personal experience.

5. Discussion

Figure 1 summarizes the three core issues that affect the adoption of UEV which are value perception and functional practicality (such as insufficient economic value perception and uncertainty about battery health), trust and market transparency (such as lack of seller credibility and information opacity), and symbolic value and social influence (such as ambiguous environmental identity and insufficient peer influence). These themes are closely related to the TAM and the TPB and reveal situational variables and psychological mechanisms that traditional models fail to fully capture. Each theme is discussed, not only explaining the consumer behavior logic behind it, but also explaining how these qualitative findings supplement or even expand the theoretical system based on the variables in existing literature.

On this basis, Figure 1 proposes two situational paths: in the enhanced scenario, economic benefits, trust mechanisms and green identity work together to significantly improve the willingness to adopt UEV; while in the weakened scenario, battery uncertainty, market opacity and negative social connections jointly weaken consumer trust and hinder their willingness to adopt. It is intended to show the obstacles and transformable driving mechanisms faced by the promotion of UEV.

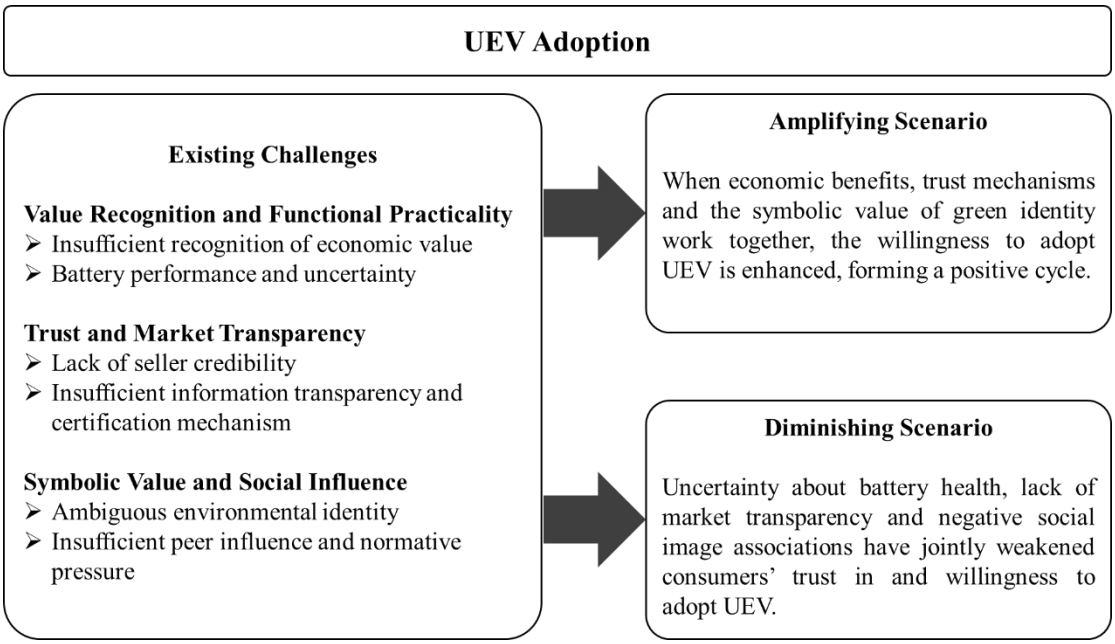

Figure 1. Existing challenges, amplifying scenario, and diminishing scenario

5.1. Perceived Value and Functional Practicality: Reshaping the Connotation of PU and PBC

"Perceived value" is not only an extension of PU in TAM but also reflects consumers' comprehensive evaluation of the long-term economic and technical performance of used electric vehicles. It can be seen from the expert interviews that consumers' interest in UEVs does not come from the pursuit of new technologies, but from rational considerations of cost savings and actual usability. This is significantly different from the path of emphasizing environmental motivation or innovation recognition in previous EV research.

