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# TRENDS IN SOCIAL SCIENCES AND HUMANITIES RESEARCH



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# **Trends in Social Sciences and Humanities Research**

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# Table of Content

<b>ANALYSIS OF THE ROLE OF FINANCIAL TECHNOLOGY IN SHAPING MICROECONOMIC AND MACROECONOMIC DYNAMICS IN TODAY'S BUSINESS WORLD</b>	1-7
BoFan He, XiaoLu Ruan, Wei Mao, Gang Chen, Yao Chen*	
<b>FRANK MORETTI'S THEORY OF "LITERARY MAP": A RIGOROUS INQUIRY</b>	8-11
Enno Bendoly	
<b>AN EXAMINATION OF THE EVOLVING PATTERNS AND THE STRATEGIC DIRECTION OF RENEWABLE ENERGY TECHNOLOGY ADVANCEMENTS</b>	12-16
Dolf Deger	
<b>STUDY OF THE EARLY WARNING MODEL FOR NETWORK PUBLIC OPINION RISKS BASED ON THE INTEREST PREFERENCES OF INTERNET USERS</b>	17-24
Xiao Li*, Sarah Bauch	
<b>THREE KEY DIMENSIONS IN CONSTRUCTING THE TANG POETRY ROAD IN EASTERN ZHEJIANG</b>	25-31
Wei Xia	
<b>THE CONTRAST OF CHINESE ECONOMIC IMAGES BUILT BY THE INTERNAL AND EXTERNAL MEDIA FROM THE PERSPECTIVE OF PHOTO NEWS ABOUT POVERTY ALLEVIATION</b>	32-41
Jing Li, PeiJie Li*	
<b>RESEARCH ON THE HIGH-QUALITY DEVELOPMENT OF DIGITAL VILLAGES FROM THE PERSPECTIVE OF GOOD GOVERNANCE THEORY</b>	42-47
HongHui Yang, YuPing Fang, NaNa Li*	
<b>AN INVESTIGATIVE ANALYSIS OF THE MARKET PROSPECTS AND CONSUMER BEHAVIORAL INTENTIONS FOR NEW ENERGY VEHICLES IN GUANGXI UNDER THE CONTEXT OF NEW QUALITY PRODUCTIVITY</b>	48-71
Xiao Yang*, YvMei Long, QingPing Liang, JinYan Li, JingWen Sun	
<b>RESEARCH ON THE TEACHING OF CLASSICAL CHINESE POETRY RECITATION IN VOCATIONAL EDUCATION</b>	72-77
YuSong Liu, JianJun Song*	
<b>RESEARCH ON ALEXANDER VON HUMBOLDT'S ANTISLAVERY THOUGHT AND HIS PHASED REFORMATIVE SOLUTIONS TO ABOLISH SLAVERY IN LATIN AMERICA</b>	78-88
XiaoFang Ma, HongWei Yang*	
<b>BALANCING, CHALLENGES, AND OPPORTUNITIES: KAZAKHSTAN'S MULTI-VECTOR FOREIGN POLICY AFTER UKRAINE CRISIS</b>	89-97
Miao Wang	



# ANALYSIS OF THE ROLE OF FINANCIAL TECHNOLOGY IN SHAPING MICROECONOMIC AND MACROECONOMIC DYNAMICS IN TODAY'S BUSINESS WORLD

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**Abstract:** This article will focus on the impact of fintech on the microeconomy and macroeconomy. At present, the status and role of scientific and technological innovation in economic and social development is becoming more and more prominent, and financial technology, as an emerging form of scientific and technological innovation, has also developed rapidly in recent years. Financial technology refers to the use of modern information technology means, especially mobile Internet, cloud computing, big data and other technical means to innovate financial services, provide new functions and services for financial activities, so as to improve the efficiency of financial resource allocation, reduce costs and risks of a new financial form. As the IMF develops policies to help member countries respond to a rapidly changing environment, we need to better understand the economic impact of fintech. How will Fintech change the financial world? Will it change the whole face of finance? Will banks be replaced by blockchain systems that support peer-to-peer transactions? Will AI reduce the need for trained professionals? These are all questions we need to discuss.

**Keywords:** Fintech; Microeconomy; Macroeconomy

## 1 INTRODUCTION

For the development of the world, financial technology is a new form of business produced after the development of the financial industry to a certain stage, as a new form of development, it has an important role in promoting the world economic growth.

In recent years, with the rapid development of information technology such as Internet technology, big data and cloud computing, financial technology has been widely used in the financial field and has had a profound impact on the financial industry. In recent years, the world's financial technology industry has developed rapidly, especially in the fields of mobile payment, big data credit, and Internet insurance, and has achieved better development results. However, in the process of economic development, the world is also facing a series of problems and challenges, such as serious environmental pollution and financing difficulties for enterprises. According to a report by McKinsey Greater China, seven key technologies will continue to influence the overall development trend of financial technology in the next 10 years, driving business model restructuring and shaping the competition pattern of the financial industry[1].

However, there are still some problems in the development process of financial technology in China: the overall development level of financial technology is low, and the market size is relatively small; The system of relevant policies and regulations is not sound, and there are loopholes in supervision; The reserve of technical personnel is insufficient, and the ability of financial technology innovation is insufficient; The application degree of Internet information technology is not high, and the level of risk management is not high.

Fintech covers the products, developers and operators of alternative financial systems. Fintech is challenging traditional business models, and it is growing rapidly. Recent estimates show that investment in fintech continues to grow. From peer-to-peer lending to high-frequency trading to big data and robotics, innovation in fintech takes many forms. There are many successful examples of fintech innovation. Mobile banking, for example, has brought millions of previously unbanked people into the mainstream financial system in Kenya and China. For example, virtual currency exchanges allow people in developing countries to send money across borders quickly and inexpensively. According to a report by McKinsey Greater China, seven key technologies will continue to influence the overall development trend of financial technology in the next 10 years, driving business model restructuring and shaping the competition pattern of the financial industry. The report states that AI technology can create incremental value of up to \$1 trillion per year for the global banking industry. Blockchain technology has enabled the development of decentralized finance (DeFi), digital wallets, digital assets, and non-fungible tokens (NFTs). Cloud computing can improve the efficiency of application development and maintenance, reduce infrastructure costs, and reduce downtime. The emergence of business-to-customer (B2C), customer-to-customer (C2C), provider-oriented business-to-business (B2B) and peer-to-peer (P2P) platforms are typical examples of Fintech systems. Fintech companies offer solutions that differ from traditional institutions regarding the providers and the interaction types as well as regarding the banking and insurance processes they support[2].

## 2 MICROECONOMIC ANALYSIS

### 2.1 Impacts of Fintech to Consumers

The development of fintech has dramatically changed the way consumers pay. Traditional cash payment is gradually replaced by electronic payment, and the rise of mobile payment is more convenient for People's Daily life. Through mobile apps and code scanning functions, consumers can pay at any time, anywhere. This payment method is not only fast and convenient, but also provides more payment options, such as Alipay, wechat Pay and so on. Consumers no longer need to carry large amounts of cash with them, nor do they have to worry about change, and the payment process is safer and faster[3].

The impact of fintech is not limited to payment methods, but also extends to online consumption and e-commerce. With the development of e-commerce platforms, consumers can purchase various goods and services without leaving their homes. Fintech provides a secure payment channel and convenient shopping environment for online consumption, while also promoting the rapid development of the e-commerce industry. Through e-commerce platforms, consumers can get more choices, compare the price and quality of different goods, and find the most suitable purchase plan for themselves.

The development of financial technology has provided consumers with a more convenient way to pay. While traditional cash and credit card payments require consumers to visit a merchant in person when swiping a card or paying cash, mobile payments allow consumers to easily make payments from any location via their phone. At the same time, the application of mobile payment is becoming more and more extensive, including two-dimensional code payment, NFC payment and transmission payment. The convenience of mobile payment is a very good choice for consumers[4].

Fintech can provide consumers with more accurate advice on financial products. Traditional banking institutions usually provide very large financial products in one bank, and consumers need to choose according to their own needs, which is easy to produce selection problems. With the development of fintech, consumers usually have access to more financial product advice, which is based on their specific financial situation and goals, and is more accurate and can meet the needs of consumers.

The development of fintech has also brought more reliable financial products to consumers. Thanks to the development of fintech, more and more financial institutions are offering products on demand rather than through traditional products with fewer features. In addition, consumers can also better understand the risks, benefits and fees of various financial products, which can help them make better decisions and protect their financial security.

R brand belongs to company A, the company has a wide building area, strong capital, complete equipment, technology and R & D resources accumulated over the years to ensure that the R brand of stable sources of supply, and R brand products filled with goose down, goose down high quality. At the same time, R brand self-production and self-marketing, in the production process to strengthen quality control, strict control of the supply chain to ensure that product quality in line with the standard, and reduce the middleman link can greatly reduce product costs, to ensure that the company's profits are maximised. R brand has its own unique scientific and technological innovation. Its pillow has a patented multi-chamber neck protection technology, dynamic soft and hard neck protection technology; core has a patented comfortable thermostat and anti-leakage technology, the support of these technologies to form a variety of unique goose down pillow and quilt products. With the powerful A down as brand endorsement, the market awareness and influence of R brand will increase day by day.

## 2.2 Impacts of Fintech to Individual Firms

Some companies often face financing difficulties, and fintech provides more financing channels for companies. With the development of financial technologies such as P2P lending and blockchain, the financing channels for companies have become more diversified, which means that companies can obtain financing more easily. In addition, fintech has also brought some new financing methods, such as equity crowdfunding, which can usually attract more investor attention and bring more financing opportunities for the company[5].

In addition to better access to financing, fintech also brings more efficient operating models for companies. With the development of mobile payment, cloud computing and other technologies, companies can more easily handle remittance, payment and other matters, but also more convenient to deal with the company's internal office affairs. In addition, fintech can also help companies carry out more refined management.

With a large amount of data base, significant technical advantages, and scenario-based development mode, fintech has brought sustained and far-reaching impacts on social and economic development, and brought more opportunities and new challenges to enterprises.

On the one hand, for general enterprises, fintech not only has an impact on their balance sheet business, but also has an impact on the company's intermediate business field, making enterprises face new threats[6].

On the other hand, in the context of the rapid development of financial technology, in order to achieve transformation, traditional enterprises use financial technology to optimize and improve personnel training, research and development innovation and management.

## 2.3 Impacts of Fintech to Markets

It improves the efficiency and quality of financial services in the market. Fintech innovation has brought more efficient, convenient and innovative financial services. For example, the Internet financial platform can realize online loan application, which greatly saves the applicant's time and energy; Artificial intelligence technology can achieve large-scale personalized investment consulting and provide investors with more intimate services.

Financial risk management in the market has been strengthened. Fintech innovation can lead to more accurate, comprehensive and timely risk management. For example, blockchain technology can realize the tracking and supervision of the whole process of financial transactions, discover risk points in time, and avoid the occurrence of risk events[7].

Financial technology innovation has caused an impact on the traditional financial market, thus reconstructing the pattern of the financial market. This change in the pattern will profoundly affect the development of financial markets in the



future. Fintech innovation has brought more efficient, convenient and innovative financial services. The Internet financial platform can realize online loan application, which greatly saves the applicant's time and energy; Blockchain technology can realize the tracking and supervision of the whole process of financial transactions, discover risk points in time, and avoid the occurrence of risk events; Ai technology can also monitor financial markets in real time and improve the anti-fraud and risk management capabilities of financial institutions[8].

### **3 MACROECONOMIC ANALYSIS**

#### **3.1 The Impact of Fintech on the Global Financial Industry**

The emergence of financial technology has affected the traditional financial industry, making the financial industry more transparent and convenient. Compared with traditional finance, fintech pays more attention to technological innovation and can provide more comprehensive, efficient and intelligent financial services through modern technologies such as cloud computing, artificial intelligence and blockchain. At the same time, the application of fintech makes property management more modern, personalized and intelligent, bringing more upgraded consumption experience to financial services[9].

In addition, fintech also improves the competitive environment in the financial market and promotes the innovation process in the market. It can achieve intelligent risk assessment and management through big data, cloud computing, blockchain and other technologies, so it can provide technical support for the emergence of various financial products with different risk levels, meet the needs of different customers, and maintain the stable development of the market.

#### **3.2 The Promotion of Financial Technology to the Development of the World Economy**

As an important part of economy, finance is closely related to economy. The development of the financial industry not only has an impact on the financial industry itself, but also has far-reaching economic effects. The rapid development of fintech has brought a multi-faceted boost to the economy.

First, fintech tools improve the way to raise capital and attract more investment. The traditional financial system has problems of low risk and low efficiency in providing financing services for small enterprises such as new enterprises[10]. Financial technology has created a new financing method for new enterprises, such as crowdfunding, angel investors, private equity investment, etc., to a certain extent, it has solved the problem of difficult and expensive financing, and encouraged and promoted the vigorous development of innovative enterprises.

Second, the rapid development of financial technology has also spawned the Chinese market of financial services consumption. It provides consumers with more choices, and greatly simplifies the process of financial services, so that consumers enjoy better financial services.

#### **3.3 Financial Technology Promotes the Transformation and Upgrading of the International Economy**

Growth used to depend on labour-cost advantages and lower-order exports. However, with the changing demographic structure, rising costs and changing international trade environment, enterprises are facing major challenges in transformation and upgrading[11]. Fintech innovation provides more opportunities for enterprises to transform and upgrade.

#### **3.4 Current Situation of Fintech Development**

With the continuous expansion of financial market, fintech has become an important force to promote the innovation and development of the financial industry, which has changed the operation mode of the traditional financial industry to a certain extent, improved the efficiency of financial services, reduced the cost of financial services, and provided new impetus for economic growth[12].

#### **3.5 The Impact of Fintech on Economic Growth**

As a new form of financial business, compared with the traditional financial service mode, Fintech has the following characteristics: Fintech can realize the financing and management of funds through technical means and improve the efficiency of the use of funds; Fintech can change the process and model of traditional financial services. While improving the quality and efficiency of financial services, it can also reduce costs and increase revenue. Third, fintech can help enterprises improve management level and financing efficiency; In the traditional financial business, there is a lot of information asymmetry, and the emergence of financial technology has changed this situation.

On the one hand, the financial industry is an important industry department of our country and an important force to promote the sustained and rapid development of the national economy[13]. On the other hand, the financial sector is also an important area for promoting technological innovation, accelerating economic transformation and upgrading, and improving the quality and efficiency of economic development.

#### **3.6 The Main Problems Existing in the Development of Finance Technology**

With the continuous development of financial technology, it has made some achievements in financial technology, but at the same time there are some problems and insufficient. The development of financial science and technology is still in its initial stage, and there are problems of unbalanced development and unbalanced regional development[14]. In recent years, financial technology has developed rapidly, but due to the imbalance of regional development, the

development level of different places is relatively different, especially the western region, poor areas of financial technology development is relatively slow.

### **3.7 Measures and Suggestions to Promote Economic Growth**

We will increase investment in science and technology and intensify research and development. Promoting the development of financial technology can not only drive technological progress, but also effectively improve the level of financial services, promote the transformation and upgrading of economic structure, and improve international competitiveness[15].

Therefore, it is necessary to further increase scientific and technological investment in the field of financial technology, and improve the level of financial technology research and development and innovation capacity. At the same time, we should pay attention to the protection of intellectual property rights in the field of financial technology, and create a good atmosphere for innovation for enterprises.

## **4 FINTECH AND MARKET EFFICIENCY**

Financial technology refers to the use of information technology, the Internet and big data and other new technological means, innovative ways and processes to improve financial business and services. In recent years, the rapid development and application of financial technology has had a profound impact on the financial market, improving the efficiency and convenience of the financial market. Consumer finance market is a currency exchange market between consumers and financial institutions. The development and innovation of fintech is profoundly affecting this market.

### **4.1 Improve the Efficiency of Financial Transactions**

The emergence of financial technology has made financial transactions more efficient. By using cloud-based big data analytics, investors are able to more accurately assess financial products and market risks, resulting in more informed investment decisions[16]. At the same time, fintech also provides faster, safer and more convenient trading methods, reduces transaction costs, and makes it more convenient for investors to carry out trading operations.

The core of the consumer financial market lies in the flow and operation of funds, and the development and innovation of financial technology have brought better efficiency to the consumer financial market. Taking traditional credit as an example, the traditional credit process is cumbersome, takes a long time, and the repayment period is not flexible, while fintech realizes the rapid and efficient improvement of the process by digitizing and intellectualizing the process. Through technical means such as artificial intelligence and big data, it can quickly judge consumers' credit and borrowing risk information, improve the speed and accuracy of credit audit, and fine-tailor products and services according to consumers' needs[17].

### **4.2 Promote Innovation and Expansion of Financial Services**

The development of financial technology has brought new financial service models and business innovation. For example, mobile payments, peer-to-peer lending platforms and stock trading apps, among others, allow financial services to better meet consumer needs[18]. Through intelligent financial tools and automated investment advisors, investors can obtain more personalized and professional investment advice, and better manage and increase their wealth.

The traditional consumer finance model generally divides the demand of consumers according to age, gender, income level, etc., and lacks personalized and refined services in mass consumption. The development and innovation of financial technology can be personalized through consumers' online behavior and massive data, and provide tailor-made financial products and services to meet consumers' needs in a humanized, intelligent and inclusive manner[19].

### **4.3 Strengthen Financial Supervision and Risk Control**

Fintech is not only beneficial for market participants but also has important implications for regulators and financial stability. Fintech can improve the accuracy and efficiency of financial regulation by detecting abnormal transactions and risk events in a timely manner through intelligent monitoring tools and risk management systems. In addition, through the application of blockchain technology, the transparency of financial transactions and information has also been significantly improved, reducing the possibility of fraud and market manipulation[20].

The emergence and development of financial technology has enabled the financial market to achieve more efficient transactions and better services. However, fintech also faces issues such as data privacy and information security, which require the joint efforts of regulators, financial institutions and users. Only under the premise of protecting personal privacy and information security, strengthening the development of inclusive fintech can better promote the efficiency of the financial market and make positive contributions to the development of social economy.

Due to the innovation and innovation of financial technology, new consumption scenarios and business models such as e-commerce, sharing economy, and Internet vertical fields continue to emerge, thus constantly expanding the boundaries of the consumer financial market[21]. Services such as installment payment, credit loan, and consumption installment in the consumer finance market are gradually expanding to automobile, education, tourism and other fields. The development and innovation of financial technology are bringing more choices and opportunities to the consumer finance market.

To sum up, the impact of fintech innovation on the consumer financial market is far-reaching and extensive. Consumer financial institutions need to better grasp the impact of fintech innovation on the market, keep up with the pace of

technological innovation, propose better products and services, meet consumer demand, and maximize consumer rights and interests.

## **5 CHALLENGES AND RISKS**

### **5.1 Regulatory Issues**

The development of fintech poses important challenges for regulators. Regulators need to ensure that the strategies developed by tech companies comply with the country's legal laws and principles of fair competition. The emergence and rapid expansion of fintech also requires a complete regulatory system to enable this emerging industry to better function in the national economy.

### **5.2 Risk Control**

There are differences in risk control between financial technology companies and traditional financial institutions. For example, in terms of customer data protection and privacy protection, security issues are not immediately guaranteed, and fintech requires higher institutional and system security measures. Fintech companies need to have a very complete and robust risk management plan in place to protect their customers' interests.

### **5.3 Technical Input**

The development of fintech requires the investment of very high-end IT technology to enable it to provide the latest financial services, which means that the investment is high. Due to the fierce market competition, modern financial institutions and emerging financial technology institutions need to continue to make long-term high investment in technology to maintain competitiveness. This is a very challenging thing for small financial institutions.

### **5.4 Asymmetric Information**

The popularization and development of financial technology will further exacerbate the problem of information asymmetry. In fintech, technologically advanced institutions are often able to obtain more user information, which leads to better risk control[22]. This will cause the imbalance of competition in the market, which needs to be guided and regulated by regulators.

In general, the development of fintech has brought many positive effects to the financial market, such as improving efficiency and broadening the scope of financial services. But it also faces challenges in management and regulation, privacy and security. In the process of continuous development, fintech will continue to play its important role in bringing more innovation and convenience to the financial market.

### **5.5 Challenges of Market Regulation**

The rapid growth of the fintech industry has led to a number of regulatory and regulatory challenges. Due to the innovation and complexity of fintech, traditional financial regulatory models often fail to meet the needs of fintech businesses. Regulators need to develop a series of new rules and regulations to regulate the operation and development of the fintech industry.

### **5.6 Risks of Information Security**

The core business of the fintech industry involves large amounts of financial data and personal privacy information. Therefore, information security has become one of the risks in the fintech industry.

### **5.7 The Challenge of Trust Crisis**

The healthy development of the fintech industry cannot be separated from the trust and support of users. However, due to the rapid development of the financial technology industry and imperfect supervision and other reasons, some criminals have also exploited the loopholes and carried out a series of illegal and criminal acts, damaging the interests and trust of users.

### **5.8 Challenge of Compliance Risk**

Because the fintech industry is highly innovative and flexible, there is a certain amount of legal and regulatory ambiguity.

### **5.9 The Challenge of Talent Shortage**

With the rapid development of the fintech industry, the demand for talent is also increasing. However, the current supply of talents in the financial technology industry is still insufficient, and the shortage of talents has become one of the challenges of the financial technology industry.

## **6 CONCLUSION**

This paper talks about the impact of fintech on the macroeconomy and microeconomy. As conclusion, fintech has had a positive impact on economic development. The development of new fintech technologies, such as big data and artificial intelligence, in consumer finance and supply chain finance has promoted the optimal allocation of resources, and rapid payment methods such as mobile payment have improved the use of resources. These new changes have brought about economic development. The development of financial technology can first promote the region to attract more scientific and technological talents, bring about an increase in population, and play the role of the initial demographic dividend. Secondly, the different impacts of financial technology on the industrial structure of different regions also cause the impact on regional economic differentiation. The regional industrial structure determines the way of production and development in a region. At present, it has changed from a high-speed development stage to a high-quality development stage, and optimizing the industrial structure has become the main task of each region.

This study makes the accompanying contributions to the literature: First, this study examined the impact of fintech and the submeasures of third-party payment, credit, and insurance on economic growth. Moreover, we investigated the causal nexus between fintech and economic growth. Moreover, we examined the regional and provincial impact of fintech on economic growth. Furthermore, we explored the impact of fintech on labor productivity. Therefore, this study estimates the impact of fintech on labor productivity in China. This adds to a large body of literature on the determinants of Labour productivity[23].

As an emerging economic force, fintech has had a positive impact on economic development. By improving and innovating financial services, Fintech provides more efficient, convenient and innovative solutions for economic activities. However, fintech also faces some challenges and risks, such as data security, regulatory issues, and technical risks. In the development process of financial technology, it is necessary to give full play to its positive role, while focusing on risk control and reasonable supervision, in order to achieve a virtuous cycle of economic development and financial innovation. With the rapid development and application of science and technology, financial technology (FinTech) has gradually become an important force to promote economic development. By combining financial business and advanced technological means, Fintech provides more efficient, convenient and innovative solutions for economic activities.

