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Straddling Mandatory Standardisation and Voluntary ESG Practices: A Sustainable Innovation Path for Vehicle Intelligence

Zhenghui Pan[1,2,3,a,*], Yang Sun[2], Wangfa Feng[3], Wei Zheng[2], Jian Li[2], Zhisheng Zhang[1,2], Haixing Huang[2], Li Zhen[3], Qingsheng Zeng[3], Lin Ma[3], Kexiang Liu[3]

[1]*IoT Technology and Application Areas, Doctorate in Computer Science, San Antonio Catholic University of Murcia, Murcia, Spain*
[2]*Strategic Business Management Research Areas, Doctor of Business Administration, Russian University of Transport, Moscow, Russia*
[3]*AIoT Laboratory, IoT Intelligent Link Technology and Application Areas, Great Wall Motor Holdings Group, Shanghai, China*
[a]*pzhoz@outlook.com*
[*]*Corresponding author*

Abstract: *This study examines the application of onboard Internet of Things (IoT) technology in the intelligent automotive industry, particularly the integration of Environmental, Social, and Governance (ESG) principles with onboard IoT technology and the importance of mandatory standardization. The research initially analyzes the current development of onboard IoT technology and its applications in the smart automotive sector, highlighting its potential to enhance road safety, increase energy efficiency, and improve user experience. Subsequently, the paper discusses the necessity of incorporating ESG principles into the standardization process of onboard IoT technology, emphasizing the significance of this integration in promoting sustainable development in the industry. Additionally, the article explores the role of mandatory standardization in advancing the development of onboard IoT technology, including ensuring the technology's interoperability and safety, as well as its positive impact on accelerating technological innovation and market acceptance. Finally, by proposing a value assessment model for the standardization of onboard IoT technology that considers ESG factors, the paper offers businesses a new perspective that supplements traditional absolute value assessment methods. This model is capable of evaluating not only the financial value of the technology but also its contributions to ESG aspects.*

Keywords: *Vehicle IoT Technology; Mandatory Standardization; ESG Practices; Sustainable Innovation; Automotive Intelligence*

1. Introduction

In today's rapidly evolving world, the innovation in smart automotive technology is reshaping our modes of transportation. Particularly, the development of Vehicle Internet of Things (IoT) technology not only brings unprecedented innovative opportunities to the automotive industry but also offers the possibility of safer, more efficient, and environmentally friendly travel. However, these technological innovations are not without challenges. Among them, the integration of mandatory standardization and Environmental, Social, and Governance (ESG) principles is one of the key issues facing the smart automotive industry.

Firstly, the rapid development of smart automotive technology poses challenges to traditional automotive design, manufacturing, and operation models. As vehicle IoT technology advances, ensuring its safety, reliability, and compatibility has become an urgent issue. In this context, the concept of mandatory standardization emerges. Mandatory standardization helps ensure technological interoperability and safety, and accelerates market acceptance and widespread application of technology. For instance, unified communication protocols and data formats can enable better collaboration between vehicles and devices from different manufacturers, thereby enhancing the efficiency and safety of the entire ecosystem. However, technological development is not just a technical issue. Environmental protection, social responsibility, and good governance (i.e., ESG principles) play an increasingly important role in corporate decision-making today. In the smart automotive industry, the integration of ESG principles requires companies to consider the environmental impact, social contribution, and governance structure while pursuing technological innovation. For example, in developing new vehicle IoT technologies, companies need to consider how to reduce environmental impacts, ensure product acceptability and accessibility, and maintain transparency and responsibility throughout the supply chain.

The core of this article is to explore how to integrate ESG principles in the process of mandatory standardization of vehicle IoT technology, and the impact of this integration on the innovation of smart vehicles. This includes analyzing how mandatory standardization can help address technical issues in vehicle IoT technology, and how these standardization measures promote the implementation of ESG principles in the smart automotive industry. Through an in-depth analysis of the integration of mandatory standardization and ESG principles in vehicle IoT technology, this article aims to provide a comprehensive perspective to understand how these two aspects jointly influence the future development of smart automotive technology.