This observation aligns with and extends the work of Rezvani, Jansson [5], who highlighted economic concerns as important for EV adoption but often secondary to environmental attitudes in new car buyers. Our study suggests that in the second-hand market, economic pragmatism dominates, with consumers prioritizing measurable financial benefits over symbolic or innovative appeal. This reflects a shift in motivational hierarchy unique to UEV consumers.

It is particularly noteworthy that "battery health uncertainty" is widely mentioned as a purchase barrier. This factor appears to belong to the technical attributes of the product, but its core reflects consumers' lack of PBC - that is, consumers cannot be sure whether they have enough information and resources to make "rational and safe" purchase decisions. This uncertainty significantly reduces behavioral intention.

This result corroborates studies by Riverso, Altamura [68], which identified perceived risk and information asymmetry as critical barriers in used EV markets, but our qualitative data deepens the understanding by linking these directly to PBC reductions and highlighting consumers' psychological need for tangible assurance mechanisms.

Existing research rarely focuses on PBC as affected by product degradation uncertainty [11]. Our finding expands this scope by showing that technical opacity, like unclear battery status, directly undermines perceived control.

Accordingly, many experts suggest restoring consumers' PBC through standardized battery test reports and extended battery warranty services. These measures not only improve PBC, but also indirectly affect behavioral intention by enhancing PU. This finding expands the definition of PU in the TAM model, extending "technical effectiveness" to "trusted technology availability".

Furthermore, the significance of the "Total Cost of Ownership" (TCO) underscores the limitations of the traditional TAM, particularly with respect to the PEOU construct. In the context of UEV, PEOU extends beyond interface usability to include the consumer's ability to access, comprehend, and evaluate the economic implications of vehicle ownership. This suggests that future extensions of TAM could incorporate "economic information availability" as a subdimension of PEOU, thereby enhancing the model's explanatory power in predicting consumer decision-making behavior.

While Davis [69] conceptualized PEOU primarily as interface ease, our findings suggest that in secondhand markets, economic comprehension is itself a form of "usability." This aligns with the contextual expansion of TAM as proposed by Venkatesh & Bala [23]. Thus, future TAM extensions could incorporate "economic cognitive load" as a subdimension of PEOU.

This insight addresses a research gap by connecting economic literacy with technology acceptance, expanding TAM's relevance in consumer decisions involving complex financial calculations, consistent with arguments by Gefen et al. [70] on the role of cognitive and contextual factors in technology acceptance and user behavior.

5.2. Trust and Market Transparency: As a Bridge Variable Between PBC and SN

In the TPB model, SN and PBC jointly determine the individual's behavioral intention. However, for UEVs, these two are often severely weakened by "lack of trust". From the perspective of experts, trust is not only the trust of individuals in sellers, but also a comprehensive reflection of the trust in the entire transaction system (including platforms, certification mechanisms, and after-sales services).

This aligns with McKnight et al. [71], who emphasized that trust in e-commerce environments operates at multiple levels; interpersonal, institutional, and technological. Our findings show that institutional trust deficits critically impair both PBC and SN. Our study extends this understanding by showing that institutional trust deficits directly impair both PBC and SN, creating a systemic barrier that conventional TPB models do not explicitly address.

This study found that "lack of trust" greatly weakened consumers' confidence in their own judgment and transaction security, further leading to a decline in PBC. In the absence of third-party certification or standardized battery testing, consumers generally exhibit "defensive behavior" - that is, they would rather give up low-price opportunities than bear potential losses. This phenomenon supplements the discussion on the applicability of the TPB model under "situational uncertainty" [72]. TPB does not explicitly model situational uncertainty, which this study proposes as a mediating construction that affects both trust and perceived control.

At the same time, the solutions proposed by experts - such as establishing an industry-wide unified certification system, enhancing platform reputation management, and strengthening after-sales guarantees - enhance the stability of the market's "behavior control structure" from an institutional level. This structural enhancement not only directly improves PBC but also enhances the positive role of subjective norms by increasing consumers' "social trust" in platforms and sellers. This supports the proposition by Model that institutional mechanisms significantly increase users' trust and willingness to engage in online transactions, now extended to UEV purchases.