This paper talks about the impact of fintech on the macroeconomy and microeconomy. As a new product of the combination of traditional finance and technology, fintech can enhance the ability of enterprises to obtain internal and external financing to a certain extent, alleviate the financing constraints faced by enterprises' innovation, and thus enhance the innovation ability of enterprises. Today, the national economic development force represented by small and micro enterprises has become an important support for the continuous improvement and upgrading of economy. Micro and small enterprises are diverse in content, can develop flexibly according to the needs of society, and are highly adaptable to economic and social development[24].

## COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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# FRANK MORETTI'S THEORY OF "LITERARY MAP": A RIGOROUS INQUIRY

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**Abstract:** This article focuses on the idea of "literary map" and its application by Frank Moretti, an advocate and practitioner of digital humanities. By examining Moretti's use of "Literary Map" in three literary research cases to explore the important value and significance of this research method. In three cases, Moretti used Geometric figures to explore the narrative structure of the text, character networks are used to explore the narrative plot of the text, and emotional maps are used to explore the narrative emotions of the text. The application of "map" in the field of literary research is explained from three levels and from different angles. Moretti's research is very important for us to study the spatiality of literary texts and explore the relationship between textual elements. Visualization is of great significance to reveal deeper narrative structures.

**Keywords:** Digital humanities; Literary map; Frank Moretti; Visualization

## 1 INTRODUCTION

Frank Moretti, founder of Stanford University's "Literary Laboratory", calls himself "Mapper of Maps". He revealed the spatiality of literary narrative and the literariness of space by drawing spatial maps of literary works, and proposed the concepts of "literary map" and "narrative geography". "Literary map" is different from "literary geography". Literary geography focuses on the impact of specific geographical environment on writers and text generation. In other words, the concept of literary geography is based on the fact that "any writer, work, and even any literary phenomenon are produced in a specific geographical environment and are the geographical environment at a specific time.", which examines the impact of external geographical environment on novel creation. Moretti broke with the traditional research methods and adopted a new literary geographical spatial research strategy[1-3].

## 2 CHARACTER ACTIVITY SPACE MAP

In his 1999 book *Charts, Maps, Treemaps*, Moretti gets right to the point, "A simple question about literary maps is, 'What do they do? What do they reveal that words cannot?' "Can maps help us understand literature?" He called on literary researchers to stop "Reading" texts turns to "calculating" and "drawing" literary maps. He firmly believes that although text "reading cannot be completely replaced, The method of "drawing" literary maps will provide new possibilities for exploring the inherent narrative laws of texts. In her study of British writer Mary Cellar Mitford's novel *Our Village*, Moretti draws a literary map of each volume of the novel. In the literary map, Moretti roughly drew three concentric circles of different sizes with characters and major events as the main elements, with the village as the center and distance as the radius. In the map of Volume 1, the elements in the smallest circle are almost all people[4].

In addition to characters, the elements of the two outer circles include characters, events and natural landscapes. In this picture, Moretti completely abandoned the linear structure of time and drew the map from the perspective of the characters' activity space. With the increase of elements and the refinement of the map, the map as a whole becomes more and more concentric. This map reveals a new discovery: literary narrative structure is not necessarily linear, and literary maps can reveal the non-linear narrative structure of literary texts. Since "Our Village" is a narrative unfolded from the perspective of a person living in a village, the elements in the village naturally radiate outward from the center of the village. The famous British scholar John Barrell believes that "any map of an open area in the late 18th and early 19th centuries may be drawn differently due to different viewing angles of different people[5]. So if you draw a map from a person who needs to frequent the village, Written from a different perspective, such as a traveler or a salesman, the narrative of the novel may no longer be circular, and the final map will be of another shape. But the village is a free space that can satisfy almost all basic production activities of the villagers., the final figure it presents can be circular. As art theorist Rudolf Arnheim believes that "when a system can freely spread energy in space, it can emit its energy uniformly"[6]. A vector, like a ray of light emitted from a light source. Its final shape is a circle in the center. This provides the basis for Moretti's rationality in drawing a concentric literary map for "La Nasa".

Moretti's literary map emphasizes the spatialization and accessibility of literary elements. Visualization, thereby revealing the "unreadable" invisible narrative space of the text. He pointed Says, "The map interests me not because it is almost like a novel. not to be read in this way, but because it changed the way we read novels". For Moretti, the map is almost identical to the text of the novel. It is as readable and as interesting as the novel, but the difference is that the text

The reading of books is a process from concrete to abstract, while the reading of maps is It is a reverse process, that is, from abstract to concrete[7]. His literary map Want to be reflected in "Charts, Maps, Trees", "Network Theory and Plot Analysis" and "London Sentiment" Hit. In these three treatises the literary map breaks the linear structure of the text. structure, presenting the abstract underlying structure of the text directly in front of the reader, thus Reveals the hidden characteristics and patterns of literary texts.

In the process of drawing maps for other volumes of the novel, Moretti discovered that these literary maps were unstable. From the maps in Volume One to Volume Five, although the circular structure is still the core spatial structure of the novel, more and more elements begin to appear outside the village, no longer concentrated, but radiating outward. The instability of the village may be related to the urbanization process in the social environment at that time. With the advancement of urbanization, villages have also begun to transform themselves. Driven by urbanization, people in the village are no longer satisfied with the current life in the village. People have begun to move to places outside the village, and the number of places outside the village has naturally increased. It incorporates many elements of production and life. From the changes shown in the literary map, researchers can explore the reasons for the birth, development, and changes of literary works, and discover the impact of the social environment on literary creation[8].

The literary map Moretti draws is not without controversy, however. Italian geographer Claudio Oseretti For, the literary map Moretti drew for La Vellagna is not exactly a "Map", but simply "Geometry". Map is an illustration of the earth's surface It is a picture of the distribution of things and phenomena on the surface, marked with symbols and words, and usually colored. Oseretti believes that in the traditional sense of the map , location and distance are the most important elements on a map, and in Moretti In a literary map drawn, place and distance are not important; The relationship between points and literary elements. Although in the traditional sense, the characters of Morai serve as the nodes of the map, and the verbal interactions between the characters serve as connections to draw the character relationship network. At the same time, in order to maximize the readability of the graphics sex, reducing interactivity, Moretti gave up the directionality of character interaction and and a demonstration of the importance of character interaction. Compared with the character activity space map pair The literary map is refined and deepened, and the character relationship map focuses on integrating complex The plot is reduced to the interaction between characters, that is, the interdependence of the characters in the novel Relationships are justified by the fact that the plot is made up of character interactions. Hamlet "Special" character relationship diagram breaks the linear narrative structure of traditional drama. At this In this picture, all characters and interactive plots from the first scene to the last scene are Presented on the same plane, so that the past and present occur on the same plane superior. In addition, the character relationship diagram also shows different character interaction areas, which allows researchers to analyze character relationships regionally and find out the plot feature[9].

Through this approach, Moretti reveals issues that traditional methods of close reading miss. Hamlet is undoubtedly the core character of the entire drama. If the node Hamlet and its cross-links are deleted from the diagram, the character relationship diagram will almost collapse. However, if Claudius, who seems to be second only to Hamlet in importance, is deleted from the picture, it will have almost no impact on the stability of the picture. Moretti conducted the following experiment, first deleting Hamlet and then Claudius, and the impact on the picture was minimal. It can be seen that Claudius's influence on the stability of the character network structure is minimal. The literary map drawn by Dante cannot be called a "map", but only a "geometrical map". "Graphics", but the era of digital humanities has subverted the traditional concept of "maps". The concept is that a map cannot just be a representation of natural landforms, but a "visible It is a method that is not limited to geographical maps[10]. In literary research, maps need to be transformed into abstract and usable text elements according to the needs of researchers. Visual and spatial literary maps. Using this kind of literary map, researchers Able to discover patterns hidden deep in the text to make up for the lack of careful reading.

Although these literary maps themselves are not direct interpretations of literary texts, explanations, but they provide researchers with a new method of analyzing literary texts[11]. They are abstract expressions of text, presentation of text space information, and two-dimensional graphics abstracted from a three-dimensional perspective. From three-dimensional to two-dimensional In the process of abstraction, it is inevitable to ignore some secondary elements in the text, but This also allows important elements to stand out. Obviously, these literary places Pictures have extraordinary power. They almost escape the constraints of written description. Spatial relationships directly interpret the invisible narrative structure of the text. As painted by Moretti The "Our Village" map produced by the "Stable" changes reveal the impact of social changes on village life in the novel. ring.

### 3 CHARACTER RELATIONSHIP MAP

After trying to use character activity space to study the narrative structure of the novel, Moretti raised a new question: whether the plot can be quantified, and how to quantify it? In order to quantify the plot, Moretti drew a character relationship diagram of Shakespeare's play "Hamlet". He thought that if Hamlet and Horatio were deleted at the same time, the character relationship diagram would be completely separated, and the beginning and ending of the story would be completely separated. will be completely torn apart. Horatio is far inferior to Claudius in both the number and importance of his interactions, but structurally Horatio is more important than Claudius. This also shows that the

centrality of the character is not necessarily related to the importance of the character in the narrative structure. Although Claudius is in the densest area in the network, this just shows that he is already in an area where the clustering reaches 100%. This is an area that is interrelated with all nodes, so his presence or absence has an impact on the entire area. Not big. Horatio is a bridge connecting marginal characters. The clustering in his area is very low. Many characters only have a simple connection with him. Losing him will destroy the balance of the entire drama.

On this basis, Moretti moved from plot research to style research. Research. The marginal character Horatio has a weak connection with other characters middle. He showed almost no emotion in the play, and did not speak much, portraying a plain, emotionally cold style throughout the play. "Style, as a style of plot, embodies In terms of plot. " In previous literary studies, "style" has always been generalized, and researchers often start from a broader language. Research style from language and cultural perspectives. Moretti explores the relationship between plot and style. provides a new perspective on the relationship between characters. He uses character relationship diagrams to explore the role of characters in the narrative. importance in the structure, and then discover the style of the characters in the plot, which provided me with They show new ways and new possibilities for studying texts. The literary map of character relationships drawn by Moretti based on network theory breaks away from the shackles of time relationships, breaks away from linear structures, and understands text plots from a spatial perspective . "Network theory can provide a way to quantify plots , thereby providing an important piece that is still missing from computational analysis of the literature."

On this basis, our grasp of the plot will no longer be linear, but based on the text itself. Through the character relationship diagram, we can explore the deep structure below the surface of the text from a more macro perspective, and interpret the plot and even the text style from many aspects.

#### 4 NARRATIVE EMOTIONAL MAP

In the study of narrative emotion, Moretti expanded the scope of the text and turned the focus to London in the 19th-century novel, drawing a macroscopic view of London. An emotional map of 19th century London.

In the process of drawing emotional maps, Moretti once turned to historical geography Home Secchi Bonin seeks advice, Bonin turns to Moretti is critical of the idea, saying of Moretti: "Conceptual meanings like 'materialism', 'equality' cannot be combined with place. These concepts are not There is no intrinsic connection between specific locations on the real map. if These concepts cannot be mapped, so how can emotions be mapped? " However, Philip Fisher was positive about the concept of "emotion in geography" attitude, he wrote in his treatise "The Passion":

"Every citizen...is exposed to a range of dangers and people experience Being constantly or intermittently exposed to this fear of danger. everyone will place one's own expectations within one's own geography of fear...we are now in a In a new geography of fear... this is the passion of fear. Above all, it is the passion of fear that separates suddenness from the role it plays in the passion Leave. "

According to Fisher, human instinct makes people feel a certain space. Feelings are memories and expectations, especially strong emotions such as happiness and fear. "Home" often symbolizes happiness, while "prison" means fear. fear. People tend to associate certain emotions with specific geographical spaces. London, as a huge geographical space, will certainly contain all kinds of human beings. Such complex feelings.

Inspired by Fisher, Moretti determined to draw emotional map of London Confidence. He selected 15,000 paragraphs containing nouns about places in London, each paragraph was about 200 words, and asked the taggers to mark the situations in the paragraphs. feel. Due to differences in the judgment of emotions among the taggers, Moretti finally In the end, we decided to simplify the emotions in the paragraphs and mark the paragraphs with only the two most extreme emotions: "fear" and "happiness", and then mapped out the emotional geography of London. picture.

Under the background of industrialization in the 19th century, London underwent tremendous changes. The city continued to expand outwards, and the population of London increased dramatically. However, compared to London in reality, London in the novel reflects "stability". There are two main reasons for the formation of this "stability". One is because of the "heterogeneity" of London City. As a "small world", London City is complex enough to meet the needs of all writers' writing scenes and needs. Emotional needs, writers rarely need to introduce places outside London On the other hand, it is because of the "homogeneity" shown by London's West End, which is specifically reflected in the fact that the West End has formed a stable structure in the long-term development process. Class style needs to express this class, the author only needs to quote the West London The place name of the district is enough

In the emotional geography map of London, the most worthy of analysis is the emotion of London in the novel. Shockingly, apart from conventional emotional expressions, such as the prison district, which is closely associated with fear, London is mainly emotionally neutral, and more than half of the London place names in the novel have no clear emotional expression. Moretti believes that "such a striking neutrality has less to do with the absence of emotion in the novel than with the silence at the public level."

. Place names in novels are often part of public spaces, settings where people tend to hide their true emotions. In other words, novels gain greatly in emotional intensity when they escape public geography.

Furthermore, the emotions of London novels are not static. During the first half of the 18th century, fear remained the dominant emotion in fiction. As time went on, in the second half of the 18th century, the amount of fear emotion in



London novels decreased significantly. Fisher believes that the reduction of fear is "one of the core achievements of modern civilization." The emergence of electric lights, police, and insurance has reduced people's fear. However, this is inconsistent with the phenomenon in the novel. Electric lights, police, and insurance are all in It only appeared later. Here, a difference emerges between qualitative and quantitative research. This is probably due to the special characteristics of Victorian novels. Sex, in many novels, specific place names rarely appear, and instead they are used to describe sex, expressed in language. The stability of London's West End in the novel is related to There is a direct link to the happy gatherings of the first half of the 19th century. Early 19th century kitsch The happiness brought by worldly pleasures is transformed into deeper happiness, such as family love, and words such as family love are often associated with the West District.

In the process of drawing the emotional map of London, Moretti proposed the concept of "emotional geography" and found that emotion and geography are closely linked. "We find empirical evidence supporting existing theories of public emotions, showing how established narrative polarities (foreground/background, story/discourse) are responsible for narrative temporality and narrative geography. We also find that real versus fictional significant differences between geographies, while also drawing the "first line" for future "semantic spaces". The three axes of corroboration, improvement and discovery define the variability between quantitative literature research and existing results. relationship. Eventually, the day of theory building will come.

In the paper "Emotional Map of London", Frank Moretti's literary map is no longer content to introduce specific literary elements, such as place names and people's names as the main elements of the map, but also introduces abstract emotional concepts, and The scope of research on literary maps has been expanded.

## 5 CONCLUSION

In the context of the digital age, the relationship between literature and geographical maps has undergone a transformation. Moretti adopted a subversive research method in the study of literature. He first extracted the elements in the text, and then spatialized these elements to draw a unique literary map and realize the visualization of the text. Different from traditional close reading, Moretti's literary map shows a "distant reading" method. He wrote in "Speculations on World Literature", "Distance is a condition of cognition. With distance, you can focus on units that are much smaller or larger than the text: technique, theme, rhetoric - or It is genre and system. Moretti's idea of literary map itself is the practice of "distant reading" thought. Through literary map, researchers can study the relationship between people and society, the role and style of characters in narrative, and the emotional expression in novels. Literary maps can help researchers understand the deep thinking mechanism of text formation to a certain extent and reveal the complex process of transforming thinking into text. This is what "words" cannot do, but "maps" can do it.

## COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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# AN EXAMINATION OF THE EVOLVING PATTERNS AND THE STRATEGIC DIRECTION OF RENEWABLE ENERGY TECHNOLOGY ADVANCEMENTS

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**Abstract:** The rapid development of the world's automobile industry has brought great speed and convenience to people's daily travel. At the same time, it has also caused corresponding energy crisis and environmental pollution to some extent. In order to promote the long-term and healthy development of the industry, some important international automobile companies have strengthened research on new energy vehicles. Based on this, this article explains the evolution and characteristics of the world's automotive power technology, analyzes the relevant new energy vehicle development policies promulgated by our country, and provides necessary reference.

**Keywords:** New energy; Power technology; Development trends; Policy orientation

## 1 INTRODUCTION

As an important pillar industry for the development of the national economy, the automobile industry has been listed as a key area for a new round of industrial and technological revolution under the sustainable development concept of "low carbon, environmental protection, and energy conservation" and has begun to Developing towards intelligence, electrification and globalization. At this stage, in the context of the continuous development of the automotive industry, relevant powertrain companies will be based on the research and development and application of hybrid technology to achieve corporate transformation, upgrading and development. Moreover, according to my country's current policy analysis on the introduction of new energy vehicles, within a long period of time, the technical departments of previous fuel vehicle companies will continue to strengthen the thermal efficiency of engines and the research and development of special hybrid engines[1-2].

## 2 ANALYSIS OF THE EVOLUTION AND CHARACTERISTICS OF AUTOMOBILE POWER SYSTEMS

The development of automobile power systems has roughly gone through four periods. The initial automobile power system was provided by steam power; as early as the mid-eighteenth century, Mr. Watt invented the steam engine, and then by the end of the nineteenth century, Daimler and Diesel invented the steam engine. The internal combustion engine changed the power system of automobiles from steam power to fuel power[3]. In the early 20th century, electric vehicles became popular in the United States. The automobile power system developed from scratch, from huge to streamlined, and its development tended to be more comfortable and convenient.

The second stage of automobile development is a stage of energy conservation, high efficiency, and environmental protection. Its structural performance is that the gasoline engine has been optimized from the carburetor to multi-point injection, using direct injection in the cylinder, and gradually developed into a mechanism using mixed injection, and has transformed from purely mechanical to electronic control, continuously comprehensively optimize performance, and continuously improve its economy, to the current period of development to control pollutant excretion[4].

The third phase of the automobile power system, the hybrid power stage, is to upgrade and improve the traditional power system to achieve energy saving and emission reduction, and optimize its economical performance.

The fourth period of automobile power system is the pursuit of green, simple and intelligent stage, using pure electric power system[5]. At present, the power system of the automotive industry is in the transition from the third stage to the fourth stage. Most automobile factories and power system assembly companies in various countries regard hybrid power and new energy power as their key research and development directions, investing a lot of money, time, and technology in research and development. Preferential policies for the automobile industry in various countries favor green, simple, and smart cars.

**Table 1** Documents issued by relevant Chinese institutions

Policy Implementation Time	Policy Projects	Policy Changes
August 11, 2016	"New Energy Vehicle Carbon Quota Management Method"	1. Deepened the definition of carbon quotas for new energy vehicles 2. Proposed the preliminary management concept of carbon quotas (managers, applicable objects, quota calculation, trading and settlement, etc.)

1st solicitation of opinions on September 22, 2016	"Interim Methods for the Parallel Management of Company Average Fuel Consumption and New Energy Vehicle Points"	1. Deepened the calculation method of two point indicators (NEV, CAFC points) 2. Deepened the management method of two point indicators
1st solicitation of comments on June 13, 2017	"Method for Parallel Management of Average Fuel Consumption and New Energy Vehicle Points of Passenger Car Companies"	1. Strengthened technical standards for new energy vehicles 2. Changed the points value of pure electric vehicles (linked to the actual mileage of pure electric vehicles) 3. The time range of each link in points management has been changed.
Officially released on September 22, 2017	"Interim Methods for the Parallel Management of Company Average Fuel Consumption and New Energy Vehicle Points"	1. Officially implemented on April 1, 2018, the original 2018 new energy points proportion standard will be cancelled. 2. The company threshold for the points proportion standard has been established, and the annual output of fuel vehicles has been increased from 50,000 to 30,000. 3. New energy vehicle points are not allowed to be carried forward, but only the new energy vehicle points from 2019 can be carried forward in equal amounts for one year.

### 3 DEVELOPMENT POLICIES FOR NEW ENERGY POWER TECHNOLOGY

In order to promote the development of the new energy automobile industry, promote automobile emission reduction and energy conservation, reduce air pollution, and promote the strategic transformation of energy in my country's transportation sector, with the review and approval of the State Council, relevant Chinese organizations have launched a nationwide promotion of new energy Car work[6]. In recent years, with the development of society, in order to further accelerate the development process of new energy vehicles in our country, government departments have successively promulgated the "New Energy Vehicle Promotion Subsidy Standards", "Double Points Management Method", and "Management Regulations for Investment in the Automobile Industry" A series of preferential policies such as this fully reflect the importance my country attaches to new energy vehicles and demonstrates its determination to support the industrial development of new energy vehicles[7].

#### 3.1 Parallel Management Method of Average Fuel Consumption of Passenger Car Companies and New Energy Vehicle Points

In recent years, Chinese government departments have introduced parallel management methods for passenger car companies' fuel consumption and new energy vehicle points (Table 1). It can be seen from Table 1 that: my country has correspondingly relaxed the average fuel consumption standards for small car companies. For the small passenger car industry with an annual output of less than 2,000 units, it has relaxed the points compliance standards for average fuel consumption; at the same time, it has also relaxed the standard for new energy vehicles[8]. Corresponding threshold requirements have been set for the proportion of automobiles. For passenger car companies with an annual output of less than 30,000 units, a new energy vehicle point proportion standard has been formulated; for companies with an annual output of 30,000 or more units, the points proportion standard in 2019 is 10%, and the points proportion standard in 2020 is 12%; the proportion standards for new energy vehicles in 2021 and in the future will be specifically announced by relevant information and industrial institutions; implement a parallel management method of points so that positive points can be based on 80% Or 90% of the proportion will be carried forward to subsequent annual applications, and the negative points offset will be reset to zero.

#### 3.2 New Energy Vehicle Promotion and Application Subsidy Program and Its Product Technical Standards

First, standards for pure electric vehicles. In recent years, our country's government departments have made strict regulations on subsidy programs for pure electric vehicles. Among them, the standards for cruising range are more stringent, focusing on automotive products that support long cruising range[9]; the density of battery energy is strictly set, and a correlation coefficient is formed; the energy consumption standards for automobiles are more stringent, and a correlation coefficient is formed; newly added batteries, A maximum limit is set for electricity subsidies, and the maximum limit for unit battery and electricity subsidies should be  $\leq 1,200$  yuan/kWh. As shown in Table 2.

The formula for calculating the subsidy for bicycles and passenger cars is as follows: Bicycle subsidy amount = mileage subsidy index \* battery system energy density adjustment coefficient \* vehicle energy consumption adjustment coefficient (Table 3 for specific subsidy coefficients). Changes in the threshold requirements for power consumption subsidy per 100 kilometers is shown as Table 4.