2. Theoretical Analysis

2.1. Vehicle IoT Technology Facilitates ESG Integration

The evolution of smart automotive technology dates back to the late 20th century, initially focusing on enhancing vehicle safety and efficiency. With the rapid advancement of information technology in the 21st century, the concept and technology of smart vehicles have significantly expanded. Today, smart vehicles encompass not only autonomous and advanced driver-assistance systems but also connected car communications, electrification, and personalized user interfaces[1]. Globally, the United States, Europe, Japan, and China are leaders in smart automotive technology development. The core of vehicle IoT technology is to achieve connectivity between vehicles and smart devices, Internet services, and even everything. These technologies extend beyond just enhancing driving comfort and convenience, including improving traffic safety, increasing energy efficiency, and reducing environmental impact. Vehicle IoT technology has become a key driver in the smart automotive field. Shen, et al. (2023)[2] noted that vehicle IoT technology greatly enhances vehicle performance and safety by integrating sensors, communication devices, and data processing systems, and analyzed privacy issues in smart vehicle data collection and processing. Furthermore, Sun, et al. (2023)[3] highlighted the potential of vehicle IoT in improving vehicle energy efficiency and reducing environmental impact. Further, Wang, et al. (2023)[4] discussed the applications of vehicle IoT in enhancing user experience and driving comfort. Lin, et al. (2023)[5] studied the role of vehicle IoT in autonomous driving technology, while Zhao, et al. (2023)[6] explored these technologies' contributions to smart city development. Finally, He, et al. (2023)[7] analyzed the vital role of vehicle IoT in improving road safety and reducing traffic accidents, studying the social benefits of smart vehicles in enhancing traffic safety and reducing accidents. The smart automotive industry, while pursuing technological innovation, also faces significant ESG challenges, including transparency and responsibility issues in the industry’s governance structure. Liu (2023)[8] discussed the potential of smart vehicles in reducing carbon emissions and improving energy efficiency but also pointed out environmental concerns related to battery production and recycling, exploring the impact of smart vehicles on urban traffic and lifestyle, emphasizing the importance of social responsibility.

Mandatory standardization of vehicle IoT technology is crucial for its successful implementation. Fu (2024)[9] emphasized the role of unified technical standards in ensuring system interoperability and safety. Li (2024)[10] discussed the importance of standardization in promoting technological innovation and reducing costs. Zhu, et al. (2024)[11] analyzed the impact of mandatory standardization on enhancing user trust and technology acceptance. Zhu, et al. (2023)[12] explored the role of standardization in the global market, particularly in addressing technological compatibility issues across different countries and regions. Lan (2023)[13] studied the role of mandatory standardization in promoting innovation in the automotive industry. Lastly, Wang, et al. (2023)[14] discussed the importance of standardization in protecting consumer interests and enhancing market transparency. Pan (2024)[15] believed that integrating ESG principles into vehicle IoT technology is key to achieving sustainable development in the smart automotive industry. Zhao, et al. (2023)[16] discussed the importance of integrating ESG principles in enhancing the environmental benefits of smart vehicles. Yu (2023)[17] analyzed the role of ESG principles in promoting social responsibility and increasing public acceptance. Shi, et al. (2023)[18] explored the importance of good governance in ensuring data security and privacy protection in smart vehicles. Chen, et al. (2021)[19] discussed the application of

ESG principles in smart vehicle supply chain management. Wang, et al. (2022)[20] analyzed the environmental impact of ESG principles in the manufacturing and maintenance of smart vehicles. Finally, Zhang Jing, et al. (2022)[21] explored the role of ESG principles in the governance structure of the smart automotive industry, emphasizing the need for comprehensive policy tools and multi-level governmental policy coordination in the field of disruptive innovation.

Based on the literature review, this article proposes the following theoretical analysis: The development and application of vehicle IoT technology must consider the integration of ESG principles to ensure sustainable development in the smart automotive industry. Moreover, mandatory standardization is a key means to achieve this goal, as it not only enhances the safety and interoperability of technology but also promotes market adaptability and user acceptance. Accordingly, Proposition 1 is proposed:

Proposition 1: Mandatory standardization of vehicle IoT technology facilitates rapid technological development and promotes the integration and implementation of ESG principles in the smart automotive industry.