Hence, we propose integrating "structural trust" or "institutional trust" as a mediating construct within an extended TPB framework. This addition better captures the complex interplay between institutional factors and individual psychological mechanisms, clarifying how formal guarantees and market transparency can enhance consumers' perceived behavioral control and responsiveness to social influence.

5.3. Symbolic Value and Social Influence in SN

The discovery of symbolic value and social influence highlights the multi-layered meaning of SN in the TPB model. In UEV purchasing behavior, this variable not only comes from the opinions of relatives and friends, but also includes self-projection of social image, identity and green consumption concepts. This expands the interpretation of SN from merely injunctive norms [73] to include identity signaling and symbolic motivations as shown in research by White et al. [74] on green consumption.

This broader perspective aligns with research by Barbarossa et al. [35], who argued that green consumption decisions are shaped not only by injunctive norms but also by symbolic motivations related to self-identity and social status. Experts in our study emphasized that owning a UEV serves as a form of social symbolic expression, particularly among younger, urban, and middle-class demographics.

However, unlike new EVs which often symbolize innovation and environmental leadership [75], UEVs display ambiguous semiotics: environmental consciousness mixed with potential stigma of secondhand use. This sense of contradiction makes it difficult for the "symbolic effect" of UEVs to stably stimulate positive SN. In this context, the "green re-consumption narrative" proposed by experts (such as circular economy, energy conservation and carbon reduction) has become a new discourse construction, which is expected to reshape the brand image of UEV.

In this context, the experts proposed the "green re-consumption narrative," which frames UEV ownership within the discourse of circular economy, resource efficiency, and sustainability by emphasizing reuse instead of replacement. This strategic reframing is expected to rebuild positive symbolic value and enhance the social appeal of UEVs, thereby strengthening the influence of subjective norms on adoption decisions.

Furthermore, social influence encompasses observational learning and peer imitation, especially visible in second- and third-tier Chinese cities. This phenomenon parallels Rogers' Diffusion of Innovations theory [76], which posits that early adopters shape subsequent adoption through behavioral modeling and social proof. The experts highlighted that the formation of localized "UEV micro-communities" creates a powerful feedback loop, where peer endorsements on social media platforms like WeChat, Douyin, and Xiaohongshu accelerate normalization and reduce adoption hesitancy.

Thus, social norms in the UEV context should be understood as a complex social-psychological construct that incorporates both normative pressures and symbolic identity work, making it a crucial lever for policy-makers and marketers aiming to increase market penetration.

5.4. Bridging the Gap Between Purchase Intention and Actual Behavior

While many respondents expressed strong intentions toward purchasing UEVs, a noticeable gap remained between these intentions and actual behavior. Through in-depth thematic analysis of expert interviews, several insights emerged regarding the psychological and contextual barriers contributing to this discrepancy. Experts commonly emphasized that although pro-environmental attitudes and favorable cost perceptions significantly enhance intention, these do not always lead to action due to concerns such as battery degradation uncertainty, lack of transparent certification, and insufficient infrastructure for UEV servicing. These findings support the TPB [18], particularly the construction of PBC, which plays a critical role in converting intention into action. Low PBC—due to perceived risks, limited market regulation, and knowledge asymmetry—was identified as a major inhibitor.

Furthermore, participants pointed out that government-backed assurance schemes, such as battery health certificates and resale warranties, could significantly reduce perceived risks and increase trust, thereby helping translate intention into actual purchase behavior. This aligns with the extended TPB and TAM, where external facilitating conditions [36] are pivotal in shaping behavioral outcomes. Additionally, introducing peer-to-peer information exchange platforms and third-party verification mechanisms was seen as effective in enhancing both subjective norms and user confidence. Hence, the interviews not only confirmed the existence of the intention–behavior gap but also revealed actionable pathways to close it—such as increasing transparency, institutional trust, and consumer education.