**Table 2** Specific requirements for pure electric cruising range

Pure Electric Driving Mileage (Km)	Subsidy Amount In 2018 (Yuan)	Subsidy Amount In 2017 (Yuan)
$100 \leq R < 150$	0	20000
$150 \leq R < 200$	15000	36000
$200 \leq R < 250$	24000	

$250 \leq R < 300$	34000	
$300 \leq R < 400$	45000	44000
$400 \leq R$	50000	

**Table 3** Relevant requirements for vehicle energy consumption

Electricity Consumption Per 100 Kilometers Is Better Than The Threshold Standard	Subsidy Coefficient In 2018
$0\% \leq r < 5\%$	0.5
$5\% \leq r < 25\%$	1
$25\% \leq r$	1.1

**Table 4** Subsidy threshold standards for electricity consumption per 100 kilometers

2017 Subsidy Standard For Electricity Consumption Gate Per 100 Kilometers	2018 Subsidy Standard For Electricity Consumption Per 100 Kilometers	2018 Subsidy Threshold Standard For Electricity Consumption Per 100 Kilometers
$m \leq 1000$		
1000	$< Y \leq 0.014 \times m + 0.5$	$Y \leq 0.012 \times m + 2.5$
$m \leq 1600$	$Y \leq 0.005 \times m + 13.7$	$Y \leq 0.0126 \times m + 0.45$
$1600 < m$		$Y \leq 0.0108 \times m + 2.25$

Second, standards related to plug-in hybrid electric vehicles. In recent years, the Chinese government has made strict regulations on the subsidy program for plug-in hybrid electric vehicles. The main reasons are to lower the basic subsidy amount and to make vehicle energy consumption standards more stringent. The calculation formula is as follows: bicycle subsidy amount = mileage subsidy index \* vehicle energy consumption adjustment coefficient. Specific requirements for pure electric cruising range can be found in Table 5.

**Table 5** Specific requirements for pure electric cruising range

Pure Electric Driving Mileage (Km)	Subsidy Amount In 2018 (Yuan)	Subsidy Amount In 2017 (Yuan)
$50 \leq R$	22000	24000

Third, detailed requirements for vehicle energy consumption. At this stage, my country has introduced new regulations on vehicle energy consumption standards, which mainly reflect the following two aspects:

- ① When  $50 < R < 80$ , the fuel consumption in state B must meet the following standards, see Table 6:
- ② When  $R = 80$ , the power consumption per 100 kilometers in state A must meet the relevant threshold conditions for pure electric passenger vehicles in my country (the tightening coefficient is ignored).

### 3.3 Soliciting Opinions on Management Requirements for Investment in the Automobile Industry

In addition to clarifying the scope of investment in the automobile industry, my country's relevant management regulations also release a message that focuses on supporting the transformation of previous automobile companies and encouraging them to develop and manufacture new energy vehicles. Among them, the relevant policies include the content of "correctly guiding the investment direction of social capital and controlling the disorderly development of automobile companies." An updated and more reasonable plan has been made for the overall layout of the new energy vehicle industry, supporting existing fuel vehicle companies to expand the proportion of investment in assets, continuously optimizing the product structure, and developing new energy vehicles. See Table 7 for the classification of investment project types in the automobile industry.

**Table 6** Subsidy coefficient for state B fuel consumption

Comparison of limits corresponding to B-state fuel consumption and current conventional combustion consumption in national standards	Subsidy coefficient in 2017	Subsidy coefficient in 2018
$65\% \leq r < 70\%$	1	0
$60\% \leq r < 65\%$		0.5
$B < 60\%$		1

**Table 7** Classification of automobile industry investment projects

investment projects	Fuel vehicle investment project	Traditional fuel vehicle Ordinary hybrid car Plug-in hybrid project
	Pure electric vehicle investment project	pure electric vehicle Extended range pure electric vehicle fuel cell vehicle

Parts investment project	car engine body assembly The fuel cell Special-purpose cars and trailers managed by parts
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First, investment direction. The previous production capacity distribution structure of fuel vehicles has been improved. New production capacity investment projects must be established in provinces where the utilization rate of automobile production capacity in the past two years has been higher than the domestic average. Support enterprises to invest in the form of equity, such as mergers, reorganizations and strategic cooperation, and promote enterprises to jointly develop new products and coordinate production to increase the concentration of the automobile industry. Encourage my country's state-owned automobile companies and private car companies to carry out mixed ownership reform activities to achieve the goal of "complementing their advantages and combining powerful forces", and then build a world-class group automobile enterprise. Encourage important enterprises in my country's automobile industry to strengthen the cooperation and practice of "production, academia, research and application", pool advantageous resources, and then build an automobile industry alliance.

Second, prohibited investment projects. The exclusion conditions for fuel vehicle investment projects in my country are as follows: ① Independently newly established fuel vehicle companies. ② Existing vehicle manufacturers are building fuel vehicle production levels across commercial vehicle and passenger vehicle categories. ③ Existing fuel vehicle companies that are not included in my country's regional development plan will all move to other provinces. ④ Changes in the equity of fuel vehicle zombie companies.

Third, investment projects in auto parts. About the engine project. For new automobile engines and new engine investment projects in my country, the power per liter of gasoline engines to be produced must be higher than 70 kilowatts, while the power per liter of diesel engines must be higher than 50 kilowatts, and the engines must meet my country's relevant vehicle emission standards.

#### 4 IMPORTANT NEW ENERGY VEHICLE TYPES CURRENTLY SALES AND APPLICATIONS

The models of new energy vehicles currently on sale in major automobile industries can be roughly divided into three categories, namely pure electric, gasoline-electric hybrid (non-plug-in), and plug-in hybrid. Among them, the production and sales of non-plug-in new energy vehicles are generally concentrated in several joint ventures such as Honda, Toyota and Hyundai. Representative examples include Toyota's "Planetary Gear Dual Motor Power Mode" and Honda's "Single Motor Assisted IMA Mode". In terms of motor and engine integration, there is also Hyundai/Nissan's single-motor dual-clutch combined drive (P2 solution) mode, which is a mode in which the engine and motor are combined by a clutch.

The engines of the above-mentioned PHEVs all use the Atkinson cycle, and the thermal efficiency can reach 38.5%-40%, which is about 220g/kWh lower than the fuel consumption. Although our country's state-owned automobile companies have successfully developed Atkinson cycle engines, However, there is still a long way to go compared to developed countries in terms of thermal efficiency. Most of the main pure electric passenger cars launched are WM Motor, NIO, Yundu, Singularity, Qiantu, Xinte, Zhengdao, etc. They all adhere to the concepts of "intelligent interconnection" and "new energy" in car manufacturing. The "pure electric technology" at the root of the improvement cannot provide good impetus. At the same time, suppliers relying on the above technologies are also partners of traditional automobile companies such as CATL.

#### 5 CONCLUSION

In short, with the development of society and the rapid changes in science and technology, my country's automobile industry will be restricted by environmental factors, energy factors, and technical factors in its forward development. In order to promote the sustainable development of the automobile industry, relevant automobile companies must actively develop, Promote and apply new energy vehicles. The ultimate development goal of the company is pure electric vehicles, and pure electric technology must rely on previous fuel vehicle companies. In the future, hybrid vehicles will have broad market development space. Therefore, in the past, fuel vehicle companies should continue to improve the thermal efficiency of engines, or strengthen the research and development of hybrid-specific engines.

#### COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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# STUDY OF THE EARLY WARNING MODEL FOR NETWORK PUBLIC OPINION RISKS BASED ON THE INTEREST PREFERENCES OF INTERNET USERS

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**Abstract:** In the context of big data, from the perspective of network ecology, this article divides Weibo public opinion subjects into four groups based on their interest motivations: image managers, platform operators, public opinion consumers and network promoters. According to the four groups Extract Weibo public opinion risk factors based on the interest preferences of each community to construct a Weibo public opinion risk model. The model was verified using Weibo real-time data as a sample, and through logistic regression analysis, it was concluded that the prior cognition, information preference, behavioral preference, information person preference and other interest preferences of the Weibo public opinion subject community have an impact on the development trend of Weibo public opinion. The degree of influence coefficient is used to calculate the early warning level, thereby obtaining a Weibo public opinion early warning model that can be dynamically adjusted according to case updates. The research has important theoretical significance for deepening and enriching the research on online public opinion, and at the same time provides new methodological support for realizing public opinion risk early warning.

**Keywords:** Internet public opinion; Logistic analysis; HHM risk framework; Risk modeling

## 1 INTRODUCTION

Currently, the Internet has entered the era of big data, and Weibo has become a mainstream application of communication media. Different from traditional media, Weibo is based on nodes and uses social networks to spread information. Each node has the ability to comment, forward, etc. on information. In this mode, the development of public opinion on Weibo

Development is largely affected by the personal interests, preferences and behavioral habits of Weibo users. Therefore, this article intends to start from the interests and preferences of netizens in the use of Weibo, establish an HHM Weibo public opinion risk early warning system, and establish a Weibo public opinion risk early warning model.

This article disassembles Weibo public opinion into four Weibo public opinion subjects, and establishes a Weibo public opinion risk early warning model based on their preference characteristics. It is elaborated from the four aspects of prior cognition, information preference, behavioral preference and information person preference of the four main bodies: image management main body, platform operation main body, public opinion consumption main body and network promotion main body.

### 1.1 Public Opinion Subjects

This article divides Weibo public opinion subjects into four categories based on their different interest demands. Among them, the main body of public opinion consumers is a group whose purpose is entertainment and Internet surfing. Image management subjects are groups whose purpose is to safeguard their own interests and create a positive image. The platform operating entity is a community that provides messaging services to other communities. The main body of online promotion is a community that actively promotes and creates public opinion for the purpose of profit [1-2].

### 1.2 Prior Knowledge

Prior knowledge refers to Weibo users' basic interest in a certain type of public opinion, that is, users' natural points of interest without the influence of public opinion. Internet hot spots are the mapping of hot social events on the Internet. Netizens with similar interests tend to pay more attention to the same type of events. Therefore, the keywords in Weibo information are a manifestation of netizens' prior cognition.

### 1.3 Information Preferences

Information preference refers to the degree of preference of Weibo users for Weibo information topics and forms. Due to different identity backgrounds and knowledge composition, they have different acceptance levels of different information formats and information topics. Therefore, the topic classification and information format of Weibo information are a manifestation of information preferences.

## 1.4 Behavioral Preferences

Behavioral preferences refer to inertial behaviors that express attitudes, emotions, cognitions, and opinions. Driven by different psychological backgrounds and interests, Weibo users express their emotions by forwarding, commenting, and liking Weibo information. Therefore, the number of Weibo forwardings, comments, and likes reflects the behavior of netizens to a large extent. preferences.

## 1.5 Informant Preferences

Informant preference refers to Weibo users' preference for public opinion groups and the degree of influence by ethnic groups. Since Weibo has two functions: "fans" and "follows", different "ethnic groups" are formed because of their different positions and points of interest, and interactive discussions are conducted based on ethnic groups. Ethnic groups will also influence them through this mutual fan relationship. Therefore, the number of fans and followers of Weibo users is a reflection of the information person's preference.

## 2 HHM METHOD RISK FACTOR IDENTIFICATION

### 2.1 HHM Method

The HHM method specifically refers to decomposing a complex system or process into multiple levels or levels. Each level or level is a complete system or process from a specific perspective, so as to understand the different levels of the system or process. question. This method is very effective for modeling large-scale, complex structural systems. Weibo public opinion covers a wide range of areas, has a lot of content, and has complex influencing factors. Therefore, this article will identify the risk factors of the Weibo subject community based on HHM.

### 2.2 HHM Framework for Weibo Public Opinion Risk Identification

This article focuses on the risk identification of Weibo subject communities, analyzes the risk factors of Weibo public opinion from three aspects: subject community, preference and behavior, and constructs the following HHM sub-framework for risk identification as a direct framework model for risk identification .

## 3 DETERMINATION OF RISK FACTORS OF WEIBO PUBLIC OPINION

Starting from the four perspectives of the subject layer, this article analyzes the behavioral preferences of different subject groups, thereby analyzing their possible behavioral activities and extracting the risk factors of the Weibo public opinion early warning model, and finally conducts modeling analysis through their behavioral data.

### 3.1 Weibo Public Opinion Risk Indicator System

According to HHM's analysis of Weibo public opinion from four perspectives, the Weibo public opinion risk indicator system has two layers, the preference layer and the data monitoring layer. The preference layer includes four preferences: prior cognition, information preference, behavioral preference, and information person preference. The data monitoring layer includes 8 basic indicators such as F1 topic category, F2 fan effect, F3 headline account, F4 information format, F5 forwarding volume, F6 like volume, F7 comment volume, and F8 topic post count.

### 3.2 The Main Perspective of Image Management

The image manager's prior cognition and information preference are reflected in the attention to the topic, of which the information format can be ignored. The image manager's external publicity department often focuses on its own related topic categories and keyword searches. The search keywords of each image manager are different, so the risk factor F1 topic category is extracted. The number of image managers accounts for a small number of the total Weibo users, so their behavioral preferences have little impact on the overall Weibo. However, due to fan benefits, image managers are often industry leaders in a certain industry and have certain authority, so their influence is mainly reflected in the number of image managers. on its fan appeal. So the risk factor F2 fan effect was extracted [3-5].

### 3.3 Perspective of Platform Operating Entity

The number of platform operators accounts for a small number of the total Weibo users, so their behavioral preferences have little impact on the overall Weibo. However, due to the resonance among platform operators, a Weibo public opinion spreads from a single media platform to a multimedia platform, making Weibo Public opinion amplifies like ripples. So the risk factor F2 fan effect was extracted.



### 3.4 The Perspective of Public Opinion Consumers

The large number of public opinion consumers is the basis for the development of Weibo public opinion. The factors that affect the interests of public opinion consumers are the factors that affect Weibo public opinion. First, Weibo users' browsing of a certain topic can reflect the user's prior cognition and information preferences. The topic category of public opinion, sensitive keywords, being influenced by surrounding users or attracted by media headlines, and the information format of the public opinion all have a great impact on Weibo users' browsing choices. Therefore, the influencing factors F1 topic category, F3 headline number, and F4 information format are extracted.

Public opinion consumers have fewer fans, so their posting behavior can only affect their own small circle and does not need to be considered. And their behavior of forwarding, liking, and commenting on other people's Weibo can promote the development of that Weibo. Therefore, the influencing factors F5 retweets, F6 likes, and F7 comments are extracted. The fans of public opinion consumers are often other users in the real social network circle. The number is small and will not be considered for now.

### 3.5 The Main Perspective of Online Promotion

Internet promoters use Weibo public opinion to achieve their own goals, so there is no prior cognition, information preference and information person preference. As for their behavioral preferences, they often put hot topic names in the title of their posts to increase their own views, or to increase the number of retweets and likes in order to promote the development of a certain public opinion. Since the number of retweets and likes is difficult to distinguish between online promoters and public opinion consumers, this article only considers the behavioral preference of posting hot topics. This behavior can lead to an increase in the number of posts on a certain topic, but a smaller number of truly relevant posts. So the number of influencing factors F8 topic posts was extracted [6-8].

## 4 CONSTRUCTION OF RISK EARLY WARNING MODEL BASED ON LOGISTIC

The risk early warning system consists of three parts, namely the case library indicator monitoring subsystem, the risk identification subsystem and the early warning and forecasting subsystem. First, build a case library and build an indicator monitoring subsystem. For different types of cases, there are natural differences in the interests and preferences of Weibo users. In order to narrow this difference and improve the early warning level of the early warning system for such cases, it is necessary to replace and supplement the database cases based on research, so that the case database cases remain highly homogeneous. The indicator monitoring subsystem is divided into monitoring layer indicators and description layer indicators. The monitoring layer tracks and records 8 basic Weibo public opinion data, and calculates 4 characteristic layer indicators through content mining, structure mining and behavior mining. Characteristic layer indicators can add mining data and determine the weight of each indicator based on the importance of the four communities in such cases, thereby determining the monitoring layer indicators that need to be mined [9-11]. Secondly, determine the risk identification threshold and build a risk identification subsystem. The risk identification subsystem is divided into six sub-modules: early warning setting, indicator setting, weight interval setting, calculation, comparison and discrimination, and alarm. Among them, the early warning setting module selects the monitoring description layer indicator object according to the case type. The indicator setting module edits the description layer indicator algorithm for the early warning setting module. The weight interval module determines the indicator selection range of the indicator setting module. The calculation module combines the indicators. Perform calculations to obtain the final early warning monitoring indicators, determine the early warning level through the early warning setting module, and finally input the calculation results into the early warning and forecasting subsystem [12-15].

Finally, the early warning and forecasting subsystem takes the highest number of views of the case library case as a reference and is set to 1. Convert the pageviews of other cases to the highest pageviews into a percentage, which is the popularity ratio of the case. Use the popularity ratio as the exposure rate to perform logistic regression analysis on the monitoring layer indicators, and calculate the OR value of the indicator in the process of forming public opinion on Weibo, thereby determining the warning level warning value of each early warning indicator, based on the early warning preset by the risk identification module. Forecasts are issued based on level.

### 4.1 LOGISTIC Risk Early Warning Model

The logistic model is suitable for situations where the explained variable is a dummy variable (that is, the value is 1 or 0). In a statistical sense, this model generally measures the probability when an event occurs (the value is 1) through the logarithmic distribution of the function. The model expression is shown in Equation 1:

$$\ln\left(\frac{P}{1-P}\right) = g(x) \quad (1)$$

Among them  $g(x) = w_1x_1 + w_2x_2 + w_3x_3 + \dots + w_nx_n$ , P is the probability that the dummy variable takes 1, and 1-P is the probability that the dummy variable takes 0. X1-Xn are factors affecting dummy variables. W1-W nThe coefficient of

each influencing factor. This article mainly analyzes the OR value of this model to determine the degree of influence of each factor on the dummy variables.

### 4.2 Indicator Selection

In the research, the reliability of the model depends to a large extent on the quality of the early warning analysis indicators. Considering that the indicators collected directly using Weibo alone are too large, which may lead to research distortion, this article combines the number of likes, the number of retweets, 8 bottom-level indicators such as page views are calculated, and secondary indicators are obtained for calculation. Specifically, the Weibo public opinion indicators selected in the study are shown in Table 1.

**Table 1** Variable assignment method table

Variable Code	Variable Name	Assignment Method
X1	fan effect	Weibo public opinion internet celebrity index
X2	Toutiao account	Weibo public opinion headline index
X3	message format	Image-based (photos, short videos) is 1; (comics, radio) is 0 text-based
X4	Forward volume	The total number of retweets of all posts under this topic
X5	Number of likes	The total number of likes for all posts in this topic
X6	Number of comments	The total number of comments on all posts under this topic
X7	Number of topic posts	Original posts posted by participating users on this topic
y	Public opinion popularity value	Take the day's public opinion high page views as a reference value

### 4.3 Input Layer Settings

This article uses multinomial logistic regression in SPSS 18.0 to analyze the impact of various factors on public opinion. The input layer settings are shown in Table 2.

**Table 2** SPSS 18.0 input layer settings

Options	Input Value	Options	Input Value
dependent variable	Hot public opinion Weibo ranking	Classification	Classification code: 1 Critical value: 0.5
covariate	X1-X6	save	Predicted value: probability Residuals: Standardized contains the covariance matrix

The analysis path is as follows:

(1) First, calculate the quartile level division of Y. SPSS 18.0 gives the degree of quartile analysis, namely Analysis → Descriptive Statistics → Frequency. After the ratio is obtained, Y is expressed as a categorical value, that is, 1 represents high, 2 represents relatively high, 3 represents medium, and 4 represents low. This article mainly studies the impact of risk factors on public opinion popularity, so this article uses 1, the highest value of public opinion popularity, as the reference variable.

(2) To perform multinomial logistic regression analysis, in SPSS 18.0, enter Analysis → Regression → Multinomial logistic regression.

### 4.4 Interpretation of Results

This article explains the output values of each factor. The list of output values that need to be explained is shown in Table 3.

**Table 3** SPSS 18.0 output layer explanation table

Output Value	Explain	Output Value	Explain
	OR value: describes the independent variable versus the dependent variable		
Exp(B)	Quantity of influence. The OR value is greater than 1, which is a promoting variable. If the OR value is less than 1, it is a protected variable.	Sig	P value: P<0.05 is significant; P>0.05 is not significant

## 5 EMPIRICAL ANALYSIS

### 5.1 Data Acquisition and Processing

This article selects the data object as social topics on Sina Weibo, and the data acquisition method is JAVA programming technology. Starting from the original Weibo, it traverses to obtain the following field data: user ID, user name, information content, user attributes, number of forwarded comments and likes, status Update time, etc., and establish a database of social public opinion cases.

As of 21:00 on March 27, 2017, starting from 1218 original Weibo posts on 47 public opinion topics, a total of topic categories, hosting media IDs, number of posts, number of fans of hosting media, information content, and number of likes were obtained, page views and other 8 types of data. Weibo Public Opinion is a public opinion monitoring platform. Users can customize all-media public opinion monitoring information and reports including terminals by combining keyword schemes. This article uses the Weibo public opinion platform to obtain the public opinion index. The acquisition source type is set to Weibo, and the time span is from 0:00 to 24:00 on March 27, 2017.

Data sorting is carried out based on the obtained basic data, mainly including: removing duplicate values and missing values; based on the number of content forms such as pictures, videos, voices, texts, expressions, etc. in the information content field, the corresponding information format preference fields are assigned values of 0 and 1; The cleaned data was numerically calculated according to the research variable formula; the public opinion popularity ratio was calculated; and finally a Weibo public opinion early warning case library matrix with 47 rows and 8 columns was constructed.

### 5.2 Case Selection

This article selected 47 social Weibo public opinion cases that occurred on March 27, 2017 on Sina Weibo for risk early warning analysis to test the interests of image maintainers, platform operators, public opinion consumers and online promoters in the early warning analysis. The accuracy of the impact of preferences on Weibo public opinion.

### 5.3 Analysis Results

This article uses the method of logistic regression analysis to conduct empirical analysis using 47 social case modeling of Sina public opinion, sorting out the interest preferences of image maintainers, platform operators, public opinion consumers and online promoters in social Weibo public opinion. The influence of public opinion on Weibo. Based on the model calculation results (such as Table 5), the corresponding conclusions are drawn:

(1) Based on the role of image maintainers, the following conclusions are drawn: The degree of radicalization of internal netizens changes significantly higher than the degree of personal profit-involvement of netizens. Due to the "group instinct", individual netizens will subconsciously coordinate with each other to achieve consistency of will and behavior. In addition, the current Internet provides virtual identities for netizens, making netizens express their opinions more freely and the "group effect" is more significant.