2.2. The Mediating Role of Mandatory Standardization in ESG Practices

The sustainable development of smart automotive technology and vehicle IoT technology is closely interlinked. Mandatory standardization is crucial not only for technological interoperability and safety but also as a vital means to promote the integration of ESG principles[22]. The impact and management of smart vehicles and vehicle IoT technology on environmental protection are key components of ESG principles. Tian, et al. (2023)[23] noted that the environmental impact of smart vehicles extends beyond exhaust emissions to include resource consumption and waste generation during production. Furthermore, Feng, et al. (2023)[24] emphasized the importance of smart vehicle battery recycling and reuse, highlighting the potential of smart vehicles in reducing urban congestion and carbon footprints. Cui, et al. (2022)[25] analyzed the role of smart vehicles in promoting sustainable urban development, discussing the application of vehicle IoT technology in improving energy efficiency and reducing emissions. Lastly, Jiao, et al. (2023) studied how mandatory standardization can be used to manage the environmental impact of smart vehicles[26]. The social responsibility and public acceptance of the smart automotive industry are another important aspect of ESG principles. He, et al. (2023)[27] analyzed the contributions of smart vehicles to traffic safety and accident reduction, exploring the social benefits of smart vehicles in enhancing travel efficiency and accessibility. Gan (2023)[28] researched the potential impact of the proliferation of smart automotive technology on the labor market, discussing its contribution to improving the quality of life for urban residents. Zheng (2023)[29] explored public acceptance and trust issues regarding smart automotive technology. Xu, et al. (2023)[30] analyzed societal attitudes towards smart automotive technology and its impact on market development.

Governance structure and data security in the smart automotive industry are key to realizing ESG principles. Kuang, et al. (2023)[31] discussed privacy issues in smart vehicle data collection and processing, analyzing the cybersecurity challenges of smart automotive technology. Li (2023)[32] explored legal and ethical issues in smart vehicle data management, studying transparency and responsibility in the governance structure of the smart automotive industry, and discussing the challenges of establishing effective governance mechanisms. Lastly, Xu, et al. (2023)[33] analyzed the importance of data security in the smart automotive industry.Based on the literature review, the following proposition is proposed:

Proposition 2: Mandatory standardization of vehicle IoT technology will significantly enhance the ESG performance of the smart automotive industry, especially in terms of environmental protection, social responsibility, and governance structure.

3. Path Exploration

3.1. Promoting ESG Practices

With the rapid development of smart automotive technology, Environmental, Social, and Governance (ESG) issues have become a focal point in the industry. Smart automotive technology, especially Vehicle Internet of Things (IoT) technology, while offering innovative solutions, also presents new challenges[34]. The environmental challenges of smart automotive technology are mainly manifested in energy consumption, emissions, and the production and recycling of batteries. According to Xue, et al. (2023)[35] although smart vehicles help reduce carbon emissions from traditional fuel vehicles, the carbon footprint in the battery production process for electric vehicles is not negligible. Additionally, battery recycling and disposal are critical issues for environmental protection. Zhou, et al. (2023)[36] noted that electric vehicle batteries contain harmful substances that could significantly impact the environment if not properly handled. Thus, the smart automotive industry, while driving technological innovation, also needs to focus on environmental protection, particularly in battery production and recycling. Smart automotive technology has significant advantages in improving traffic safety and travel efficiency but faces challenges in social responsibility. Xu, et al. (2023)[37] pointed out that the proliferation of autonomous vehicles could impact the job market, especially for those reliant on driving jobs. Moreover, the high cost of smart vehicles might limit their adoption among low-income groups, potentially exacerbating social inequality. Therefore, smart automotive companies, while pursuing technological innovation, also need to consider their social impact, particularly in promoting social inclusivity and fairness. Governance structure is another important ESG challenge faced by the smart automotive industry. Data security and privacy protection are key issues. Zhao (2023)[38] emphasized that smart vehicles collect and process large amounts of personal data, necessitating high standards for data protection. Moreover, the governance of the smart automotive industry also involves ethical issues, particularly in the decision-making process of autonomous driving. Tan, et al. (2023)[39] pointed out that the decision-making logic of autonomous vehicles in emergencies needs to consider legal, ethical, and social standards comprehensively.

The ESG challenges of the smart automotive industry are multifaceted, covering environmental protection, social responsibility, and governance structure. In facing these challenges, the industry needs to take comprehensive measures, including improving battery production and recycling processes, considering social impact and fairness, and establishing effective governance mechanisms. Only in this way can smart automotive technology promote sustainable development while achieving technological innovation, bringing broader benefits to society. Therefore, establishing an effective governance structure and ensuring the safety, transparency, and responsibility of smart automotive technology is key to the industry's development.