6. Theoretical Contributions

This research advances the theoretical understanding of sustainable mobility adoption by extending and recontextualizing the TPB and TAM frameworks in the underexplored domain of UEV. It redefines core constructs, particularly perceived behavioral control, by demonstrating that control perceptions are influenced not only by charging accessibility but also by uncertainty surrounding battery performance and ownership costs—factors central to the secondhand EV context. In addition, this study introduced new psychological constructs such as environmental identity and trust in intermediaries, which play a mediating or moderating role in the behavioral model, thus helping to explain the user's adoption decision process more systematically. The study also emphasized the temporal dynamic characteristics of UEV adoption behavior: unlike the purchase of new electric vehicles, the adoption of used electric vehicles involves a retrospective assessment of the vehicle's historical status, thus incorporating memory-based reasoning mechanisms into the formation of behavioral intentions. Furthermore, the study found that UEV adoption behavior is not only influenced by product attributes, but also shaped by broader socio-technical narratives, such as battery reuse mechanisms, policy and institutional environments, and the level of development of market infrastructure. These findings collectively indicate that traditional behavioral models urgently need to evolve and expand to more accurately reflect the complexity of behavior in the context of sustainable technology diffusion.

7. Practical Implications

The results of the study would also be a great resource for stakeholders who have an interest in the UEV market. Understanding consumer behavior patterns and obstacles is essential knowledge to all stakeholders, i.e. EV manufacturers, resellers, marketers and policy makers. To help develop a robust and wide-reaching used EV market, these factors need to be tackled to make the opportunity sustainable and accessible. This work underscores the need to develop and maintain a flourishing UEV community.

7.1. Implications for Businesses and Marketers

The business side of UEVs: Building consumer trust in UEVs is key to making them successful. Adopting rigorous quality assurance controls, such as standardized vetting of battery condition, digital battery passports and third-party certifications, will help settle concerns around product dependability. Such tactics are reducing uncertainty and increasing consumer confidence and enabling UEVs to be sold in higher volumes.

It is important for businesses to establish clear pricing models accounting for the effect of battery degradation, mileage, government subsidy and further determine the overall product sales value. This clarity will help relieve the financial insecurities of consumers and demonstrate that UEVs are a rational financial investment. Product-related services such as extended warranties, maintenance help, and training offer businesses an opportunity to reduce some of the challenges and anxiety after the purchase decision[57]. These measures contribute to happier customers and better-informed shopping decisions.

To change the attitudes of consumers, proper targeted marketing communications are indispensable. The promotional narrative should have focus on environmental consciousness, moderation in consumption and improvement in technology. Consumer identity affirming message tends to more likely resonate and instigate attitudinal shifts towards products and brands.

7.2. Implications for Policymakers and Regulatory Bodies

This research emphasizes the need for the adoption of a uniform national guidelines for battery diagnostics and condition reporting aimed at boosting the ripeness and penetration of the UEV market. Directing that only certified reports are sold at sale, regulatory demands can promote market transparency and decrease the perception of risk. These measures are key to establishing a more secure and efficient market for electric cars.

To stimulate mass use of UEVs, we need to reconsider the policy of offering incentives. Currently, encouragement is primarily directed at new EVs, ignoring the economic benefits that UEVs bring to lower- and middle-class car users. Governments should also consider offering a wider variety of financial incentives for certified UEVs, such as tax breaks, purchase rebates, and use of low-emission zones in cities. It will work to make sustainable transportation available to everyone.

Consumer studies are of vital importance to drive the benefits for owning UEVs. With the debunking of myths & exposure of the established benefits of owning a UEV, perception can be nudged in the right direction. Collaborations with NGOs, industry associations and academia can lend credibility and augment research and outreach activities.

Finally, those policies promoting battery recycling infrastructure and second-life usage can provide customers with confidence in the end-of-life value and thus increase the perceived product longevity and sustainability.