(2) Based on the effect of platform operators, it is concluded that the influence of the media is higher than the persuasive effect of the media, and the persuasive effect of the media is significantly higher than the influence of the emergency itself. The main way for netizens to obtain information is through media reports. The media has a direct impact on netizens' emotions by processing and rendering event information. Netizens tend to pay attention to the large number of media reports and forget the reality and ignore the information source itself.

**Table 4** Weibo public opinion data statistics table

Serial Number	Browse	Participate	Forward	Comment	Like	Posting Media	Focus On	Fan
1	8156000	4	138	1555	587	Gao Ji Chinese website	418	3710
2	63148000	10	2943	21798	12475	Reporter Zhang Zhizhong	1827	3346
3	1101000	3	370	95	1404	Gansu website registration	208	242
4	897000	3	624	4073	2641	Capital Experts Weibo	244	80
5	1984000	2	37	129	88	Chongqing Morning News	1577	840000
6	4438000	1	163	481	315	China News Weekly	2339	37670000
7	21776000	8	3899	8594	11457	Jiangsu News	852	2780000
8	310000	3	46	76	20	Nanjing zero distance	1075	3460000
9	634500	1	9	18	7	Suzhou micro life	1570	810000
10	157000	2	13	23	12	Legal Network	753	470000

11	240000	1	92	137	73	modern express	1049	1900000
12	291000	1	0	1	2	Hefei Lifestyle	150	180000
13	250000	1	32	51	16	Sina Jiangsu	3834	820000
14	107000	1	32	82	298	personal	2340	7040000
15	2881000	2	3	55	148	Zhejiang Evening News	1254	100000
16	386000	1	22	169	201	West China Metropolis2004 Daily		4020000
17	578000	4	110	594	130	Sina Jiangxi	2974	52000
18	43680	1	5	2	17	personal	120	128
19	527000	1	175	140	557	personal	14	10
20	39751	1	0	15	55	Impression Yantai	495	110000
21	5739000	2	1	7	11	Today's headlines	1101	45
22	57420	1	1	0	9	Suzhou Fire Protection	195	15
23	684000	1	15	15	42	international online	926	4140000
24	6827000	6	10	69	15	chinaxiaokang.com	1254	100000
25	438000	6	15	29	66	personal	104	350000
26	450000	2	88	95	188	Queen of Stocks	2995	27879
27	578000	1	53	26	102	Jinding Strategy Rubik's92 Cube		20527
28	158900	1	1	5	10	Ancient sages discuss the165 present		427
29	264000	3	67	22	297	Shuishui Liu Xuan	301	5521
30	49000000	12	9026	15405	2872	Sina Sichuan	3287	1480000
31	5720000	11	4623	67014	66234	Sichuan Public Security396 Bureau		290000
32	839000	2	82	798	138	Released in Chengdu	860	6320000
33	26400	3	1618	8917	4042	CCTV News	1975	48900000
34	313000	3	6324	23473	12852	personal	2606	530000
35	93800	1	68	154	81	Refuting rumors and the1628 truth		350000
36	1573000	2	38	260	132	personal	2064	8479
37	86000	2	123	124	945	personal	535	5350
38	300000	2	3048	16826	9465	Sina Education	1910	4500000
39	1751000	7	1509	5910000	50354	beijing morning news	1831	3238
40	69000	1	13	252	83	Sina Justice	3702	34493
41	9401000	8	1062	3757	1513	China News Network	647	3143
42	415000	1	53	97	129	Sina stocks	1621	2640000
43	879000	1	2	5	4	Xiamen Evening News	344	2270000
44	775000	2	22	43	23	modern express	1052	904
45	1291000	3	30	120	33	Yangzi Evening News	1568	1241
46	587000	1	14	44	12	Sina Xiamen	4001	127
47	377000	2	111	199	162	China News Weekly	2421	37650000

(3) Regarding the role of government work, the conclusion is drawn: The effect of the government in handling crises is significantly higher than the role of the government in guiding emotions. When the government is dealing with a crisis, it can speed up its response, improve its work transparency, and enhance its credibility, which can reduce the intensity of the spread of netizens' emotions and weaken the crisis more than just focusing on online reports and making false reports.

(4) Based on the effect of online promoters, it is concluded that online promoters have a greater influence. It is appropriate for online promoters to "fill", "hype" a single topic, or "spoil" a hot topic by placing commercial advertisements. The fever of online public opinion has a great impact. To "reduce" the fever of online public opinion, it is necessary to further regulate the behavior of online promoters.

## 6 CONCLUSION

The rules summarized in this article are applicable to social Weibo public opinion events, but the model does not extract all risk factors in Weibo public opinion. There are still many areas that need improvement, and further work needs to be carried out.

(1) This article selected 47 cases for verification using the logistic model, but the number of cases selected was small, and the convincingness of the proof needs to be strengthened.

(2) The risk warning model of this study is based on the behavioral interests and preferences of netizens. The extracted indicators need to be refined based on psychology, behavior, etc. The determination of variables and their weights also needs to be based on cases. Adjustment, and the disadvantage of this method is that the update speed of the case library restricts the prediction accuracy, making the prediction results inaccurate.

**Table 5** Parameters in the equation of model calculation results

	B	SE	WALD	DF	SIGNIFICANCE	EXP(B)
Step 1 User identity						
message format	0.283	.000	.000	1	.987	1.920
Number of fans	0.178	.000	.536	1	.464	1.510
Toutiao account	0.082	.000	.495	1	.482	1.208
Forward volume	0.129	.001	.833	1	.362	1.347
Number of comments	0.053	.000	.419	1	.518	1.130
Number of likes	0.076	.000	1.055	1	.304	1.193
Number of topic posts	0.231	.279	3.650	1	.056	1.703
Step 2 Constant	1.288	.790	2.659	1	.103	.276

In short, the prediction research of online public opinion still has a lot of room for development in the future, and the research on the combination of netizens' interest preferences and public opinion needs to be further deepened.

## COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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# THREE KEY DIMENSIONS IN CONSTRUCTING THE TANG POETRY ROAD IN EASTERN ZHEJIANG

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**Abstract:** This paper explores the construction of the Tang Poetry Road in Eastern Zhejiang from three important dimensions. Firstly, the close connection between the Tang Poetry Road in Eastern Zhejiang and the inheritance of Chinese traditional culture is discussed. By delving into the historical origins of the Tang Poetry Road in Eastern Zhejiang, the paper examines the inheritance and development of Chinese traditional culture along the Tang Poetry Road in Eastern Zhejiang, as well as its cultural value. Secondly, the paper analyzes the integration of culture and tourism development along the Tang Poetry Road in Eastern Zhejiang, exploring strategies for cultural resource exploration, integration, and development of cultural tourism resources along the poetry road, and the integration and development of culture and tourism. Lastly, the focus is on empowering the rural revitalization strategy through the Tang Poetry Road in Eastern Zhejiang, analyzing the background and importance of the rural revitalization strategy, the practice of promoting rural revitalization through the Tang Poetry Road in Eastern Zhejiang, and implementation strategies.

**Keywords:** Tang Poetry Road in Eastern Zhejiang; Chinese traditional culture; Culture-tourism integration; Rural revitalization

## 1 INTRODUCTION

As time progresses and society advances, the inheritance and development of culture have become an integral part of national construction. Eastern Zhejiang, as one of the important birthplaces of Chinese civilization, bears rich historical and cultural heritage. Tang poetry, as a treasure of Chinese literature, has been praised by people since ancient times. Against this backdrop, the construction of the Tang Poetry Road in Eastern Zhejiang becomes a task of profound significance, aiming to inherit excellent traditional Chinese culture, promote the integration of culture and tourism, and support the implementation of rural revitalization strategies.

By delving into these three key dimensions, this study aims to provide theoretical support for the construction of the Tang Poetry Road in Eastern Zhejiang, while also offering insights and guidance for local cultural inheritance, economic development, and the formulation and implementation of rural revitalization strategies. Furthermore, by exploring the developmental trajectory of the Tang Poetry Road in Eastern Zhejiang, it contributes to the prosperity and inheritance of Chinese culture.

## 2 THE INHERITANCE OF CHINESE TRADITIONAL CULTURE ALONG THE TANG POETRY ROAD IN EASTERN ZHEJIANG

### 2.1 Historical Origins of the Tang Poetry Road in Eastern Zhejiang

“The Tang Poetry Road in Eastern Zhejiang” was first proposed by Mr. Zhu Yuebing, a scholar from Xinchang, in 1988, and officially named and announced by the Chinese Tang Dynasty Literature Society in 1993. In the literary geography of China, the Tang Poetry Road in Eastern Zhejiang is comparable to the Silk Road and the Ancient Tea-Horse Road in terms of its scenic beauty. According to research, more than 450 Tang poets left over 1,500 poems along this road. The Tang Poetry Road in Eastern Zhejiang is a cultural route that traverses the landscapes and humanities of seven prefectures in Eastern Zhejiang (Yuezhou, Mingzhou, Taizhou, Wenzhou, Chuzhou, Wuzhou, and Quzhou). Most of the poets departed from the Qiantang River, passed through the ancient capital of Shaoxing, crossed the Cao’e River from Jinghu Lake to the south, entered the Jianxi River, passed through Jianzhong, and arrived at the Tian Tai Mountain’s Shiliang Feipu. This route extends to Wenzhou and then returns to the Qiantang River from the Ou River. Starting from Xixing and ending at Tian Tai Mountain, the main line passes through Xiaoshan, Yuezhou, Jinghu, Keyan, Ruoye Creek, Cao’e River, Jianxi River, and Tian Tai Mountain. The formation of the poetry road is related not only to the terrain, landscape, and beautiful scenery but also to the political and economic promotion, the influence of wars and the migration of scholars and aristocrats to the south, the attraction of religious culture, the joint promotion of native and non-native poets, and the influence of the tradition of seclusion. The Tang Poetry Road in Eastern Zhejiang is a treasure trove of Chinese culture that integrates Confucianism, Buddhism, Taoism, poetry, calligraphy, tea culture, drama, pottery, folklore, dialects, and mythological legends. The natural landscapes and cultural heritage along the route are rich and diverse, exerting significant domestic and international influences[1].

### 2.2 Inheritance and Development of Traditional Chinese Culture in Eastern Zhejiang

The Tang Poetry Road in Eastern Zhejiang is a poetic cultural route. A total of 451 Tang poets visited Eastern Zhejiang, accounting for one-fifth of the total number of poets included in the Complete Collection of Tang Poetry, leaving behind over 1,500 poems. The convenient transportation, prosperous economy, beautiful natural landscapes, and profound cultural and historical heritage of Eastern Zhejiang during the Tang Dynasty have earned widespread social recognition for its unique mountain and water features, humanistic history, and local customs, thus ensuring the enduring influence of the poetry road. [2] In the history of Chinese culture, there are few cultural routes like the “Tang Poetry Road” where Chinese landscapes, painting and calligraphy art, and religious thoughts collide [3].

The Tang Poetry Road in Eastern Zhejiang not only embodies poetry but also holds significant historical and cultural significance and outstanding universal values as world cultural heritage. It possesses seven major historical and cultural heritages: first, the birthplace of Chinese landscape poetry; second, the center of the Sinicization of Buddhism; third, the consolidation and enrichment period of Taoism; fourth, the holy land of Chinese calligraphy art; fifth, the birthplace of Chinese landscape painting; sixth, the center of aristocratic culture; seventh, the prosperous land of folk literature and customs. These traditional cultures still have profound influences on contemporary society, providing a solid cultural foundation for the harmonious development of local communities.

### 2.3 Cultural Value of the Tang Poetry Road in Eastern Zhejiang

The Tang Poetry Road in Eastern Zhejiang inherits and promotes the art of Tang poetry literature. The Tang Dynasty was a glorious period in the history of Chinese literature, and Tang poetry epitomized this era. As an important place for Tang Dynasty literati to travel and create, the Tang Poetry Road in Eastern Zhejiang has left behind a large number of excellent poems. [4] These poems not only reflect the social customs and natural landscapes of the time but also demonstrate the artistic charm and cultural connotations of Tang poetry.

The Tang Poetry Road in Eastern Zhejiang explores and showcases regional culture. Eastern Zhejiang has a rich cultural heritage, nurturing numerous literati and artists. The construction of the Tang Poetry Road in Eastern Zhejiang can not only deeply explore the cultural resources of this region but also integrate these cultural resources organically to form a cultural brand with local characteristics. Through the promotion and dissemination of this brand, more attention and understanding can be attracted to the historical culture of Eastern Zhejiang, promoting the inheritance and development of regional culture.

The Tang Poetry Road in Eastern Zhejiang drives and leads modern cultural innovation. In the process of constructing the Tang Poetry Road in Eastern Zhejiang, the combination of Tang poetry culture with modern elements creates cultural products that are both traditional and modern. This cultural innovation can not only satisfy the aesthetic needs of modern people but also promote the development of cultural industries and the prosperity of cultural markets. At the same time, the construction of the Tang Poetry Road in Eastern Zhejiang can also lead a new trend of cultural tourism, promoting the upgrading and transformation of the cultural tourism industry.

The Tang Poetry Road in Eastern Zhejiang promotes international cultural exchange and cooperation. Tang poetry, as a treasure of Chinese culture, enjoys high reputation and influence internationally. By constructing the Tang Poetry Road in Eastern Zhejiang, the Tang poetry brand can be promoted to the international stage, strengthening cultural exchanges and cooperation with countries around the world. This cultural exchange and cooperation can not only enhance friendship and understanding among people of all countries but also promote the centrality of Chinese culture on the world stage.

## 3 INTEGRATION OF CULTURE AND TOURISM DEVELOPMENT ALONG THE TANG POETRY ROAD IN EASTERN ZHEJIANG

### 3.1 Exploration of Cultural Resources along the Tang Poetry Road

#### 3.1.1 *Sorting out the characteristics of Tang poetry culture*

The Tang Poetry Road in Eastern Zhejiang, named after the vast number of poems left by Tang Dynasty literati along this route, not only boasts beautiful natural landscapes but also possesses profound cultural and historical heritage. It traverses the mountains, rivers, and cultural circles of ancient Yue culture, Chan Buddhism culture, and maritime culture in Eastern Zhejiang, showcasing the unique charm of Jiangnan water towns and the rich literary atmosphere. In history, the Tang Poetry Road in Eastern Zhejiang was not only a place for literati and scholars to roam but also a place for them to seek inspiration and express their feelings. Tang poets such as Du Fu, Bai Juyi, and Li Bai have left behind renowned poems here, depicting not only the beautiful landscapes of Eastern Zhejiang but also profound insights into the era, life, and nature [5].

#### 3.1.2 *Excavating the Tang poems in Eastern Zhejiang*

The “Tang Poetry Road in Eastern Zhejiang” is a condensed summary of Tang people’s roaming routes by modern scholars. Although there are no exact records of it in historical texts, nor clear signposts and explicit names, poetic creation flourished and thrived, leaving behind a vast amount of poetic works [6]. During the Tang Dynasty, Chinese poetry had become increasingly sophisticated, with abundant forms, techniques, and creative experiences, and a wider range of subjects. Among the more than 2,200 poets included in the Complete Collection of Tang Poetry, 451 poets had visited this place, leaving over 1,500 poems with vigorous poetic sentiments. In the book *The Complete Compilation of Tang Poetry on the Tang Poetry Road in Eastern Zhejiang*, author Lu Shengjiang proposes a new perspective. The book includes over 550 poets related to the Tang Poetry Road in Eastern Zhejiang, with more than 2,500 poems. Extracting



the locations related to the Tang Poetry Road from Tang Dynasty poetry, corresponding to modern geographical spaces, understanding the geographical locations and spatial distribution characteristics of each important node, and then connecting them, a physical tourist route that matches the ancient Tang Poetry Road can be developed. The scenic spots along the Tang Poetry Road in Eastern Zhejiang were the destinations longing for Tang Dynasty poets. Early travel literature mainly focused on landscape literature, and Tang poets, with their romanticism, enjoyed visiting famous scenic spots and historical sites. Jishan and Jian water were particularly beautiful and enticing. Roughly tallying up, poets visited dozens of scenic spots, including Jinghu Lake, Lanting Pavilion, Yu Cave, Fushan Mountain, Mount Kuaiji, the ancient canal, Yunmen Temple, Shanyin Road, Mount Qinwang, Ruoye Creek, She's Mountain, Shifan Mountain, Rizhu Ridge, and the stone inscriptions of Li Si. Especially, many poems were written at Jinghu Lake, Ruoye Creek, and Yunmen Temple, totaling over a hundred poems. Ruoye Creek is the largest tributary of Jinghu Lake, and the scenery along the short stretch from Jinghu Lake to Ruoye Creek is the densest, where the most poets visited and the most Tang poems were produced[7].

### **3.1.3 Exploring poets and their creative backgrounds**

During this period, numerous Tang poets, renowned for their poetry, visited Shaoxing.[8] Some wandered widely, seeking famous mountains, such as Du Fu and Zhang Hu; some chose to retreat from the world, like Quan Deyu, Lu Yu, and Dai Shulun; some visited friends to alleviate inner melancholy, like Meng Haoran; some were appointed to official positions or exiled, like Song Zhiwen, Li Yong, Liu Changqing, Bai Juyi, Yuan Zhen, and Du Mu; some turned to Buddhism or Taoism to satisfy their spiritual needs. Tang poets came to Eastern Zhejiang for various reasons, purposes, and circumstances. Their poems, whether spontaneous personal compositions or obligatory collective creations, are rich in content. They describe natural landscapes, battlefields, borderlands, peasants, merchants, political realities, historical stories, class struggles, women's issues, philosophical reflections, and parting loves. This elevation of poetry's status and the demonstration of poets' active life pursuits, magnificent life realms, and distinctive personalities embody the vibrant spirit and culture of the Eastern Zhejiang region.

## **3.2 Integration and Development of Tourism Resources along the Tang Poetry Road in Eastern Zhejiang**

### **3.2.1 Planning and designing tourism routes along the Tang poetry road**

Guided by the overall concept of integrating culture and tourism, the integration of culture and tourism along the Tang Poetry Road in Eastern Zhejiang must adhere to the concept of "building platforms together and sharing brands." [9] The development approach of integrating culture and tourism will focus on the cultural resources of the Tang Poetry Road, such as landscapes, cultural heritage, poetic sentiments, and artistic conceptions. It will connect natural landscapes with cultural heritage, historical culture with modern civilization, and expand the cultural connotation and extension of the Tang Poetry Road. A series of high-quality tourism routes centered around the Tang Poetry Road will be created. Selecting scenic spots along the Tang Poetry Road with abundant poetic works, designing food routes, scenic routes, and study routes according to travel needs. For example, in Shaoxing Xinchang, a "Tang Poetry Feast" theme can be used to link important attractions in Xinchang, achieving the sharing of food and scenic beauty along the Tang Poetry Road. [10] Mountain and water routes can be categorized based on different natural landscapes. Additionally, focusing on Shaoxing as a "destination for study tours in China," study routes such as calligraphy and celebrity study tours can be designed, for example, following Li Bai's footsteps in Shaoxing. Moreover, in route planning, diverse tourism activities and experiential projects should be set up to meet the needs and interests of tourists, such as poetry recitals, cultural lectures, and interactive experiences, allowing tourists to appreciate the beauty of landscapes while deeply understanding and experiencing the charm of Tang poetry.

### **3.2.2 Development and promotion of cultural and tourism products along the Tang poetry road**

Based on the cultural connotation and tourism resources of the Tang Poetry Road in Eastern Zhejiang, a series of distinctive Tang poetry cultural tourism products will be developed. These products, themed around Tang poetry, combined with local history, culture, and natural landscapes, will offer diversified tourism experiences. Cultural experience tours, poetry study tours, and other tourism products can also be developed. Through creative design and interactive experiences, tourists can feel the charm of Tang poetry and enhance the quality and attractiveness of cultural tourism. Leveraging the advantages of the "Internet +" era, combining the authority of newspapers and television with the characteristics of short, flat, and fast new media platforms such as "Weibo" and "Douyin," a multidimensional and multi-directional communication path will be constructed to comprehensively promote and endorse the "pearls" along the Tang Poetry Road. [11] This will shape the brand image of the "Tang Poetry Road in Eastern Zhejiang," for example, by following Tang poetry dramas on parade. Additionally, in the branding strategy of the Tang Poetry Road in Eastern Zhejiang, specialized research is crucial. Through the establishment of high-end think tanks, the cultivation and construction of research teams, and the organization of academic forums and seminars, theoretical and practical support will be provided for the construction of the Tang Poetry Road brand.

## **3.3 Strategies for the Integrated Development of Culture and Tourism along the Tang Poetry Road in Eastern Zhejiang**

### **3.3.1 Strengthen policy guidance and support**

In the process of integrating culture and tourism along the Tang Poetry Road in Eastern Zhejiang, the role of the government is crucial. To fully leverage the guiding and supporting role of the government, a comprehensive and clear

development plan and strategy must be formulated. This not only provides clear development directions for integrated culture and tourism projects but also offers clear policy guidance for relevant enterprises and institutions.[12] To effectively reduce business costs and stimulate market vitality, the government needs to take a series of substantive measures.[13] This includes establishing special funds to support integrated culture and tourism projects, implementing tax exemptions and loan preferential policies to reduce the financial burden on enterprises, optimizing approval processes, streamlining procedures, improving administrative efficiency, and providing more efficient and convenient services to enterprises. Additionally, government supervision and evaluation of integrated culture and tourism projects are crucial. By establishing a sound regulatory mechanism, project quality and efficiency can be ensured, avoiding low-level redundant construction and resource waste. Furthermore, through regular project evaluations, problems can be timely identified and addressed, ensuring the sustainable and healthy development of projects.

### ***3.3.2 Deepen industry-academia-research collaboration and innovation***

In promoting the integrated development of culture and tourism along the Tang Poetry Road in Eastern Zhejiang, deepening industry-academia-research collaboration and innovation is crucial. By establishing close cooperation with universities, research institutions, etc., the intrinsic value of Tang poetry culture can be jointly explored, providing a continuous source of inspiration and driving force for the innovation of tourism products and services. Universities and research institutions possess rich academic resources and research capabilities, providing theoretical support and cultural guidance for integrated culture and tourism projects. Through collaborative research, academic exchanges, etc., the inheritance and innovation of Tang poetry culture in Eastern Zhejiang can be promoted, providing new ideas and methods for the innovation of tourism products and services. Moreover, encouraging enterprises to increase research and development investment is also an important means to promote integrated culture and tourism innovation. Enterprises should actively use new technologies, materials, and processes to upgrade tourism products and services, enhancing their quality and attractiveness. For example, using modern technology to recreate the natural landscapes and character portraits depicted in Tang poetry, providing tourists with a more vivid and authentic experience. In addition, organizing forums, seminars, and other activities for the development of integrated culture and tourism is also an important way to promote information exchange. These activities can not only gather wisdom and resources from all parties to jointly promote the development of integrated culture and tourism innovation but also strengthen cooperation and exchanges among governments, enterprises, universities, and research institutions, promoting in-depth integration of industry, academia, research, and application.