3.2. Promoting ESG Practices

In the smart automotive industry, the development of Vehicle Internet of Things (IoT) technology is increasingly becoming a key factor in driving industry progress. However, with the rapid evolution of this technology, mandatory standardization has become a necessary measure to ensure its safety, efficiency, and interoperability. Firstly, mandatory standardization is crucial for the development of vehicle IoT technology. As Zhou (2023)[40] pointed out, standardization ensures effective communication and interoperability between different devices and systems, which is essential for building a safe and reliable smart automotive ecosystem. Additionally, as Wang, et al. (2023)[41] stated, unified standards help reduce manufacturing costs and accelerate market adoption of the technology. Moreover, standardization also enhances consumer trust, with consumers having more confidence in standardized technology, which is vital for the acceptance of new technologies. Implementing mandatory standardization is a complex process involving the coordination and balancing of multiple stakeholders' interests. The standardization process must consider various technical parameters, safety requirements, and market demands, and the development of standards requires the broad participation and negotiation of stakeholders, including automakers, technology providers, government agencies, and consumer groups. Additionally, standardization implementation must also consider international coordination, as the global nature of the automotive market requires standards to have international applicability.

However, mandatory standardization in its implementation also faces various challenges. Firstly, the challenge posed by rapid technological change cannot be ignored. The rapid evolution of vehicle IoT technology means that standards need to be continually updated and adapted to new technologies. Secondly, conflicts of interest among stakeholders are significant, with different stakeholders potentially having varying views and needs regarding standardization. Furthermore, there is also the complexity of international standardization, as regulations and market demands in different countries and regions may add additional complexity to the standardization process. Mandatory standardization of vehicle IoT technology has profound implications for the development of the entire smart automotive industry. Unified standards help lower technological barriers, promoting industry innovation and competition. Moreover, standardization also improves consumer acceptance of smart automotive technology, which is crucial for the widespread application of these technologies. Finally, standardization has a significant impact on the long-term sustainability of the industry, helping to ensure the safety, efficiency, and environmental friendliness of smart automotive technology.

In summary, mandatory standardization of vehicle IoT technology is a key component in the development of the smart automotive industry. Although there are challenges in the implementation process, its role in ensuring technology interoperability, reducing costs, enhancing consumer trust, and promoting industry innovation and sustainability is vital. Therefore, the smart automotive industry needs to continue to push for and refine the standardization of vehicle IoT technology to achieve long-term healthy development of the industry.

4. Application of the Value Assessment Model

As Environmental, Social, and Governance (ESG) principles become increasingly important in corporate decision-making, integrating these factors into the standardization assessment of vehicle IoT technology has emerged as an innovative field. This chapter aims to explore how to apply a value assessment model for vehicle IoT technology standardization, integrating ESG factors, supplementing the traditional Economic Value Added (EVA) model for absolute value assessment.

4.1. Promoting ESG Practices

As shown in Table 1, building a comprehensive ESG indicator system is the foundation of the assessment model. This system should include environmental protection indicators (such as reduction in emissions, improvement in energy efficiency), social responsibility indicators (such as product safety, user satisfaction), and governance structure indicators (such as data security, transparency, and compliance)[42].

Table 1: ESG Assessment System Indicators

Target Layers	*Normative Layers*	*Indicator Layers*
Value System	*E*	*Product environmental performance*
		Carbon emissions
		Supply chain environmental impacts
	S	*Product quality and safety*
		Public welfare and charity
		Employee rights and interests protection
	G	*Board of directors*
		Executive remuneration
		Risk management
		Business ethics

Source: Compiled by this Research

4.2. Calculation of Weights for Indicators

Determining the weights of various ESG indicators is crucial for ensuring the accuracy of the assessment results. The allocation of weights can be based on industry standards, stakeholder expectations, and long-term sustainability goals. Initially, an expert scoring method is used to determine the relative importance of each indicator and to create an assessment matrix. Subsequently, a judgment matrix is constructed based on the evaluations of experts, and the maximum eigenvalue λ of this matrix and the corresponding eigenvector are calculated. Finally, a consistency test is conducted, combining the Random Index (*RI*) table to calculate the Consistency Index (*CI*) and the test ratio $CR = CI/RI$. As shown in Table 2, when $CR < 0.1$, the judgment matrix is considered to have passed the consistency test, and the eigenvector that passes this test represents the weight coefficients of the indicators within that level.