8. Conclusion

This study investigates the key factors influencing consumer adoption of UEVs by integrating the TPB and the TAM. Using qualitative analysis of expert interviews, the research identifies essential behavioral determinants such as attitude, subjective norm, perceived behavioral control, perceived usefulness, and perceived ease of use, while extending the models to address UEV-specific concerns such as battery durability, information asymmetry, and resale value. These factors substantially shaped perceived risk and consumer confidence. The findings highlight that UEV adoption is not merely a functional choice but also psychologically and socially influenced behavior. Experts emphasize that UEVs are gaining competitiveness in the market due to their affordability, environmental value, and increasingly structured resale platforms. However, several barriers persist, including lack of transparency, fluctuating market conditions, and uncertainty surrounding battery health. At the same time, there is strong potential for UEV growth driven by increasing environmental awareness, supportive policies, and advancements in battery diagnostics. Based on these insights, the study underscores the need for transparent battery health reporting, standardized certification processes, and value-added services such as extended warranties and consumer education. These measures are essential to mitigate consumer concerns and build trust. Furthermore, the study provides practical marketing recommendations including clear communication of environmental and economic benefits and the use of identity-based messaging to enhance consumer engagement. Overall, this research contributes to a deeper theoretical and practical understanding of adoption of UEV, calling for an expanded behavioral framework that includes lifecycle transparency, ecosystem maturity, and socio-technical narratives. By addressing these dimensions, both industry stakeholders and policymakers can better support the development of a robust and sustainable UEV market.

8.1. Limitations and Future Research Directions

This paper studies the purchasing factors of UEV in China, but there are still a few shortcomings. First, the study mainly collects information through interviews with a small number of experts. Although these experts have in-depth opinions, they cannot represent the views of most consumers or other relevant groups, such as second-hand car dealers, service companies or policymakers. To make the research results more reliable and more universal, future research can

add more respondents and use quantitative methods such as questionnaires. This can better verify the research conclusions and expand the scope of application.

This study focuses on the Chinese market because China has developed rapidly and has a great influence in electric vehicles. However, due to differences in culture, laws, infrastructure, etc., these research conclusions may not be applicable to other countries. Therefore, cross-national comparative studies can be carried out in the future to help us find which factors are universal and which are specific to specific countries. This is very important for understanding the development trend of global electric vehicles.

In addition, although this study uses TPB and TAM theories to analyze consumer behavior, these models may not be comprehensive enough. For example, consumers' concerns about risks, trust in the second-hand market, and environmental awareness are all important factors that are not fully considered in the model. Future research can expand existing theories or introduce new theories, such as the UTAUT model or the consumer value model, to more fully understand consumers' true thoughts.

Finally, more attention needs to be paid to the gap between willingness and action. Many people may say they are willing to buy but ultimately do not act. In the future, long-term tracking or experiments can be used to study whether people's behavior will change when policies, technologies or market environments change. Only by truly understanding these changes can more effective promotion strategies be designed.

9. Declarations

9.1. Author Contributions

Conceptualization, Z.Y., J.T., and N.W.; methodology, Z.Y. and J.T.; software, Z.Y.; validation, N.W. and J.T.; formal analysis, Z.Y. and J.T.; investigation, Z.Y.; data curation, Z.Y. and N.W.; writing—original draft preparation, Z.Y.; writing—review and editing, N.W. and J.T.; visualization, Z.Y. and N.W. All authors have read and agreed to the published version of the manuscript.

9.2. Data Availability Statement

The data presented in this study are available in the article.

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9.4. Institutional Review Board Statement

This research is approved by Dhonburi Rajabhat University Institutional Board (Certificate No. 050/2567).

9.5. Informed Consent Statement

Not applicable.

9.6. Declaration of Competing Interest

The authors declare that there are no conflicts of interest concerning the publication of this manuscript. Furthermore, all ethical considerations, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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