Through the implementation of strategies such as strengthening policy guidance and support, deepening industry-academia-research collaboration and innovation, the integrated development of culture and tourism along the Tang Poetry Road in Eastern Zhejiang can effectively achieve more significant results. This will inject new vitality and momentum into the local economic and social development while providing tourists with richer and higher-quality tourism experiences.

### ***3.3.3 Enhance tourism quality and service levels***

In the process of integrated development of culture and tourism along the Tang Poetry Road in Eastern Zhejiang, enhancing tourism quality and service levels are crucial. High-quality tourism experiences and service quality are key to attracting tourists and maintaining tourist satisfaction. Firstly, it is necessary to enhance the cultural connotation and creativity of tourism products. By deeply exploring the unique charm of Tang poetry culture in Eastern Zhejiang and combining it with tourism products, distinctive tourism projects can be created. For example, Tang poetry-themed cultural tourism routes can be developed, allowing tourists to appreciate the charm and artistic conception of Tang poetry while enjoying natural landscapes. Secondly, it is essential to improve tourism service facilities and service levels. Increase investment in tourism infrastructure construction to improve tourism reception capacity and service quality. At the same time, strengthen the training and education of tourism practitioners, enhance their professionalism and service awareness, and ensure that tourists can enjoy professional and thoughtful services. Additionally, strengthen market supervision and management. Establish a sound tourism market regulatory mechanism, regulate market order, prevent problems such as price fraud and poor service quality. Meanwhile, strengthen tourism safety management to ensure the personal safety of tourists.

### ***3.3.4 Strengthen regional cooperation and coordinated development***

The integrated development of culture and tourism along the Tang Poetry Road in Eastern Zhejiang needs to strengthen regional cooperation and coordinated development. By cooperating and exchanging with other regions, a cultural tourism brand centered around Tang poetry culture can be jointly created to expand market influence. Establish tourism cooperation mechanisms with neighboring areas to jointly develop cross-regional tourism routes and products, achieve resource sharing and complementary advantages. Meanwhile, strengthen cultural exchanges and cooperation with other regions to promote the inheritance and innovation of Tang poetry culture, enhance the attractiveness and influence of cultural tourism. Additionally, strengthen cooperation and exchanges with well-known tourism destinations at home and abroad, learn from advanced tourism development experience and management models, and enhance the overall level of integrated culture and tourism development along the Tang Poetry Road in Eastern Zhejiang.

## **4 TANG POETRY ROAD IN EASTERN ZHEJIANG AND RURAL REVITALIZATION STRATEGY**

### **4.1 Background and Importance of the Rural Revitalization Strategy**

The rural revitalization strategy was proposed in the context of socialism with Chinese characteristics entering a new era. Its aim is to address the issues of unbalanced and inadequate development between urban and rural areas in China, and to promote comprehensive revitalization and sustainable development of the rural economy, culture, ecology, and society. [14]The implementation of this strategy not only concerns the well-being of the vast rural population but is also a crucial step towards realizing the goal of building a socialist modernized country comprehensively. At the national level, great attention has been paid to rural revitalization, and a series of policies have been introduced and implemented to provide strong support for rural development. From the central to local levels, governments at all levels are actively promoting the implementation of the rural revitalization strategy to ensure the prosperity of the rural economy, social stability, and cultural prosperity.

The Tang Poetry Road in Eastern Zhejiang holds a unique position in rural revitalization. As a tourist route with rich historical and cultural heritage, the Tang Poetry Road not only boasts beautiful natural scenery but also embodies profound cultural connotations. It is not only an important carrier for inheriting and promoting the excellent traditional Chinese culture but also a significant engine for promoting rural revitalization and facilitating the development of rural economy and society.

Through the integrated development of culture and tourism along the Tang Poetry Road, it can drive economic development in rural areas, improve farmers' income levels, enhance rural living environments, and promote the inheritance and innovation of rural culture. Meanwhile, the increasing popularity and influence of the Tang Poetry Road also provide strong support and guarantee for the implementation of the rural revitalization strategy.

## **4.2 Practices of Tang Poetry Road in Eastern Zhejiang in Promoting Rural Revitalization**

### ***4.2.1 Inheritance of rural culture along the Tang poetry road***

The Tang Poetry Road in Eastern Zhejiang is not only a tourist route but also a cultural corridor. It connects numerous historical and cultural sites and natural landscapes, carrying rich Tang poetry culture and regional characteristics. Through the integrated development of culture and tourism along the Tang Poetry Road, the unique charm of rural culture can be deeply explored, and the inheritance and innovation of rural culture can be promoted [15]. On one hand, the development of culture and tourism along the Tang Poetry Road provides a new platform and opportunities for the inheritance of rural culture. By organizing Tang poetry cultural activities, poetry experience activities, etc., more tourists can be attracted to rural areas to experience the charm of rural culture firsthand. These activities not only allow tourists to appreciate the charm and artistic conception of Tang poetry but also enhance their sense of identity and belonging to rural culture. On the other hand, the development of culture and tourism along the Tang Poetry Road also provides impetus for the innovation of rural culture. Based on inheriting traditional culture, local tourism and cultural products with modern elements and creative concepts can be developed. This not only enriches the connotation and extension of rural culture but also injects new vitality into rural economic development.

### ***4.2.2 Promotion of rural economy by the Tang poetry road***

The integrated development of culture and tourism along the Tang Poetry Road plays a significant role in revitalizing the rural economy. Firstly, by attracting tourists to visit, it can increase rural tourism income and improve farmers' economic income levels. At the same time, with the increase in the number of tourists, it will also drive the development of related industries such as rural catering and accommodation, further promoting the diversified development of the rural economy. Secondly, the development of culture and tourism along the Tang Poetry Road can also promote the upgrading and transformation of rural industries. Under the drive of the tourism industry, rural areas can develop characteristic agriculture, ecological agriculture, and other new agricultural industries, improving the added value and market competitiveness of agricultural products. Additionally, characteristic industries such as handicrafts and cultural creativity can be developed to add new growth points to the rural economy. [16] Lastly, the integrated development of culture and tourism along the Tang Poetry Road can also promote the construction of rural infrastructure and environmental improvement. With the rise of the tourism industry, rural infrastructure such as transportation, communication, and accommodation will be improved, providing better living conditions and development environment for rural residents. Meanwhile, through the improvement and protection of the rural environment, a more beautiful and livable rural landscape can be created, attracting more tourists to visit and reside.

## **4.3 Empowering Rural Revitalization Implementation with the Tang Poetry Road**

### ***4.3.1 Advocating government support and providing funding and policy support***

The government plays a crucial role in promoting the integration of the Tang Poetry Road with rural revitalization. Firstly, the government should provide sufficient funding support to ensure the smooth implementation of relevant projects. This includes funding for infrastructure construction, cultural heritage protection, tourism product development, and more. At the same time, the government should introduce a series of preferential policies such as tax incentives, loan support, etc., to attract more social capital into the cause of integrating the Tang Poetry Road with rural revitalization.

In terms of policy support, the government should formulate and improve relevant laws and regulations to provide legal guarantees for the integration of the Tang Poetry Road with rural revitalization in Eastern Zhejiang. Additionally, the government should establish a cross-departmental cooperation mechanism to strengthen communication and collaboration among various departments, ensuring the smooth implementation of various policies. Meanwhile, the

government should also encourage and support the participation of diverse entities such as enterprises, social organizations, etc., in the cause of integrating the Tang Poetry Road with rural revitalization, forming a good situation of government guidance, market leadership, and social participation.

#### **4.3.2 Encouraging public participation to foster a collaborative and sharing environment**

Public participation is one of the key factors in integrating the Tang Poetry Road with rural revitalization in Eastern Zhejiang. Only by actively involving rural residents and tourists in relevant activities can a collaborative and sharing environment be formed. Therefore, the government and society should strengthen the publicity and promotion of the integration of the Tang Poetry Road with rural revitalization, raising public awareness and participation.

Specifically, various cultural activities and training courses can be organized to stimulate the interest and enthusiasm of rural residents in the culture of the Tang Poetry Road. Meanwhile, establishing volunteer teams, carrying out public welfare activities, and other methods can attract more social forces to participate in the cause of integrating the Tang Poetry Road with rural revitalization. Additionally, establishing a sharing mechanism allows tourists and rural residents to participate together in the development and operation of relevant projects, creating a good situation of shared interests and shared responsibilities.

## **5 THE INTERCONNECTION OF THREE IMPORTANT DIMENSIONS**

Through in-depth research on the Tang Poetry Road in Eastern Zhejiang, we can easily observe that in its construction, three important dimensions are interconnected and mutually reinforcing. The historical origins of Zhejiang East Tang Poetry culture provide a profound foundation for the inheritance of Chinese traditional culture, while the inheritance of this traditional culture injects new connotations into Zhejiang East Tang Poetry culture. As a bridge connecting Zhejiang East Tang Poetry culture and local economy, the integrated development of culture and tourism makes the Tang Poetry Road in Eastern Zhejiang both a continuation of history and a product of modern society. The interplay of these three dimensions creates the unique charm of the Tang Poetry Road, offering a new path for the cultural development and economic prosperity of the region.

The construction of the Tang Poetry Road in Eastern Zhejiang brings comprehensive benefits in multiple aspects. Firstly, in terms of cultural inheritance, by excavating the historical roots of Tang Poetry culture, the Tang Poetry Road is expected to become a carrier of traditional culture, providing a solid foundation for future generations to inherit. Secondly, in terms of economy, the integrated development of culture and tourism will promote the prosperity of the local tourism industry, stimulate the growth of related industries, and generate comprehensive economic benefits. At the same time, through deep integration with local handicrafts and cultural products, the Tang Poetry Road in Eastern Zhejiang can also serve as a stimulant for promoting local craft traditions. Lastly, in the social aspect, the construction of the Tang Poetry Road in Eastern Zhejiang will inspire people's love for traditional culture and encourage society to pay more attention to cultural literacy, fostering a positive and harmonious cultural atmosphere.

It is expected to achieve more significant results in the cultural, economic, and social aspects. Firstly, culturally, we look forward to the Tang Poetry Road becoming a new highlight of traditional culture, attracting widespread attention domestically and establishing itself as a model of local culture internationally. Secondly, economically, the Tang Poetry Road is expected to become a key pillar of the cultural tourism industry in the Zhejiang East region, injecting continuous momentum into local economic development. Finally, socially, we hope that the construction of the Tang Poetry Road will encourage more people to pay attention to and love traditional culture, fostering a civilized, rational, and harmonious social ethos.

## **6 CONCLUSION**

The construction of the Tang Poetry Road in Eastern Zhejiang is both a historical mission and a responsibility and commitment to traditional culture. By delving into the historical roots of Tang Poetry culture, promoting the inheritance and development of Chinese traditional culture, and leading the integrated development of culture and tourism, the Tang Poetry Road will usher in a new wave of cultural, economic, and social vitality in the Zhejiang East region. This process is not only a tribute to the past but also an aspiration for the future. We hope that the Tang Poetry Road in Eastern Zhejiang will become a splendid chapter in the inheritance and development of Chinese culture, paving the way for future generations to connect with history and the future.

## **COMPETING INTERESTS**

The authors have no relevant financial or non-financial interests to disclose.

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# THE CONTRAST OF CHINESE ECONOMIC IMAGES BUILT BY THE INTERNAL AND EXTERNAL MEDIA FROM THE PERSPECTIVE OF PHOTO NEWS ABOUT POVERTY ALLEVIATION

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**Abstract:** Photo news is one of the most important form of media transmission in the visual culture times, of which typical strategy of visual rhetorics is visual images. In the practice of visual rhetorics, the generation of visual images is a significant reason for the persuasive function of certain symbol. Visual images can be divided into three categories: archetype images, concept images and code images. Archetype images refer to the stereotyped forms repeatedly used in a certain tradition for a long period. Concept images can be recognized as the visual form to express specific conceptual content. Code images are mostly the combination of a series of symbols. Three kinds of visual images usually coexist in specific visual texts, echoing active dialogue with each other. The research on differences of visual images between Chinese and foreign media in Chinese economic picture news can reveal the characteristics of Chinese economic images of self-shaping and other-shaping. In this regard, this paper selects internal and external mainstream media, such as, People's Daily Overseas Edition, CNN, BBC and so on, which often publish photo news as the source of corpus, taking photo news about poverty alleviation as an example. This paper analyzes how the Chinese and foreign media present Chinese plan of poverty alleviation to the international community through visual images, thus building images of Chinese economy.

**Keywords:** Visual images; Poverty alleviation; Photo news; Economic images

## 1 INTRODUCTION

The achievements of China in poverty alleviation are remarkable. Through the efforts of the Chinese government, as well as a series of effective policy measures currently, China has entered the stage of comprehensively building a moderately prosperous society and revitalizing rural areas. It is crucial to consolidate and expand the achievements in poverty alleviation, promote sustainable development in poverty-stricken areas, and actively create the image of great power in the international community and convey the idea of poverty alleviation, in which news is playing a significant role [1].

With the advent of the era "reading pictures", it is realized that photos in news are not only used to deliver the facts, but also represent hidden language, which is the visual embodiment of implications [2]. Therefore, appropriate application of photos is beneficial for making it livelier and more infectious for poverty alleviation news. To shoulder the critical mission to show the world China's economic developments, poverty alleviation strategies and core values, it is an inevitable tendency to combine traditional text-based forms with photos, especially visual images of which to form rich visual narratives.

The research is carried out on the basis of the propositions by Liu Tao about how to classify and identify different kinds of visual images. And the analysis made on results of the research can also be combined with theories of rhetoric, semiology and communication. As China's economic growth is becoming more and more influential, it is necessary to pay attention to how China's economic images are shaped by the internal and external media. In this research, photo news is the main way to study the shaping of China's economic images with the specially chosen topic of poverty alleviation. Research objects, which are photos in poverty alleviation news from some mainstream media, including China Radio International, CCTV, BBC, Associated Press, etc., is collected. The research aims to explore the characteristics of Chinese economic images shaped by the internal and external media through distinguishing discrepancies of visual images shown by these photos.

## 2 LITERATURE REVIEW

Peter Collet, in his work *A Manual of Body Language*, wrote that 60% of the information with high dissemination efficiency is delivered with photos. And in the work *Destiny Choice: Survival Options for the 21<sup>st</sup> Century* written by E.

Laszlo, he mentioned the concept of “era of reading pictures” and proposed that photos of news are combination of visual symbols with particular implications.

Visual image, a complex of reason and emotion with persuasive effects spread by photo news, is employed in studies of visual rhetorics [3]. According to Liu Tao, visual images can be divided into archetype images, concept images and code images. Archetype images refer to stereotyped images that has been repeatedly used in a certain culture for a long time and has been developed into a fixed connotation. Concept images can be used to convey specific concepts. And code images are presented by a series of symbols. Through this classification, characteristics and differences of Chinese and foreign media’s visual images can be explored in China’s economic picture news, especially in the aspect of poverty alleviation, and China’s economic images built by the internal and external media can be contrasted and analyzed.

### 3 CONTRAST OF VISUAL IMAGES PRESENTED BY THE INTERNAL AND EXTERNAL MEDIA

#### 3.1 Archetype Images

Carl Gustav Jung thought that, as an important part of the collective unconsciousness, archetypes are primitive and innate ethnic memories [4]. Archetypes are rooted in empirical world, inherited unconsciously from complex cultural traditions to become meaningful. Archetype images, carried with cultural metalanguage, are used to convey social and cultural interpretations expressed by photos.

##### 3.1.1 The internal media: rainbow

In China, there’s a widespread saying that rainbow comes after a storm. In Chinese culture, the rainbow not only reminds people of the hardships in the process, but also allows people to witness and enjoy the beautiful results. In the photo released by CCTV on December 27, 2023, the rainbow, in the middle of the photo, is fantastic and noticeable. This shows that there’re lots of problems in poverty alleviation work, but great accomplishments have been achieved, which is worthy of people’s happiness. (Figure 1 shows)

##### 3.1.2 The internal media: the great wall

The Great Wall is one of the most prominent defensive structures in Chinese history, built to protect the country from external invasions. From this perspective, when associated with poverty alleviation, it can be interpreted that poverty alleviation, as a way of becoming stronger, can protect people from sufferings.

And the construction of the Great Wall was a challenging and arduous process, undertaken in harsh natural environments with significant obstacles, requiring immense patience, perseverance, and unwavering courage. Therefore, it can also symbolize the tortuous road to poverty alleviation and people’s crucial spirits and efforts. (Also seen the following Figure 1).



**Figure 1** The Old Village Is Reborn

##### 3.1.3 The internal media: sweat

Sweat is seen as a symbol of hard work and great efforts. It represents personal or collective dedication in achieving goals or completing tasks. Sweat is the product of diligent labor. Therefore, it is regarded as a recognition of diligence, paying tribute to professionalism.

In the photo published by CCTV on February 15, 2020, the woman’s cheeks were wet with sweat. However, she’s still trying to



present their products, which is quite appealing and touching. As shown in Figure 2.



**Figure 2** Overcome Problems in Poverty Alleviation

### **3.1.4 The external media: dragon**

In the recognition of foreigners, the Chinese national totem is closely connected with the dragon. And dragon, as a mysterious animal, it is similar to Chinese long history full of unknown possibilities. In addition, crucial roles were played by China's cultural export and depictions of the image of China as a dragon in some foreign films and animations.

For example, there's a red dragon in the photo posted by Associated Press on January 6, 2024. And the reporters also portrayed China's economic growth as a flying dragon. As shown in Figure 3.



**Figure 3** China Seeks for Economic Development with Unique Icon

### **3.1.5 The external media: the national flag and the national emblem**

The national flag and the national emblem are important identities of a country, symbolizing widespread recognition in the international community. Both of the five-starred red flag, as the national flag of China, and the national emblem of the People's Republic of China represent China's modern images and appear in major events or meetings in the world.

When the external media try to tell Chinese story of poverty alleviation, they usually use photos of the five-starred red flag and the national emblem of the People's Republic of China to represent China and stress the roles China's government and Communist Party of China have played. As shown in Figure 4.





**Figure 4** China Held Summary Commendation Conference of Poverty Alleviation

### 3.2 Concept Images

According to Qian Zhongshu, images can be used to express specific concepts, which is similar to metaphor. Therefore, concept images can be defined as reflections from photos to cultural contents.

#### 3.2.1 *The internal media: inheritance*

In China, inheritance is a significant concept deeply rooted in people's heart and can inspire a sense of cultural identity and moral responsibility. In poverty alleviation, inheriting agricultural traditions, handcrafted techniques and sense of responsibility which makes generations and generations of Chinese persist in and contribute to China's great poverty alleviation work.

And always implementing successful poverty alleviation policies and projects is also a kind of inheritance, which is essential for ensuring the continuity and sustainability of poverty alleviation. By inheriting successful poverty alleviation models, policies, and lessons learned, duplication of work can be avoided, resulting in increasing efficiency and effectiveness.

In the east of Xizang, local people are trying to get rid of poverty through their unique painting skill making colorful and beautiful handicrafts. In the news reported by Xinhua News Agency on November 12, 2023, the first photo chosen is a group photo. The middle old man is Gamadle, the tenth-generation inheritor of the Tangkaga Magachi painting school, and young people around him are his students who determine to pass the skill on. As shown in Figure 5.



**Figure 5** Images of Poverty Alleviation in Eastern Xizang: "Painting Charm" Helps Poverty Alleviation

#### 3.2.2 *The internal media: bright color*

In China, bright colors usually carry diverse good meanings. For example, yellow represents wealth and harvest in Chinese culture. It

is closely associated with kindness, fertility and the power of soil, and is considered an auspicious color that brings good luck. Green symbolizes life, hope, and growth. It is connected with the natural environment and agricultural development, and is considered a color that symbolizes health and luck.

For example, the photo released by CCTV on December 20, 2019 presented broad sky, bright green and yellow farmlands and neatly arranged houses with red roofs. The combination of these beautiful colors and wide field of vision made it seem more charming and bustling with life. As shown in Figure 6.

Another example is a photo posted by CCTV on February 15, 2020. In this photo, a beam of warm yellow light shone through the roof, and a mass of green shoots were growing in the sprinkling shining water. It's a scene with a riot of color and animation. As shown in Figure 7.



**Figure 6** We've Gotten Rid of Poverty!



**Figure 7** Overcome Problems in Poverty Alleviation

### 3.2.3 The external media: change

For foreign media, it is more important to show the changes have happened in China, rather than the ideas and cultural concepts the government intended to convey. And through presenting modernized and beautiful scenery, economic growth can be clearly felt. Therefore, photos of much external news about Chinese economy, in particular, poverty alleviation, focused on the overview of poverty-stricken areas, combined with depictions of the past lives there to stress the amazing changes.

For instance, BBC used to post a photo of a village with high level of modernization which used to be troubled by severe poverty on October 11, 2021. The beautiful buildings, clear and blue sky and dense plantations made people impressive and shocked (Figure 8). It's also true of Figure 9, a photo released by Associated Press on March 23, 2022.





**Figure 8** China Welcome Changes!



**Figure 9** China Calls for More Attention to Areas in Poverty

### 3.3 Concept Images

Code images are derived from real things, specially carrying cultural sentiments and common social beliefs, which made them have relatively stabilized meanings. They can not only be recognized as a single symbol, but also appear in the form of a series of symbols, which are called collective images. Particularly, collective images coexist to form a complete jigsaw of implications.

#### 3.3.1 *The internal media: related people*

The focus of photos chosen by the internal media are mostly related people, including peasants, handicraftsmen and responsible cadres. And the cases are usually several people in a photo or several single photos.

Firstly, peasants have held a significant position and symbolic meaning in Chinese society and culture for a long history. As the largest population group in China, they remind people of the vastness of rural areas, the importance of agriculture, and the power of hard work, often being portrayed as the cornerstone of China's economic and social development. Secondly, handicraftsmen who are not only trying to get rid of poverty depending on their own unique skills, but also spreading valuable Chinese handicraft culture. Thirdly, cadres who are responsible for poverty alleviation play a crucial role in implementing relevant policies and projects. And they represent the government's efforts in poverty alleviation and shortening the gap between urban and rural areas.

For example, the photo chosen by the news published on May 16, 2019 by China Radio International with the title of *On the Road of Consolidating the Achievements of Poverty Alleviation* focused on local officials who were reviewing the results of improving agriculture equipment. All of them immersed themselves in the thoughtful and deep conversation, which showed the government's concerns on poverty alleviation (Figure 10).



**Figure 10** On the Road of Consolidating the Achievements of Poverty Alleviation

And some photos about poverty alleviation are centered on people who are strive to get rid of poverty through their own efforts, such as, peasants and handicraftsmen. The news on May 19, 2017 reported by CCTV used a series of photos of working people to tell Ganzhou's story of poverty alleviation and collectively make impressions of hard labor and harvest to imply development of local economy (Figure 11).