Table 2: Average Random Consistency Coefficient RI corresponds to the value of the order n

n	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
RI	*0*	*0*	*0.58*	*0.90*	*1.12*	*1.24*	*1.32*	*1.41*	*1.45*	*1.49*

Source: Compiled by this Research

4.3. Calculation of Scores for Each Indicator

The score calculation for each ESG indicator should be based on quantified data and qualitative assessments. These scores reflect a company's performance in specific ESG areas. The calculation of scores should take into account industry benchmarks, historical performance, and peer comparisons. The entropy method is used to calculate the objective weights of indicators, with the calculation steps outlined in formulas (1) to (3).

$$\alpha_{ij} = \frac{x_{ij}}{\sum_{i=1}^{n} x_{ij}} \tag{1}$$

$$\beta_j = \frac{-1}{ln \sum_{i=1}^{n} \alpha_{ij} \ln(\alpha_{ij})} \tag{2}$$

$$\gamma_j = \frac{(1-\beta_j)}{\sum_{i=1}^{n}(1-\beta_j)} \tag{3}$$

Here, based on the ESG rating data of companies in the same industry, X_{ij} represents the score of company i on indicator j. First, calculate the contribution α_{ij} of company i under indicator j; then, compute the entropy value β_j of indicator j; finally, the weight γ_j of indicator j can be determined.

4.4. Calculating Value

Incorporating ESG factors into corporate value assessment is a novel trend but also presents a series of challenges. Currently, there is no consensus on a method to achieve this goal, with different assessment agencies or investors employing various models and assumptions. Based on the research results of domestic and international scholars and research institutions, two basic approaches can be summarized: one is to consider the impact mechanism of ESG factors on corporate value within traditional valuation methods, reflecting these factors in the determination of valuation parameters; the other is to view ESG factors as indicators of a company's comprehensive value, supplementing traditional valuation methods. Taking into account the feasibility of the above two approaches and referring to existing literature on non-financial factor treatment, such as that by Pan, et al. (2023)[43], this paper adopts the second approach and constructs the following new energy vehicle corporate value assessment model V, considering ESG factors, as shown in equation (4).

$$V = F(ESG, V_0) = \omega * V_0 \tag{4}$$

Here, V represents the value of vehicle IoT technology standardization after integrating ESG factors; ω is the adjustment coefficient, indicating the contribution rate of ESG factors to corporate value; V_0 represents the corporate value calculated using traditional valuation models.

4.5. Obtaining the Adjustment Coefficient

Based on the scores of ESG indicators, an adjustment coefficient can be calculated to modify the results in traditional value assessment models. This coefficient should reflect the company's additional value in terms of ESG. The adjustment coefficient ω can further be calculated using the following formula (5):

$$\omega = f(ESG) = \kappa * X \tag{5}$$

Here, κ represents the weight coefficients of key ESG factor indicators, which influence the value of vehicle IoT technology standardization; X represents the score vector obtained based on the target company's performance on key ESG factor indicators.

4.6. Practical Application Cases Verification

Due to the significant influence of national policy direction on the development of the new energy vehicle industry, China currently regards this sector as a strategic emerging industry and has formulated the "*New Energy Vehicle Industry Development Plan (2021—2035)*", which sets clear development goals for the country's new energy vehicle industry by 2025. Considering Chinese policy changes and the tradition of formulating five-year plans, this paper posits that 2025 may be a critical turning point. Therefore, the high-growth phase (first phase) for BYD is set from 2023 to 2025. When applying the EVA model for the value assessment of standardized vehicle IoT technology, it is necessary to adjust certain accounting items to reflect the real value creation capability of a company's vehicle IoT technology standardization. Thus, this study uses a two-stage model for valuation, employing the EVA valuation model to estimate the V0 part, with the specific formula shown in equation (6).

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$$V_0 = Z_0 + \sum_{t=1}^{n} \frac{EVA_t}{(1+WACC)^{2}} + \frac{EVA_{n=1}}{(WACC-r)(1+WACC)^{n}} \qquad (6)$$

Where Z_0 = Total capital invested by the company at the valuation baseline point;

*EVA = Net operating profit after tax - Total capital * Weighted average cost of capital;*

*WACC (Weighted Average Cost of Capital) = Cost of debt capital * (1 - Income tax rate) * Proportion of debt capital + Cost of equity capital * Proportion of equity capital;*

r = Growth rate during the steady growth phase; the first 1~n years are the high growth phase, and from year n+1 onwards is the steady growth phase.