**Figure 11** To Witness Poverty Alleviation in Ganzhou Old Area from Three Screenshots

### **3.3.2 The internal media: poverty alleviation products**

Poverty alleviation products refer to agricultural and sideline products and special handicrafts, which can show others the main way local people overcome poverty and become better off. In this way, the significance of agriculture and the efforts made by local people to improve their living conditions can be highlighted.

And by showcasing the imagery of agricultural products, it is helpful to promote the products with the focus of the quality and abundance, leading to increasing sales and good reputation. This, also, is a way to demonstrate the achievements of poverty alleviation they have made.

For example, fresh and plump tomatoes were presented in the photos of the CCTV news on January 20, 2023, from which people can not only see local peasants' sweat and labor, but also be touched by their happy and fulfilling lives (Figure 12). And the photo of colorful and well-designed stalls and booths released by Xinhua News Agency on May 23, 2023 also showed how local people were trying to promote their products and even form their own brand "Zhenziwei". They're also fully utilizing the trend of helping rural revitalization to publicize their products and the unique brand (Figure 13).





**Figure 12** The Key to Poverty Alleviation Is Hard Work



**Figure 13** The Brand Created by Rural Revitalization, the Feelings Stored by Poverty Alleviation

### 3.3.3 The external media: combination of construction and people

When portraying China's economic images, especially telling the story of poverty alleviation in China, foreign media usually tend to prioritize showcasing the development of infrastructure and living conditions. They often combine these with people who are enjoying the achievements or few laboring people to demonstrate improvements in infrastructure and social welfare. This emphasizes material improvements and economic growth, highlighting advancements in national development, while, to some extent, unavoidably ignoring the efforts made by local people.

For example, Associated Press used to release some photos about China's economic growth because of measures about poverty alleviation which showed that a man riding an electric vehicle with the vast background of some high buildings under construction. This actually stressed great economic developments witnessed in China and the necessary role China's government is playing in improving people's living conditions. However, it's hard to seek for hints of hard work made by local people. (Seen Figure 14 below)



**Figure 14** China Pledges More Help for Rural Area to Get Rid of Poverty

## 4 CONCLUSION

### 4.1 Summary

Although visual images are divided into archetype images, concept images and code images, and are studied separately, there're overlaps in definitions of these three parts. For instance, farmlands can not only be seen as a kind of archetype images bearing people's expectation and attachment, but also be regarded as a code image representing farming culture and Chinese identities.

Overall, the internal media focus on people-centered philosophy, which means that the visual images used in related photo news are about people, including peasants, handicraftsmen and party and government cadres. Therefore, domestic media stress the great efforts people made and valuable spirits people brought into full play. This can help portray China's economic images as setting the starting point and goal of improving people's living conditions.

Besides, domestic media pay a lot attention to spiritual concern and actively spreading positive energies. For example, they usually use bright colors, people's smiling faces, positive spirits and so on to enhance people's happiness and cultivate core values of socialism. It's beneficial to prove that China's positive factors, such as putting people's well-being in the first place and focusing on unity and cooperation, can help to shape the economic image of a people-centered, stable and sustainable country that values people and has international influence.

While the external media pay more attention to the achievements of poverty alleviation China has made, therefore, the photo news on this topic is centered on the scene after poverty alleviation, such as, improved primary construction, full harvest of products and picturesque scenery. This can help to portray China's images as a country of high-speed economic development and emphasizing the problem of unbalanced development.

### 4.2 Suggestions

News media should strive for a comprehensive and objective perspective in reporting Chinese economy. Coverage should reflect various aspects, including development progress and challenges of the Chinese economy, which means highlighting not only the successful stories but also the difficulties and how people solved them. This will present a more realistic portrayal of China's economy and avoid one-sided and hypocritical reporting.

Providing scientific explanations and ample data support is also necessary when reporting on the Chinese economy. By offering detailed analysis, it helps people home and abroad to better understand the trends and situations of China's economy.

It is essential to focus on the impact of economic development on the lives and well-being of the people, eliciting resonance and

emotional connection from the public. By telling stories of poverty alleviation in particular area and narratives of individuals, it brings economic development closer to people's needs and expectations. This helps shape an economic image of a people-centered, welfare-oriented, and sustainably developing country.

Shaping the image of China's economy will benefit from media having a global perspective and engaging in international dialogue. By covering China's economic issues from fully learning about perspectives of international media and participating in global platforms, it can foster diverse perceptions and international recognition of China's economy images.

## **COMPETING INTERESTS**

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# RESEARCH ON THE HIGH-QUALITY DEVELOPMENT OF DIGITAL VILLAGES FROM THE PERSPECTIVE OF GOOD GOVERNANCE THEORY

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**Abstract:** The high-quality development of digital villages is related to rural revitalization and contributes to the construction of digital China. By combing the compatibility between good governance theory and digital rural construction, this paper analyzes the current situation of digital rural development and finds that there are some problems in the development of digital rural areas, such as the lack of farmers' participation, the inactive participation of social forces, the weak construction of digital infrastructure, and the difficulty of data sharing. To help realize the high-quality development of digital rural areas, this paper puts forward some paths, such as enhancing farmers' digital awareness and level, guiding social forces to actively participate, improving rural digital infrastructure, and promoting the opening and sharing of data resources.

**Keywords:** Digital village; Rural development; Good governance; High quality

## 1 INTRODUCTION

In the process of national prosperity and national rejuvenation, rural development is of vital importance, and the strategy of rural revitalization is the key to building a modern socialist country. At present, with the rapid progress and wide application of digital technologies such as big data, 5G, cloud computing and artificial intelligence, the modernization of agriculture and rural areas has ushered in new development opportunities, and the construction of digital villages has become an important force to promote rural revitalization and the construction of digital China. In this regard, the party and the state attach great importance to the construction of digital villages. Since 2018, relevant policy documents have been issued continuously to point out the direction for the construction of digital villages. In 2019, the " Digital Village Development Strategy Outline " detailed the development goals, and the " Digital Village Development Action Plan (2022-2025)" in 2022 further refined the strategic deployment. In 2024, the No.1 Central Document once again focused on the field of agriculture, rural areas, and farmers, pointing out the direction for the high-quality development of digital villages. Promoting the high-quality development of digital villages is of great significance for promoting the work of agriculture, rural areas and farmers and the modernization of the country, which has become an important issue that needs to be further studied and discussed.

Since the concept of digital village was put forward, the academic community has conducted extensive and in-depth research on the topic of " high-quality development of digital villages " and achieved remarkable results. About its connotation, scholars such as Chengwei Zhao and Zhuqing Xu believe that the high-quality development of digital villages is mainly reflected in alleviating major social contradictions, practicing new development concepts, promoting the smooth flow of the domestic market, and deepening supply-side structural reforms[1]. From the perspective of value, Feng'an Wen pointed out that promoting the high-quality development of digital villages is an important strategic measure to bridge the digital divide between urban and rural areas, build a strong agricultural country and promote Chinese-style modernization[2]. However, the high-quality development of rural areas is not achieved overnight. It is affected and restricted by many factors. Hong Zhang, Kewen Du and other scholars especially emphasize that government service efficiency, rural ecological environment quality and policy environment supporting agricultural development have a significant impact on the high-quality development of rural areas[3]. In exploring the path of promoting high-quality rural development, many scholars have focused their attention on the importance of digital empowerment. Huiyan Liu pointed out that the new generation of information technology is the core driving factor and key driving force to promote the high-quality development of digital villages[4]. Dongjun Ma also proposed to inject new vitality into the high-quality development of rural areas by means of digitization, informatization, digitization and intelligence[5].

Although the academic community has provided diversified ideas and solutions for the high-quality development of digital villages, there are relatively few studies based on the perspective of good governance theory. Considering that the development of digital villages cannot be separated from the participation of multiple subjects such as farmers, government and social forces, this paper aims to combine the theory of good governance to deeply explore the practical challenges and path choices of high-quality development of digital villages, to provide new perspectives and references for related research.



## 2 THE COMPATIBILITY OF GOOD GOVERNANCE THEORY AND DIGITAL RURAL DEVELOPMENT

Good governance is the perfection of governance and an ideal state of governance[6]. The World Bank defines it as a governance process that includes transparent decision-making, responsible government, rule of law protection and active participation of civil society[7]. In the book " Breaking Bureaucracy: A New Vision for Government Management," Michael Blazer further emphasized that the core of good governance lies in social autonomy and the deep participation of citizens[8]. Mr. Yu took the lead in introducing the theory of good governance into China. He believes that good governance aims to maximize public interests. Its elements include legitimacy, the spirit of the rule of law, transparency, responsibility, responsiveness, effectiveness, citizen participation, social stability, integrity, and impartiality[9]. The essence of 'good governance' is the return of state power to society, indicating good cooperation between the state and society, or between the government and citizens[10]. In terms of feasibility analysis, based on the theory of good governance and the characteristics of new rural communities, Huili He proposed a governance strategy suitable for such communities[11]. Shuhan Wang believes that the theory of good governance provides a new model for dealing with the relationship between government and citizens[12]. Qianshan Tian emphasized that good governance ensures the fundamental role of public policy in safeguarding publicity and realizing public interests. In summary, good governance, as a frontier governance model, has a wide range of applications and can provide a valuable theoretical framework and analytical paradigm for the development of digital villages[13]. Therefore, this paper aims to use the essence of good governance theory, with responsibility, interaction, sustainability, and efficiency as the core concepts, to build a development framework with farmers as the main body, government as the guide, enterprises as the support, and social forces as the broad participation, so as to further explore the feasible path for digital villages to achieve high-quality development.

## 3 ANALYSIS OF THE CURRENT SITUATION OF DIGITAL RURAL MULTI-CONSTRUCTION

### 3.1 The Current Situation of Farmers' Participation in the Development of Digital Villages

At present, digital rural construction has become a new trend of rural governance and an important basis for promoting agricultural and rural modernization. However, although farmers are the main constituent groups of villages, their actual effectiveness in the construction of digital villages is relatively limited. The contribution of farmers in participating in the digital construction of their hometowns is not significant. The main responsibility of rural governance falls mostly on the shoulders of village cadres, party members and rural sages. The role of farmers in rural management and digital construction is not prominent. Recently, the China Rural Research Institute of Central China Normal University conducted a questionnaire survey and in-depth interviews with 1815 farmers in 121 villages in 21 provinces around the theme of " digital rural construction." According to the survey, among the 58 digital village samples, 36 village digital platforms are mainly used for information collection and daily office of the " two committees " of the village, and the villagers' ports have not been developed, and the proportion is 62.07 %, and 74.44 % of the farmers said that the village online service platform has too few functions, and some certificates must go to the county to do it[14]. This result shows that there is less interaction between farmers and data construction, and there is also a distance between digital platform and farmers, which can not meet the needs of villagers' daily life.

### 3.2 The Status Quo of Government Participation in Digital Rural Development

The government mainly carries out digital rural construction by introducing policy support and increasing capital investment. In terms of policies, the national government issued "digital rural construction demonstration village (community) project notice" rural informatization construction "3-year action plan" "digital agriculture rural development plan (2019-2025)" and other policies, the local government issued a number of policies such as "Zhejiang Province Digital Rural Construction Implementation Plan" "Hunan Province Smart Radio and Television Rural Project Construction Implementation Plan." In terms of capital investment, national and local governments at all levels have increased their investment in digital villages year by year. In 2021, the national social capital investment for the construction of county agricultural and rural information digitization will be 954.6 billion yuan, and the per capita investment in rural areas will be 135.2 yuan, an increase of 24.0 % over the previous year[15]. Yingde City Finance Bureau of Guangdong Province has helped to strengthen financial security in the construction of digital villages. In 2020-2021, the overall financial funds will be 2.8 million yuan to promote the construction of digital projects, and the overall financial funds will be upgraded to 3.5 million yuan in 2022-2023[16].

### 3.3 The Current Situation of Enterprises' Participation in the Development of Digital Countryside

Enterprises play an increasingly important role in the development of digital villages. The current situation of participating in the development of digital villages is reflected in many aspects such as infrastructure construction, digital agriculture development, and digital governance exploration. For example, in terms of infrastructure construction, Alibaba has opened a rural Taobao project. By establishing service sites, training rural Taobao partners, and providing one-stop e-commerce solutions such as commodity procurement, logistics distribution and after-sales service, it

connects rural and urban markets. It provides a convenient online shopping experience for rural residents, activates the rural economy, promotes local employment and entrepreneurship, and has a positive impact on narrowing the digital divide between urban and rural areas and accelerating the process of rural modernization[17]. In terms of the development of digital agriculture, Sinochem Group actively responded to national policies, promoted the transformation of traditional agriculture to modernization, and helped to overcome poverty. The specific applications are: monitoring crop growth through remote sensing, weeding using AI technology, and using big data to analyze production[18].

### **3.4 The Current Situation of Social Forces Participating in Rural Digital Development**

Social forces play an important role in the construction of digital countryside. At present, the current situation of social forces participating in the construction of digital countryside is mainly manifested in the following aspects: non-governmental organizations and financial institutions provide digital services to the countryside through digital philanthropy, rural e-commerce, rural logistics, rural finance and other ways. Such as social forces through the Internet platform, in the digital, public welfare action digital and institutional management of digital three aspects of charitable donations, its total fund-raising from 436 million yuan in 2014, increased to the recent annual scale of nearly 10 billion yuan[19]. Some social workers will also organize online and offline digital training activities with the government to cultivate rural residents' digital skills and promote the application of digital technology in rural areas. For example, from May to June 2023, the Provincial Party Committee Network Information Office, together with relevant departments directly under the provincial government, cities and states, national digital literacy and skills training bases for the whole people and relevant social organizations, carried out a series of activities throughout the year. More than 1,300 events, more than 5,800 open and shared digital education resources, online and offline coverage of more than 15 million people, promotion of digital technology applications, enrichment of education and learning resources, strengthening of capacity-building training, and promotion of good network culture[20].

## **4 ANALYSIS OF THE PROBLEMS AND CAUSES IN THE DEVELOPMENT OF DIGITAL VILLAGES**

### **4.1 The Lack of Farmers' Participation in the Process of Digital Rural Construction**

In the process of digital rural construction in China, the lack of farmers' participation has become an important factor restricting the improvement of their endogenous power. Due to the uneven distribution of educational resources among regions, rural areas are generally faced with the problem of lack of educational resources, which leads to the generally low education level of farmers. At the same time, due to the relatively backward economy in rural areas, farmers have a low level of contact and cognition of digitization. Their ability to use modern digital technologies such as 5G, big data, and artificial intelligence is relatively weak, and digital literacy needs to be improved. In addition, influenced by the traditional self-sufficient small-scale peasant economic thinking, many farmers show a more conservative and closed attitude. They are skeptical and resistant to new technologies and new things and are unwilling to actively strengthen their ties with the outside world. It is also difficult to deeply understand the actual benefits brought about by digitization. This mentality makes them lack the motivation to actively learn and apply new technologies, and their willingness to participate in digital rural construction is weak. More importantly, some government and village committee departments may not fully realize the important role of farmers in digital rural construction, so the opportunities and channels for farmers to participate in digital rural construction are relatively limited. This situation further aggravates the lack of participation of farmers in digital rural construction and limits the comprehensive development and in-depth advancement of digital rural construction.

### **4.2 Social Forces are Not Active in Participating in Digital Rural Construction**

The negative participation of social forces has significantly affected the overall effectiveness and efficiency of digital rural construction. The primary reason is that the lack of policy publicity and guidance makes social forces lack awareness of digital rural construction, and it is difficult to grasp its importance and potential commercial value. In addition, the resources and information related to digital rural construction they obtained are relatively limited, not detailed and comprehensive enough. Secondly, under the influence of multiple factors such as the impact of Western culture and the widening gap between urban and rural development in the context of globalization, social forces are more inclined to focus resources and investment on urban development, while the attention and investment enthusiasm for digital rural construction are obviously insufficient. Furthermore, as a long-term and complex systematic project, digital rural construction requires continuous and large capital investment. However, due to the relatively low economic level and consumption capacity in rural areas, investors often worry about low return on investment and high risks, so they are cautious about digital rural construction. Finally, the lack of effective cooperation and coordination mechanisms among the government, farmers, enterprises and other stakeholders in the construction of digital villages leads to the difficulty of effective integration of resources, which undoubtedly increases the difficulty of participation of social forces and further restricts the overall promotion and effect realization of digital village construction.

### **4.3 Digital Infrastructure Construction is Weak**

The weakness of digital infrastructure is one of the core elements that restrict the development of digital villages. At the policy support level, although China has issued a series of policy documents aimed at promoting the development of digital villages, such as the " Digital Village Development Action Plan ( 2022-2025 ) " and the " Digital Village Development Strategy Outline, " and there are many suggestions on strengthening the construction of rural digital infrastructure, the specific measures and detailed guidance for the construction of rural digital infrastructure are still lacking, and there is no special policy guidance and support. In terms of capital supply, in view of the relatively backward economic development in rural areas, insufficient market demand and low return on investment, the willingness of rural areas and enterprises to invest in the region is generally not high. Therefore, the source of funds for rural digital infrastructure construction mainly depends on the government's financial allocation. The single source of funds and the limited supply of funds seriously restrict the breadth and depth of rural digital infrastructure construction. In terms of technology and talent support, due to the uneven distribution of educational resources, the serious brain drains and the constraints of traditional concepts, rural areas are lagging behind in scientific and technological innovation and technology application. The shortage of professionals in the digital field has become an important factor restricting the progress and quality of digital infrastructure construction. In addition, the complex and changeable terrain conditions in rural areas further increase the difficulty and cost of infrastructure construction, making the promotion of digital rural construction face greater challenges.

#### **4.4 Data Sharing is Difficult and There is an Information Island**

The phenomenon of information island has become a significant problem restricting the in-depth development of digital villages. At present, compared with cities, rural areas are significantly lagging behind in the construction of information infrastructure. Basic information facilities such as optical fiber networks, broadband networks, and 5G networks have not yet been fully covered, and there are compatibility problems between information systems in some regions and departments, which seriously affect the effective collection, storage and transmission of data. At the level of policies and regulations, data sharing lacks clear normative standards and a sound legal system, which makes it difficult to define the rights and responsibilities of all parties in the sharing process, thus affecting the quality and safety of data sharing. In addition, rural areas have not yet established a unified grass-roots information sharing mechanism and a digital rural big data comprehensive information platform, resulting in a lack of unified platform support for data sharing, rural data information showing a fragmented state, increasing the difficulty of task division and overall coordination. More importantly, due to the limitation of traditional concepts and cognitive level, the relevant subjects in rural areas lack a deep understanding of the importance and significance of data sharing, and the awareness of data sharing is relatively weak, which aggravates the difficulty of data sharing to a certain extent. Under the joint action of the above factors, the phenomenon of information island has been formed in the process of data sharing in rural areas, which seriously hinders the high-quality development of digital villages. Therefore, breaking the information island and promoting the sharing and integration of rural data are of great significance for promoting the in-depth development of digital villages.

## **5 THE PATH SELECTION OF HIGH-QUALITY DEVELOPMENT OF DIGITAL VILLAGES**

### **5.1 The Path Selection of High-Quality Development of Digital Villages**

In order to enhance farmers' awareness and ability to participate in digital rural construction, the government can adopt a series of strategies. First of all, the government should issue relevant policy documents to provide technical assistance, financial support and other incentive measures for farmers participating in digital rural construction, so as to reduce the threshold for them to participate in the construction and stimulate their enthusiasm. Secondly, grassroots organizations such as village committees and agricultural cooperatives should actively carry out digital education activities and explain the strategic significance and practical benefits of digital rural construction to farmers by holding digital knowledge lectures, so as to enhance their awareness of participation. Subsequently, these organizations can organize special training courses aimed at improving farmers' ability to use digital 'new farm tools', so that they can skillfully use digital devices such as smartphones and computers and master the operation methods of agricultural informatization applications. In addition, the government should encourage enterprises, non-governmental organizations and other social forces to actively participate in the improvement of farmers' digital skills and introduce advanced digital services and training resources into rural areas through cooperation mechanisms to achieve resource sharing and mutual benefit. Finally, it is very important to build a platform for farmers to exchange and interact, which can not only promote the sharing of experience and exchange of experience among farmers, but also encourage them to learn from each other and encourage each other, thus creating a positive digital rural construction atmosphere.

### **5.2 Improve the Relevant Policy System and Guide Social Forces to Actively Participate in the Construction**

To actively guide social forces to deeply participate in the construction of digital villages, the primary task is to formulate and improve relevant publicity strategies, enhance social forces' awareness and understanding of the importance of digital village construction, and reveal its potential commercial value. At the same time, it is necessary to ensure that social forces are provided with detailed and comprehensive information on digital rural construction

resources so that they can better grasp the opportunities. Secondly, it is necessary to improve the support policies of finance, credit and taxation, and increase the support for social forces. Through preferential policies and incentives, social forces such as enterprises and scientific research institutions are actively encouraged to join the ranks of digital rural construction and give full play to their unique advantages. Furthermore, it is very important to improve the financial subsidy policy. For those who actively participate in the construction of digital villages, reasonable financial subsidies should be provided to reduce their economic pressure. For example, a 'post-subsidy' mechanism can be established to provide financial support for scientific research projects and technological achievements that have been completed and have significant practical value, to promote the innovation and promotion of digital rural construction technology and promote the research and development of digital technology suitable for agricultural development. Finally, in order to ensure the smooth participation of social forces, it is necessary to improve the cooperation and coordination mechanism. Through the establishment of effective communication channels and cooperation platforms, we will promote the effective integration and efficient use of resources, clear obstacles for social forces to participate in digital rural construction and create a good atmosphere for cooperation.

### **5.3 Increase Capital Investment, Improve Rural Digital Infrastructure**

In the process of improving rural digital infrastructure, the primary task is to strengthen the top-level design. The central and local governments should work together to formulate and optimize the specific policy framework for rural digital infrastructure construction, clarify the construction direction, and provide policy guidance and strong support for the smooth implementation of infrastructure construction. As a key factor in promoting the construction of facilities, government departments need to further increase the investment of financial funds. This includes setting up a special pool of funds for the construction of rural digital facilities, adjusting and optimizing the structure of fiscal expenditure, and ensuring that financial support for agriculture is prioritized. At the same time, in order to broaden the sources of funds, social capital participation should be actively introduced. The government can provide tax incentives, subsidies and other incentives for enterprises participating in the construction of rural digital facilities, and follow the principle of "investment is ownership, investment is benefit," in order to attract more social capital into the construction of rural digital facilities. In addition, the power support of technology and talents is also indispensable. On the one hand, we should introduce advanced digital technology, and attract and train excellent digital talents to participate in rural digital construction. The government can formulate preferential policies such as entrepreneurship support and scientific research funding to provide a high-quality growth and development environment for talents. On the other hand, through the organization of digital technology training, providing practical operation opportunities, etc., to enhance the farmers' digital technology application and development capabilities, and provide solid technical and talent support for the improvement of rural digital infrastructure.

### **5.4 Promote the Open Sharing of Data Resources and Enhance the Role of Data Empowerment**

In the development of digital countryside, data elements are very important. It is necessary to promote the opening and sharing of data resources and enhance the role of data empowerment. One is to improve the rural information facilities. Through the government departments to provide policy support, attract enterprises, scientific research institutions, social organizations, and other multi-subjects to join the rural information construction project, and strive to achieve full coverage of basic information facilities such as broadband and 5G network in rural areas, and provide powerful transmission channels and links for data sharing. Second, we should improve the relevant policies and regulations of data sharing, formulate scientific standards for data sharing, and rationally plan the scope of data sharing. For example, we should implement data circulation declaration and commitment system, formulate data sharing implementation plan, and effectively ensure the quality and safety of data sharing. Secondly, it is necessary to build a unified grass-roots information sharing mechanism and a digital rural big data comprehensive information platform, deepen the integration of government affairs, business, agriculture, and digital development, and enhance the role of data empowerment. Finally, it is necessary to enhance the awareness of data sharing among relevant subjects, improve the awareness and acceptance of data sharing among relevant subjects through publicity and education, and further promote the open sharing of data resources.

## **6 CONCLUSION**

The high-quality development of digital villages not only has a profound impact on rural revitalization, but also is a key link in building the development pattern of the new era. Based on an in-depth analysis of the challenges commonly faced by the development of digital villages, this paper explores the possible ways to promote their high-quality development with the help of good governance theory, aiming to provide valuable reference for academic research and practical exploration in the field of digital villages. However, it should be pointed out that the research in this paper has not yet been analyzed in detail in combination with the actual situation of specific villages, which weakens the pertinence and practicability of the research to a certain extent. Therefore, future research will focus on the actual situation of a specific village, and further enhance the pertinence and specificity of the research through in-depth investigation and empirical analysis, in order to provide more accurate and effective guidance for the high-quality development of digital villages.

## COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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# AN INVESTIGATIVE ANALYSIS OF THE MARKET PROSPECTS AND CONSUMER BEHAVIORAL INTENTIONS FOR NEW ENERGY VEHICLES IN GUANGXI UNDER THE CONTEXT OF NEW QUALITY PRODUCTIVITY

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**Abstract:** This paper explores the market prospects and consumer behavior intentions towards new energy vehicles in Guangxi under the context of new quality productivity. By comprehensively applying the American Customer Satisfaction Index (ACSI) theory, Stimulus-Organism-Response (SOR) model, structural equation modeling, and K-means cluster analysis, the multidimensional characteristics of consumer behavior are revealed. The findings are as follows: (1) Age, occupation, monthly income, and marital and parental status significantly influence the purchase of new energy vehicles. Older individuals, higher-income corporate employees and drivers, as well as those who are married with children, have a higher purchase rate. (2) Purchasers prioritize technological innovation and functionality when buying new energy vehicles and tend to opt for emerging brands that incorporate new technologies. Customer satisfaction is directly linked to the quality of new energy vehicles, affecting the willingness for repeat purchases and recommendation behaviors. Thus, enhancing the perception of quality is crucial. (3) The main reason non-purchasers have not bought new energy vehicles is their concerns about safety. Enhancing safety, battery life, and cost-effectiveness are key to attracting potential consumers. Positive feedback on product awareness and online reviews influences purchasing intentions, necessitating targeted approaches to meet the diverse needs of different consumer groups to increase market penetration.

**Keywords:** New Quality Productivity; Guangxi; New Energy Vehicles; Structural Equation Modeling; Strategic Analysis

## 1 INTRODUCTION

On September 7, 2023, General Secretary Xi Jinping introduced the new concept of "New Quality Productivity" at the symposium on promoting the comprehensive revitalization of Northeast China in the new era. This concept delineates the path for technological development in China, emphasizing the role of technological innovation in leading the construction of a modern industrial system. It aims to drive industrial innovation through disruptive and cutting-edge technologies, fostering new industries, new models, and new drivers of growth with the development of new quality productivity[1]. Within the industries characterized by new quality productivity, new energy vehicles have already become extensively integrated into our lives. New energy vehicles, as substitutes for traditional gasoline-powered cars, have been in constant competition with them since their inception. The automotive industry continues to advance, with the development of new energy vehicles increasingly impacting traditional fuel vehicles. Intelligent connected new energy vehicles represent a more advanced form of new quality productivity. Their emergence compared to traditional fuel vehicles is not merely a simple replacement, but a comprehensive evolution. The national government has released numerous policies to support new energy vehicles, categorizing them into four types: regulatory restrictions, economic incentives, support system enhancements, and technological advancements. Exploring the market capacity and potential of new energy vehicles is of significant importance for the development of new quality productivity in China. Additionally, the "Fourteenth Five-Year Plan" explicitly states: "By 2025, the competitiveness of China's new energy vehicle market will have significantly increased, and the core technologies of China's new energy vehicles will reach an internationally advanced level."

According to data, China's domestic sales of new energy vehicles reached 8.292 million units in 2023, marking a year-on-year increase of 33.5%. Exports of new energy vehicles amounted to 1.203 million units, with a year-on-year growth of 77.6%, and the market share reached 31.6%. Data reported by the Guangxi Daily indicates that in Liuzhou, Guangxi, more than 50 out of every 100 vehicles sold are new energy vehicles, and one out of every ten new energy vehicles nationwide is produced in Liuzhou[2]. In advancing the modernization process of China, new quality productivity represents a novel exploration of emerging and future industries, Broadly defined, new quality productivity refers to a new, high level of modernization. As a vital component of new quality productivity, new energy vehicles embody various characteristics of this concept. Studying their market prospects and consumer willingness can provide valuable insights for unlocking market opportunities for other new quality productivity sectors. Fan J et al. [3] found that factors such as economic benefits, performance attributes, environmental awareness, and government policies are crucial for consumers to accept new energy vehicles. Yang Yue[4] mentioned that personal purchase intention is related to behavioral attitudes, subjective norms, perceived behavior, perceived value, and so on. Ackaah Williams et al. [5] used the Theory of Planned Behavior (TPB) to explain consumer purchase intention. Fishbein et al. [6] argued that consumer attitudes are influenced by purchasing intentions and, together with other external factors, affect consumer behavior. Hines et al. [7] suggested that both external situational factors (various policies) and internal situational factors (perceived value, perceived risk, herd mentality) impact purchasing intentions.

Through a literature review, this paper views the consumer behavior towards new energy vehicles as a process of "external factors-internal factors-new energy vehicle purchasing behavior". It examines consumer behavior across six dimensions: brand image, customer expectations, perceived quality, perceived value, customer satisfaction, and customer loyalty. A structural equation model is constructed to analyze consumers' reactions to purchasing intentions for new energy vehicles, providing precise and diversified recommendations for businesses and governments.

In summary, this paper focuses on Guangxi as the primary survey area to explore the current state of the new energy vehicle market. It analyzes the market prospects and consumer behavioral intentions, offering suggestions for the development of new energy vehicles.

## **2 RESEARCH DESIGN**

### **2.1 Data Sources and Preprocessing**

A survey method was employed, utilizing online social platforms for the distribution of questionnaires, to study the current state of new energy vehicle development in Guangxi, as well as consumer purchasing intentions and satisfaction. This approach provides multifaceted insights for the innovative development and marketing promotion of new energy vehicles. On one hand, for consumers who have not purchased new energy vehicles, we investigated the primary reasons for not purchasing, their cognitive evaluations of the product, functional expectations, and the desire and extent to which they are inclined to buy, in order to analyze their purchasing intentions. On the other hand, for new energy vehicle users, we examined their user experience, comparing aspects such as battery life with traditional fuel vehicles, to analyze their satisfaction. The questionnaire was designed and distributed based on the above considerations.

After distributing the questionnaires, the returned copies were manually entered and thoroughly reviewed. Questionnaires with inconsistencies or a significant number of unanswered items were considered invalid and discarded. In instances where a questionnaire had one or several items with missing data, Matlab was used for handling these missing values. The script's code blocks utilized the 'missing' or 'remove' functions to clean up the missing data without affecting the analysis of other items. Thus, questionnaires with missing values were retained as valid but excluded only from the relevant analyses as necessary. Following these steps, a total of 340 questionnaires were collected, out of which 335 were deemed valid, resulting in a final validity rate of 98.53%.

Given that internal consistency reliability is the most frequently employed method for evaluating the reliability of scales in market research, this study primarily assessed the internal consistency of the questionnaire using Alpha reliability. This was accomplished by calculating the Cronbach's alpha coefficient for each survey item using SPSS26.0 statistical software. Each option in the multiple-choice questions was divided into several dichotomous sub-items. Based on the

internal relationships among the questions, these were grouped into two main categories: the satisfaction levels of current new energy vehicle owners and the purchasing intentions of non-owners. The reliability testing conducted with SPSS26.0 indicated that the Cronbach's Alpha coefficients for both categories were above 0.60, with an overall questionnaire reliability of 0.974. This level of reliability is highly credible, indicating that the scales are fully acceptable without need for adjustment, and affirming the scientific and rational design of the questionnaire structure and item configuration.

**Table 1** Reliability Statistics

Category	Cronbach's Alpha	Number of Items
Satisfaction with NEVs	0.991	4
Purchase Intention of NEVs	0.674	2
Overall	0.974	6

Validity refers to the effectiveness, objectivity, reliability, and practicality of a measure, and it assesses the extent to which the results truly reflect the characteristic intended to be measured. To determine the structural validity of the instrument, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity were conducted. The results indicated a KMO value of 0.890, which is well above the acceptable threshold of 0.6, and the significance of Bartlett's Test of Sphericity was 0.000. This suggests that the data are suitable for factor analysis, allowing for the testing of structural validity.

**Table 2** KMO and Bartlett's Test of Sphericity Results (Formal Survey)

Kaiser-Meyer-Olkin (KMO)		0.890
Bartlett's Test of Sphericity	Approx. Chi-Square	1874.474
	DF	6
	Significance	0.000

The results of the factor analysis indicated that two common factors were extracted based on the condition that their eigenvalues exceeded 1. The cumulative percentage of variance explained by these factors reached 97.431%, demonstrating that the structural validity is acceptable. This high variance explained suggests that the factors effectively capture the underlying dimensions of the data being analyzed.

**Table 3** Validity Analysis Results

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total Variance	%of	Cumulative%	Total Variance	%of	Cumulative%
1	2.599	64.965	64.965	2.599	64.965	64.965
2	3.897	97.431	97.431	3.897	97.431	97.431

## 2.2 Empirical Analysis Method Design

### 2.2.1 Qualitative analysis

#### 2.2.1.1 Inductive analysis method

Prior to conducting the survey, we reviewed relevant materials, literature, news articles, and statistical data to understand the current state of new energy vehicle development and market pain points in Guangxi Province. Through the questionnaire survey, we gauged user satisfaction with new energy vehicles and customer purchasing intentions. We



recorded and organized the content from the literature and survey results to gain a deeper understanding of the development of new energy vehicles.

#### *2.2.1.2 Comparative analysis method*

In this survey, we categorized users' feelings about their use of new energy vehicles and conducted a comparative analysis of user satisfaction across different aspects of usage. This approach is beneficial for further analyzing the marketing strategies of new energy vehicles, as it helps identify strengths and areas for improvement in user experience that can influence marketing and development strategies.

### **2.2.2 Quantitative analysis**

#### *2.2.2.1 Verification analysis*

After processing the data obtained from the survey, verification analysis is conducted. This involves performing reliability and validity tests on the questionnaire scales. These tests ensure that the measures used in the questionnaire are both stable and accurately reflect the constructs they are intended to measure.

#### *2.2.2.2 Descriptive statistical analysis*

The data from the questionnaire are entered into Excel, where various functions are used to compute statistics and present them in graphical form. This method provides a simple statistical summary that describes the distribution of the data, divided into three main parts: analysis of central tendency, analysis of dispersion, and correlation analysis. The characteristics of descriptive statistics allow for an intuitive understanding of the data features. In this study, frequency distribution graphs and other charts are created to visualize the basic information of the respondents, providing a clearer picture of the respondents' general distribution, their satisfaction with new energy vehicles, purchasing intentions, and potential for future development.

#### *2.2.2.3 Structural equation modeling (SEM)*

Structural Equation Modeling is a statistical method that analyzes the relationships between variables based on their covariance matrix. It is a vital tool in multivariate data analysis, commonly used for confirmatory factor analysis, higher-order factor analysis, path and causal analysis, multi-time period designs, simplex models, and multiple group comparisons. In this paper, the SEM is utilized to analyze user satisfaction with new energy vehicles based on evaluations from the questionnaire. The model incorporates six latent variables: brand image, customer expectations, perceived quality, perceived value, customer satisfaction, and customer loyalty.

#### *2.2.2.4 S-O-R model*

The Stimulus-Organism-Response (S-O-R) model delineates how external stimuli (S) affect the emotional responses and behaviors (R) of a cognizant organism (O). This model is extensively used to study consumers' willingness to pay. In this study, the SOR model serves as the basic framework, incorporating variables of interest to consumers who have not previously purchased new energy vehicles. Product awareness, online reviews, and advertising features are considered external stimulus variables (S), perceived value is treated as the organism variable (O), and purchasing intention is the response variable (R). This forms the theoretical model affecting consumers' purchasing intentions towards new energy vehicles.

#### *2.2.2.5 K-means clustering algorithm*

The k-means clustering algorithm is an iterative clustering analysis method that organizes data members with similar characteristics into categories. This study employs the K-means algorithm to cluster potential consumer data, thereby identifying the fundamental characteristics of potential consumer groups. Based on these characteristics, effective insights are provided for industry stakeholders to better understand and target their consumer base.

## **2.3 Structural Equation Modeling**

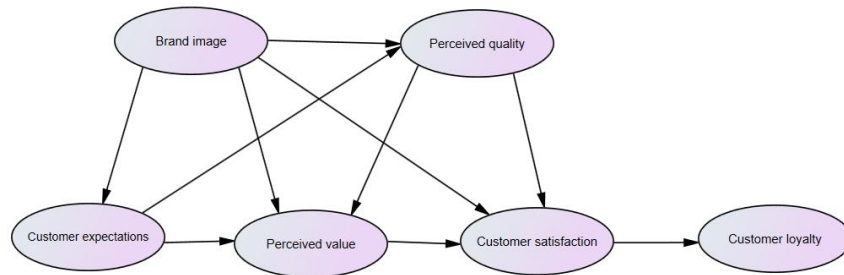
Structural Equation Models (SEM) are a generalized linear statistical modeling technique that has become a crucial statistical analysis tool and methodological approach in contemporary behavioral, psychological, and social research. It was later introduced into the field of economic management. SEM integrates the statistical techniques of "factor analysis" and "path analysis" from traditional multivariate statistical analysis, allowing for the identification, estimation,

and validation of various causal models. SEM deals with latent variables that cannot be directly observed but are of interest to researchers. These latent variables are represented through observable variables (indicators), thus establishing structural relationships between them.

Given that this study pertains to the satisfaction with new energy vehicles, and considering the diversity of new energy vehicle brands used by different consumers, variables such as customer satisfaction cannot be directly and accurately measured. They require indirect measurement through other indicators. SEM is particularly useful in this context because it does not impose stringent assumption conditions and allows for measurement errors in both independent and dependent variables. This capability effectively addresses such issues.

Therefore, this paper utilizes structural equation modeling to construct a realistic, objective, effective, and comprehensive model of the factors influencing consumer satisfaction in the new energy vehicle sector. By exploring the factors and degrees of satisfaction among respondents, the study offers practical suggestions and strategies to promote the sustainable development of the new energy vehicle market.

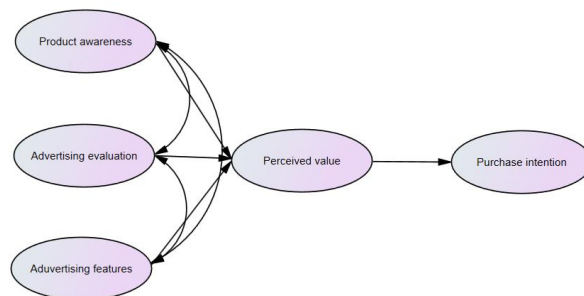
This research constructs a structural equation model based on the ACSI theory, involving variables such as new energy vehicle brand image, perceived quality, customer expectations, perceived value, customer satisfaction, and customer loyalty, as illustrated in Figure (1):



**Figure 1** Structural Equation Model of New Energy Vehicle Buyers

For potential consumers who have not yet purchased new energy vehicles, a structural equation model is established based on the Stimulus-Organism-Response (S-O-R) model. This model conceptualizes the interactions between various factors that influence the purchasing intentions of these consumers. The "stimulus" components include the consumer's awareness of new energy vehicle products, evaluations of advertisements, and specific features of advertisements that catch consumer attention. The "organism" component is represented by the perceived value that these consumers attach to new energy vehicles. Finally, the "response" component is the purchasing intention of these potential buyers.

This model facilitates a detailed examination of how external marketing stimuli (product information and advertising) influence consumer perceptions (perceived value) and, consequently, their behavioral responses (purchasing intentions). The SEM thus provides insights into the efficacy of marketing strategies and the potential barriers to market entry for non-purchasers, helping to identify targeted interventions that could convert awareness and interest into actual sales.



**Figure 2** Structural Equation Model of Unpurchased New Energy Vehicles

### 3 DESCRIPTIVE ANALYSIS OF THE NEW ENERGY VEHICLE MARKET

#### 3.1 Demographic Characteristics and Awareness Analysis of Respondents

After statistical analysis of the questionnaire data, the following conclusions can be drawn:

The respondents slightly skewed towards females, suggesting that different genders might prioritize and consider various factors differently when it comes to purchasing and experiencing new energy vehicles. These differences could be observed in the frequency of purchases, price points, brands, and the focal points during the experience. The age group of 18-30 years old is the most represented among the respondents, indicating that younger individuals are more interested in the topic of new energy vehicles. The predominant educational level is a bachelor's degree, with the majority of respondents being corporate employees. The monthly income of most respondents falls between 2,000 to 4,999 yuan, and there are more married respondents with children. Approximately 75% of respondents use private cars for commuting, highlighting a significant demand for driving as a mode of transportation. The data is summarized in the following table 4:

**Table 4 Main Content and Proportions of Respondent's Basic Information**

Basic Information	Details	Proportion
Gender	Female	54.94%
Education Level	Bachelor's Degree	44%
Occupation	Corporate Employee	26%
Monthly Income	2,000 to 4,999 RMB	31.76%
Marital and Parental Status	Married with Children	59.66%
Behavioral Trait	Drives a Private Car	75.54%

The analysis of the survey data shows that 95.28% of respondents have a general or better understanding of new energy vehicles, indicating a high level of awareness among the population. Most people are familiar with the concept of new energy vehicles.

Channels through which information about new energy vehicles is obtained:

The majority of respondents become aware of new energy vehicles through shopping websites, offline promotions, and online advertisements. Given the rapid spread of information on digital platforms, it is advisable for new energy vehicle companies to leverage online platforms more extensively for their marketing efforts. However, the importance of offline promotional strategies should not be overlooked. A combination of online and offline marketing strategies could be optimal.

Analysis of the purchasing behavior regarding new energy vehicles:

The ratio of respondents who have not purchased to those who have purchased new energy vehicles is nearly 1:1. Among those who have purchased new energy vehicles, the primary reasons identified for their purchase are commuting to work and for leisure travel, such as road trips. This insight can guide marketing strategies, emphasizing the convenience and utility of new energy vehicles for daily commutes and recreational purposes.

#### 3.2 Interaction Analysis Between Demographic Groups and Purchase Rates

##### 3.2.1 Analysis of differences in purchase rates of new energy vehicles

To explore the relationship between purchasing new energy vehicles and various demographic factors such as gender, age, education, occupation, monthly income, and marital and parental status, chi-square tests and contingency table analysis are employed. Objective: The purpose of these statistical tests is to determine if there are significant differences in the rates of purchasing new energy vehicles among different demographic groups based on their basic information; Hypothesis Testing: Null Hypothesis (H0): There is no significant influence of demographic variables (gender, age, education, occupation, monthly income, marital and parental status) on the decision to purchase new energy vehicles.

**Table 5** Chi-Square Test Results

Demographic Factor	Chi-Square Value	P-Value	Significance
Gender	1.243	0.265	Not significant
Age	29.870	***	Significant
Education	5.359	0.374	Not significant
Occupation	55.335	***	Significant
Monthly Income	29.963	***	Significant
Marital and Parental Status	44.089	***	Significant

\*p<0.05 \*\*p<0.01 \*\*\*p<0.001

Results of the Statistical Tests: The chi-square tests and contingency analyses reveal that age, occupation, monthly income, and marital and parental status significantly influence the purchase of new energy vehicles at a 5% significance level. This indicates that these factors have a statistically significant impact on the decision to buy new energy vehicles.

#### 4 SATISFACTION ANALYSIS BASED on the EXISTING CONSUMER GROUP

##### 4.1 Research Model Design

###### 4.1.1 Indicator system and questionnaire design

This study employs a survey method to collect sample data. To ensure the effectiveness and scientific validity of the questionnaire, scales adopted from established measurements in related literature are used. The questionnaire is designed based on a three-tier consumer satisfaction measurement system: First-level indicators represent the latent variables in the model, which are the broad constructs or concepts that the study aims to measure but are not directly observable; Second-level indicators represent the manifest variables (observable variables) that are directly measurable and observable, serving as manifestations of the latent variables; Third-level indicators correspond to specific questions on the survey, which are designed to measure the manifest variables.

The observable values of each manifest variable are derived from the statistical results of the survey, forming a comprehensive measurement system of consumer satisfaction with new energy vehicles. This system includes six dimensions and 19 items, as shown in the table 6. The questionnaire uses a Likert 5-point scale for these 19 measurement items, with each level corresponding to scores from 1 to 5, ensuring the questionnaire's reliability.