Table 3: Statistics of ESG Factors Assessment Score of BYD

Target Layers	Total Score	Normative Layers	Weights	Score	Indicator Layers	Weights	Score
Value System	72.98	E	61.34%	73.80	Product environmental performance	42.88%	77.01
					Carbon emissions	43.09%	72.43
					Supply chain environmental impacts	14.03%	68.19
		S	30.39%	72.27	Product quality and safety	50.43%	76.21
					Public welfare and charity	13.09%	66.27
					Employee rights and interests protection	36.48%	68.99
		G	8.27%	69.44	Board of directors	6.11%	56.43
					Executive remuneration	9.04%	56.01
					Risk management	15.37%	55.86
					Business ethics	69.48%	75.34

Source: Compiled by this Research

Table 4: Calculation Process and Forecast Results of BYD's EVA

Latitude (¥ billion)	2018	2019	2020	2021	2022	2023	2024	2025
Net profit after tax	10.57	9.93	16.40	12.11	40.13	35.40	45.50	54.97
Total capital	116.49	129.87	119.60	128.45	117.10	229.96	269.36	314.70
WACC	8.71%	7.34%	8.94%	16.03%	15.48%	11.30%	11.30%	11.30%
EVA	0.42	0.39	5.57	8.48	22.01	8.72	14.25	18.47

Source: Compiled by this Research

As shown in Table 3, this paper employs an expert compulsory scoring method to rate the performance of BYD Company on various ESG factors. With 60 points as the baseline, scores above 60 indicate that the indicator contributes to enhancing corporate value, while scores below 60 suggest that the current corporate behavior in this indicator leads to a reduction in corporate value. The overall ESG score is 72.98, indicating that the ESG principles adjustment coefficient ω for BYD's corporate value is 1.22 (*1.22 = 72.98/60*). Additionally, this paper, referencing the method of Gao, et al. (2024)[44], and considering factors such as BYD's size and development status, adjusts for R&D expenses, interest expenditures, provision for various impairment reserves, non-recurring gains and losses, construction in progress, and deferred income taxes, as summarized in Table 4.

As of December 31, 2023, BYD's total share capital was 2.91 billion shares, with a closing price of 198 RMB per share, resulting in a total market value of 576.41 billion RMB. Compared with the EVA model, as summarized in Table 5, it is evident that considering ESG factors reduced the valuation deviation rate from 21.12% to 4.06%. In improving the EVA model, this paper draws on existing research methods for handling non-financial factors, aiming to more accurately assess the value of new energy vehicle enterprises. Specifically, this paper attempts to consider the impact of ESG (Environmental, Social, and Governance) factors on the standardized value of vehicle IoT technology. Through this improvement, the study aims to more comprehensively consider corporate sustainability and social responsibility in the valuation process. The vehicle IoT technology standardization value assessment model, considering ESG factors constructed in this paper, provides a feasible approach for similar enterprises' value assessments. By comprehensively considering ESG factors, a more thorough understanding of a company's risks and opportunities can be achieved, leading to a more accurate assessment of its value. This research outcome lays a solid foundation for future valuation studies and offers investors and decision-makers more sustainable and socially responsible investment options.

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Table 5: Statistics of EVA Model Comparison Results

Items	*Total enterprise value (￥bn)*	*Share price (￥)*	*Rate of valuation deviation*
Valuation results of the EVA model	*455.68*	*156.18*	*-21.12%*
Valuation results of the modified model with ESG considerations	*553.00*	*189.96*	*-4.06%*
True market value	*576.41*	*198.00*	——

Source: Compiled by this Research

The value assessment model for standardized vehicle IoT technology, considering ESG factors, offers a new perspective for enterprises to assess and optimize their performance in environmental, social, and governance aspects. Through this integrated approach, companies can achieve financial goals while effectively promoting sustainable development objectives. Therefore, this model is significant for guiding enterprises in realizing long-term value and social responsibility.

5. Conclusion

In this paper, the study thoroughly explores the application of Vehicle Internet of Things (IoT) technology in the smart automotive industry, particularly focusing on its integration with Environmental, Social, and Governance (ESG) principles and the importance of mandatory standardization. Through detailed analysis of the development of vehicle IoT technology, the study finds that while this technology offers significant potential in enhancing road safety, energy efficiency, and improving user experience, it also brings a series of challenges, especially in terms of ESG aspects. The paper analyses the importance of integrating ESG principles with vehicle IoT technology, highlighting the central role of environmental protection, social responsibility, and good governance in the development of smart vehicles. Integrating ESG principles into the standardization process of vehicle IoT technology not only promotes sustainable development in the industry but also enhances corporate social image and market competitiveness. In the future, as technology continues to advance and market demands evolve, the integration of vehicle IoT technology and ESG principles will continue to develop and deepen. This will require businesses, governments, and other stakeholders to continually adjust and optimize their strategies to respond to new challenges and opportunities. Particularly in the application of mandatory standardization and value assessment models, more innovation and collaboration will be needed to achieve long-term sustainable development in the smart automotive industry.

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