**Table 6** New Energy Vehicle Consumer Satisfaction Evaluation Indicator System

First Level (Latent Variables)	Second Level (Observable Variables)	Third Level (Specific Questions)
Brand Image	Brand Industry Reputation	XX1: I believe this brand has a good reputation within the industry.
	Brand Innovativeness	XX2: I think this brand is very innovative.
	Brand Favorability	XX3: I believe the quality and performance of this brand's vehicles are very good.
	Brand Trustworthiness	XX4: I believe this brand is trustworthy.
Perceived Value	Vehicle Usage Experience	JZ1: Compared to the current price level, your experience of using the vehicle.
	Product Price Perception	JZ2: Compared to the current level of vehicle performance, your perception of the product's price.
	Worth of Purchase	JZ3: Compared to traditional vehicles, do you think NEVs are still worth buying?
Customer Satisfaction	Overall Satisfaction	MY1: Overall, your satisfaction with NEVs, considering various

	Actual Effect vs. Expectations	factors. MY2: Compared to your expectations, your actual experience with NEVs.
Customer Loyalty	Willingness to Repurchase	ZC1: Would you be willing to purchase NEVs again in the future?
	Willingness to Recommend	ZC2: Would you recommend others to purchase NEVs?
Perceived Quality	Exterior Design Evaluation	ZL1: Please rate the exterior design based on your experience with NEVs.
	Vehicle Performance Evaluation	ZL2: Please rate the vehicle performance based on your experience with NEVs.
	Functionality Utility Evaluation	ZL3: Please rate the functionality and utility based on your experience with NEVs.
	Vehicle Safety Evaluation	ZL4: Please rate the vehicle safety based on your experience with NEVs.
	After-sales Service Evaluation	ZL5: Please rate the after-sales service based on your experience with NEVs.
	Internal Space Capacity Evaluation	ZL6: Please rate the internal space capacity based on your experience with NEVs.
Customer Expectations	Overall Effect Expectation	QW1: Before using NEVs, your expectation of the performance of NEVs.
	Degree of Need Satisfaction	QW2: The degree to which you expect NEVs to meet your needs.

#### 4.1.2 Research hypotheses

This section outlines the hypotheses developed for the study based on literature reviews and the theoretical framework established. These hypotheses will guide the empirical investigation into various aspects of consumer behavior and satisfaction with new energy vehicles.

##### *H1: Brand Image and Perceived Quality*

A brand presents consumers with the image of the company to which the product belongs and a series of product attributes, and brand image is the comprehensive reflection of the brand's constituent elements in people's psychology. The study by ANDREASSEN et al. [8] confirms that brand image has a positive impact on perceived quality. Based on the above literature, the following hypothesis is proposed: H1: Brand image has a positive impact on perceived quality.

##### *H2: Brand Image and Customer Expectations*

Hypothesis H2: Brand image has a positive effect on customer expectations. Grace Kavengi Onyancha [9] have noted that a positive brand image usually raises customer expectations regarding a product.

##### *H3: Brand Image and Perceived Value*

Hypothesis H3: Brand image has a positive impact on perceived value. Research by Ovchinnikov [10] supports the view that brand image and reputation positively correlate with perceived quality, which in turn enhances perceived value.

##### *H4: Brand Image and Customer Satisfaction*

Hypothesis H4: Brand image positively influences customer satisfaction. This relationship is supported by the findings of ANDREASSEN [11] and BLOEME [12], who suggest that brand image directly precedes customer satisfaction and subsequently affects customer loyalty.

##### *H5: Customer Expectations and Perceived Quality*

Hypothesis H5: Customer expectations positively influence perceived quality. This hypothesis is grounded in the notion that the anticipatory positive mindset of customers affects their evaluation of product quality and value, as indicated by Jiao Huifang [13].

*H6: Customer Expectations and Perceived Value*

Hypothesis H6: Customer expectations have a positive effect on perceived value, as described by Fornell [14], who likens expectations to a mirror reflecting the anticipated quality of a product.

*H7: Perceived Quality and Perceived Value*

Hypothesis H7: Perceived quality positively affects perceived value. Higher perceived quality at a given price level enhances the perceived value of a product, as this direct relationship significantly influences customer satisfaction assessments [15].

*H8: Perceived Quality and Customer Satisfaction*

Hypothesis H8: Perceived quality has a positive impact on customer satisfaction. This idea is supported by Zeithaml [16] and Fornell [17], who view perceived quality as a critical determinant of overall satisfaction.

*H9: Perceived Value and Customer Satisfaction*

Hypothesis H9: Perceived value positively influences customer satisfaction. The core of perceived value involves a trade-off between perceived gains and losses, and its impact on satisfaction is well-documented by researchers like Woodruff [18].

*H10: Customer Satisfaction and Customer Loyalty*

Richard L. Oliver [19] believes that customer satisfaction refers to the feeling of pleasure or disappointment formed by a customer after comparing the perceived effects of a certain product or service with his/her expectations, while customer loyalty is a deep commitment of a customer to a preferred product or service, which will lead to repeated purchases of the same brand of products [20].

## 4.2 Empirical Analysis

### 4.2.1 Description of sample characteristics

The effective sample consists of 233 respondents who have purchased new energy vehicles. The gender distribution among respondents is 45.6% male and 54.94% female. The age of respondents is primarily concentrated in the 18-30 age range, accounting for 41.63% of the total, while those over 30 years old make up 58.37% of the respondents.

In terms of educational background, a significant majority, 78.97%, have completed at least an associate degree. The primary occupations among the respondents are corporate employees (26.18%) and students (21.03%). The monthly income level of most respondents is between 2,000 to 4,999 yuan. Regarding marital and parental status, 69.96% of respondents are married, with the number of married individuals with children being approximately six times that of those without children.

Overall, the demographic profile of the respondents who have purchased new energy vehicles indicates a group characterized by youth, higher education, and higher income levels.

The specific details are summarized in the table 7:

**Table 7 Characteristics of User Sample Distribution**

Variable	Option	Frequency	Percentage
Gender	Male	105	45.06%
	Female	128	54.94%
Age	18-30 years	97	41.63%
	31-40 years	44	18.88%
	41-50 years	50	21.46%
	Over 50 years	42	18.03%
Education Level	Junior high and below	13	5.58%
	High school or vocational	34	14.59%
	Associate degree	60	25.75%
	Bachelor's degree	102	43.78%

	Graduate degree	12	5.15%
	Doctorate and above	12	5.15%
Occupation	Government/Institution/Party-government staff	14	6.01%
	Professional technicians (teachers, doctors, etc.)	26	11.16%
	Service industry personnel (third sector)	20	8.58%
	Agricultural workers	7	3%
	Drivers (e.g., rideshare, taxi drivers)	12	5.15%
	Individual business owners	13	5.58%
	Corporate employees	61	26.18%
	Students	49	21.03%
	Retired	0	0%
	Others (unemployed, etc.)	31	13.3%
Monthly Income	Below 2000 RMB	65	27.9%
	2000-4999 RMB	74	31.76%
	5000-9999 RMB	52	22.32%
	10,000-50,000 RMB	28	12.02%
	Above 50,000 RMB	14	6.01%
Marital and	Unmarried	70	30.04%
Parental Status	Married without children	24	10.3%
	Married with children (age of children not specified)	139	59.66%

#### 4.2.2 Validity analysis

##### 4.2.2.1 Convergent validity test

Traditionally, researchers have used the internal consistency coefficient (Cronbach's alpha) as a measure of scale reliability. With the adoption of structural equation modeling, the construct reliability (CR) is typically employed to describe the reliability of scales. The table below lists the outputs from the model, including standardized factor loadings (STD), standard errors (S.E.), the ratio of standardized factor loadings to standard error, and significance levels (p-value). From these standardized factor loadings, one can calculate the squared standardized coefficients (SMC), construct reliability (CR), and average variance extracted (AVE).

To assess convergent validity, researchers focus on two metrics: Composite Reliability (CR) and Average Variance Extracted (AVE). Initially, the loading coefficients of the observed variables for each latent variable in the measurement model are estimated. The factor loadings are expected to fall within the acceptable range of 0.5 to 0.95. In this model, it was observed that the loadings for ZL1, ZL2, and JZ2 were below 0.5, prompting a model revision. These paths were sequentially removed starting with the lowest loading coefficient. After the modifications, the revised model was subjected to a convergent validity test.

If the AVE is less than 0.5 but the CR is greater than 0.6, the validity of the structure is still considered adequate, suggesting that the consistency among the measurement variables is acceptable.

Using AMOS 26.0 to compute these indicators, it was found that the AVE for most dimensions was above 0.5. Although the AVE for the perceived quality dimension was below 0.5, the CR values were all above 0.6, indicating acceptable reliability. This suggests that the data obtained from the questionnaire has good consistency and can be integrated into the model path diagram.

**Table 8** Convergent Validity Test

dimension	items	Significance Estimation				Item Reliability		Composite Reliability	Convergent Validity
		Unstd	S.E.	z-value	Std.	P	SMC	CR	AVE

	XX1	0.702	1.000				0.493		
brand	XX2	0.687	1.331	0.129	10.308	***	0.472	0	0.523
image	XX3	0.788	1.005	0.114	8.83	***	0.621		
	XX4	0.711	1.112	0.112	9.935	***	0.506		
	ZL1	0.701	1.025	0.107	9.57	***	0.491		
	ZL2	0.715	0.974	0.102	9.575	***	0.511		
perception	ZL3	0.801	1.000				0.642	0.891	0.577
quality	ZL4	0.781	1.142	0.107	10.656	***	0.610		
	ZL5	0.781	1.113	0.107	10.407	***	0.610		
	ZL6	0.773	1.091	0.105	10.409	***	0.598		
Customer	QW1	0.698	1.000				0.487		
expectations	QW2	0.689	0.857	0.089	9.656	***	0.475	0.650	0.481
Perceived	JZ1	0.792	1.000				0.627		
value	JZ2	0.856	1.219	0.123	9.881	***	0.733	0.828	0.618
	JZ3	0.702	1.065	0.119	8.916	***	0.493		
Customer	MY1	0.908	1.000				0.824		
satisfaction	MY2	0.92	1.094	0.059	18.448	***	0.846	0.910	0.835
Customer	ZC1	0.887	1.000				0.787		
loyalty	ZC2	0.715	0.954	0.046	20.617	***	0.511	0.785	0.649

\*p<0.05 \*\*p<0.01 \*\*\*p<0.001

#### 4.2.2.2 Discriminant validity test

Discriminant validity assesses the extent to which a construct is truly distinct from other constructs by low correlations with other variables. It is evaluated by comparing the square root of the Average Variance Extracted (AVE) for each construct with the correlation coefficients between the construct and all other constructs. If the square root of the AVE for a construct is greater than its correlations with other constructs, then it exhibits good discriminant validity.

The following table (hypothetical data representation) illustrates this concept, where the bold figures represent the square roots of the AVEs, which are consistently higher than the correlation coefficients in their respective columns. This indicates appropriate discriminant validity for the measurement model used in this study.

**Table 9 Discriminant Validity Test**

Construct	AVE	Brand Image	Customer Expectations	Perceived Quality	Perceived Value	Customer Satisfaction	Customer Loyalty
Brand Image	<b>0.523</b>	0.723					
Customer Expectations	0.481	0.497	<b>0.694</b>				
Perceived Quality	0.577	0.307	0.251	<b>0.760</b>			
Perceived Value	0.618	0.426	0.892	0.317	<b>0.786</b>		
Customer Satisfaction	0.835	0.126	0.087	0.031	0.071	<b>0.914</b>	
Customer Loyalty	0.649	0.151	0.104	0.037	0.085	1.435	<b>0.806</b>

Note: The bold numbers on the diagonal represent the root of AVE, and the lower triangle represents the Pearson correlation coefficient of the structural plane.

#### 4.2.2.3 Model fit test

Model fit tests are used to evaluate how well a hypothesized model matches the actual collected data. Utilizing AMOS 26.0 for testing the fit of the theoretical model, the results are as follows: Chi-Square ( $\chi^2$ ) Value: 240.182, Degrees of



Freedom (DF): 171, Chi-Square/Degrees of Freedom Ratio (CMIN/DF): 2.167, P-value: <0.001, Goodness of Fit Index (GFI): 0.876, Root Mean Square Error of Approximation (RMSEA): 0.075, Comparative Fit Index (CFI): 0.929, Tucker-Lewis Index (TLI): 0.914.

Conclusion: The model's fit indices are within the standard ranges, suggesting that the model fits the data reasonably well. This indicates that the theoretical constructs and the relationships among them are appropriately modeled according to the data obtained. These results suggest that the structural model is robust and reliably represents the theoretical understanding of the phenomena being studied.

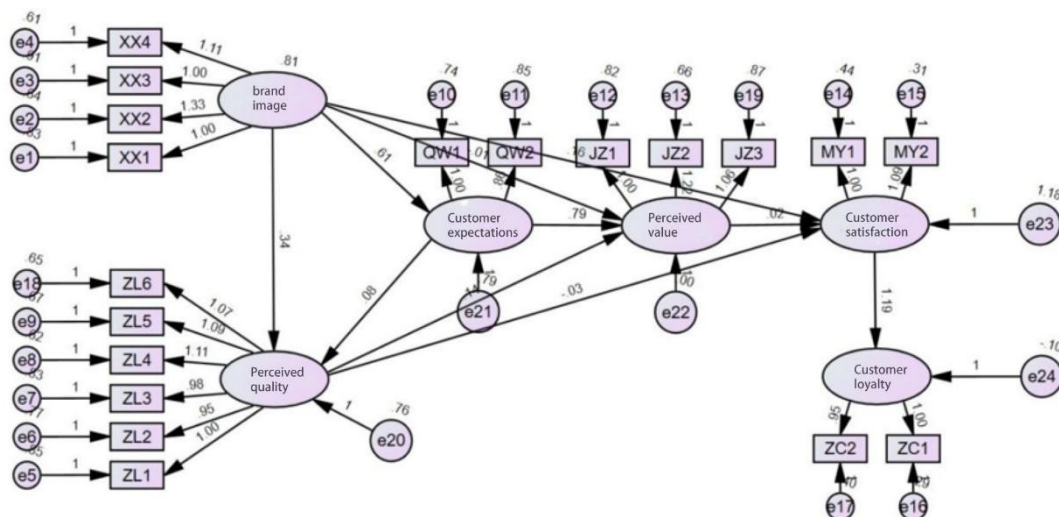
**Table 10 Structural Equation Model Fit Indices and Results**

Index	Model Fit Value	Evaluation Standard	Conclusion
CMIN (Chi-Square)	307.751	<3 Excellent; <5 Acceptable	Fit not ideal
DF (Degrees of Freedom)	172	>0.9 Excellent; >0.8 Acceptable	Fit not ideal
CMIN/DF	2.167	<3 Excellent; <5 Acceptable	Good fit
GFI (Goodness of Fit Index)	0.876	>0.8 Acceptable; >0.9 Excellent	Acceptable
AGFI (Adjusted Goodness of Fit Index)	0.833	>0.8 Acceptable; >0.9 Excellent	Acceptable
RMSEA (Root Mean Square Error of Approximation)	0.075	<0.08 Excellent	Good fit
CFI (Comparative Fit Index)	0.929	>0.9 Excellent	Good fit
TLI (Tucker-Lewis Index)	0.914	>0.9 Excellent	Good fit

**4.3 Structural Equation Model Results and Analysis**

**4.3.1 Model estimation results**

By classifying relevant indicators and processing the data accordingly, preliminary model fitting is carried out, and relevant parameter estimation and continuous correction are carried out to ultimately determine the structural model. The corresponding standardized path coefficient diagram of the structural equation model is simulated and drawn, as shown in the following figure 3.



**Figure 3 Standardized path coefficient diagram of structural equation model**

In the case where the reliability, validity, and model fit of the scale are acceptable, further testing is conducted on the significance of the path coefficients between each latent variable in the structural model. The model path test results are shown in the table below. Assuming a significance level of 0.05, 5 out of 10 paths of 6 latent variables have a significant P-value below 0.05. Combined with the standard coefficients, it indicates that the paths of hypothesis H1

"brand image has a positive impact on perceived quality", H2 "brand image has a positive impact on customer expectations", H6 "customer expectations have a positive impact on perceived value", and H10 "customer satisfaction has a positive impact on customer loyalty" are significant and the hypothesis is valid; Assuming that H3 "brand image has a positive impact on perceived value", H4 "brand image has a positive impact on customer satisfaction", H5 "customer expectations have a positive impact on perceived quality", H8 "perceived quality has a positive impact on customer satisfaction", and H9 "perceived value has a positive impact on customer satisfaction", the P-value results are 0.901, 0.196, 0.395, 0.890, and 0.790, respectively, which do not meet the requirement of 0.05. Therefore, these five paths are not significant. Assuming that H3, H4, H5, H8, and H9 are rejected.

**Table 11 Results of Standardized Path Coefficients for Structural Equation Model**

Hypothesis	Path	Standard Coefficient	P-value	Result
H1	Brand Image → Perceived Quality	0.332	**	Supported
H2	Brand Image → Customer Expectations	0.614	***	Supported
H3	Brand Image → Perceived Value	-0.011	0.901	Not Supported
H4	Brand Image → Customer Satisfaction	0.157	0.196	Not Supported
H5	Customer Expectations → Perceived Quality	0.079	0.395	Not Supported
H6	Customer Expectations → Perceived Value	0.785	***	Supported
H7	Perceived Quality → Perceived Value	0.145	*	Supported
H8	Perceived Quality → Customer Satisfaction	0.018	0.890	Not Supported
H9	Perceived Value → Customer Satisfaction	-0.027	0.790	Not Supported
H10	Customer Satisfaction → Customer Loyalty	1.193	***	Supported

\*p<0.05 \*\*p<0.01 \*\*\*p<0.001

### 4.3.2 Analysis of measurement results

#### 4.3.2.1 Latent variable analysis

##### a. Brand Image

There is a negative correlation between brand image and customer satisfaction.

The results show that the negative correlation coefficient between the two is relatively high, indicating that brand image is just an initial impression of the product brand in the consumer's mind.

For companies to achieve a win-win situation in both reputation and profits, they need to focus on product value to improve customer satisfaction.

##### b. Perceived Quality

There is a negative correlation between perceived quality and customer satisfaction.

The results show a relatively high negative correlation coefficient between the two, indicating that when the newly introduced new energy vehicles (NEVs) receive low ratings in terms of functionality, ease of operation, reliability, and after-sales service, they cannot directly influence customer satisfaction.

##### c. Perceived Value

There is a negative correlation between perceived value and customer satisfaction.

The results show that the impact between the two is significant, implying that companies need to emphasize the advantages of their products and expand their competitiveness to stand out among the many vehicle types.

##### d. Customer Loyalty

There is a positive correlation between customer loyalty and customer satisfaction.

The results show a significant positive correlation coefficient between the two, indicating that customer satisfaction and loyalty are closely related. Customer loyalty is the embodiment of customer satisfaction, laying the foundation for sustainable value for the company.

#### 4.3.2.2 Path coefficient analysis

There are two main paths influencing customer satisfaction with new energy vehicles:

Path 1: Brand Image → Customer Expectations → Perceived Quality → Customer Satisfaction → Customer Loyalty; Path 2: Brand Image → Perceived Quality → Customer Satisfaction → Customer Loyalty. Comparative Analysis of Path 1 and Path 2: The positive influence coefficient of brand image on customer expectations is 0.614, while the positive influence coefficient of customer expectations on perceived quality is 0.079. The positive influence coefficient of brand image on perceived quality is 0.332. Thus, customer expectations partially mediate the relationship between brand image and perceived quality. According to the path coefficient results, the path "Brand Image → Customer Satisfaction" is not significant, whereas "Perceived Quality → Customer Satisfaction" is significant. Therefore, perceived quality fully mediates the relationship between brand image and customer satisfaction.

The hypothesis that customer expectations positively affect perceived value is not supported, mainly because customer expectations about the quality and functions of NEVs before purchasing cannot be compared with their actual post-use experiences. Thus, customer expectations cannot directly influence customer satisfaction.

The positive impact of perceived value on customer satisfaction is not significant. This may be because, compared to traditional vehicles, NEVs lack notable convenience and functionality, making it difficult to significantly influence customer satisfaction.

The most significant path affecting NEV customer satisfaction in this study is "Brand Image → Customer Expectations → Perceived Quality → Customer Satisfaction → Customer Loyalty." This suggests that when customers perceive NEVs as having a high level of quality, their satisfaction increases. Customers who are very satisfied with NEVs are more likely to repurchase and recommend them to others, thus positively influencing customer loyalty. Overall, focusing on and improving customer perception of NEV quality is crucial to enhancing customer satisfaction.

## 5 ANALYSIS of PURCHASE INTENTIONS AMONG NON-CONSUMERS

### 5.1 Descriptive Statistical Analysis of Non-Purchasing Population

The statistical analysis of survey data from non-purchasers yields the following insights:

**Awareness Levels:** Non-purchasers have a good understanding of the design philosophy, price levels, advantages and disadvantages, and differences between new energy vehicles (NEVs) and traditional vehicles. Over 70% of non-purchasers indicated in the questionnaire that they have a general or better understanding of these aspects.

**Online Reviews:** The majority of respondents stated that online platforms were effective in helping them understand NEVs, and that the content was accurate and reliable.

**Advertising Characteristics:** Approximately 78% of respondents indicated that they could see NEV advertisements, and around 73% expressed that the advertisements were persuasive.

**Reasons for Not Purchasing:**

The primary reasons non-purchasers cited for not buying NEVs were concerns about safety and a perception that the cost-performance ratio was not high enough.

More non-purchasers wish to see improvements in the price and battery life of NEVs.

Overall, understanding these preferences and concerns is crucial for NEV manufacturers to refine their product and marketing strategies, potentially converting these non-purchasers into loyal customers.

### 5.2 Analysis of Consumer Purchase Intentions Based on the S-O-R Model

#### 5.2.1 Theoretical model and hypotheses

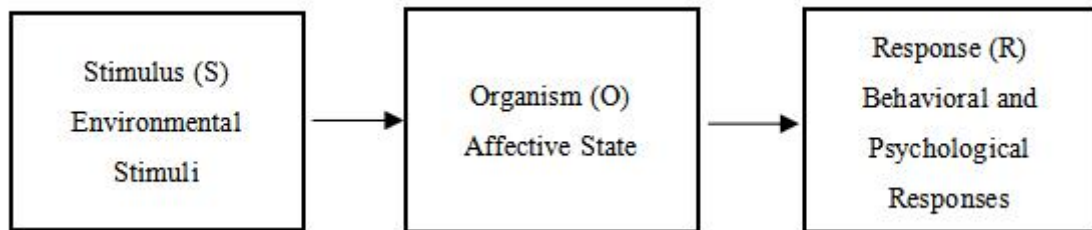
##### 5.2.1.1 S-O-R theoretical model

The Stimulus-Organism-Response (S-O-R) model originates from psychology and explains how environmental characteristics influence user behavior and psychological activities. In this model: S (Stimulus) represents external environmental stimuli that impact the individual. O (Organism) represents the cognitively aware organism. R (Response)

refers to the behavioral responses generated by the individual after experiencing psychological activities following the external environmental stimuli, such as acceptance or rejection, adoption or avoidance.

In simple terms, external environmental factors influence an individual's cognition and emotional state, which then impact their behavior.

Drawing on research findings from management, information science, psychology, and other fields, this paper applies the S-O-R model to study consumers' purchase intentions for new energy vehicles (NEVs). The external stimuli include product awareness, online reviews, and advertising characteristics that affect the organism (the consumer). The organism then processes these stimuli, forming perceptions and attitudes, leading to responses such as willingness to purchase NEVs or not.



**Figure 4** S-O-R Theoretical Model

## 5.2.2 Research hypotheses

### 5.2.2.1 Product awareness

Product awareness refers to the level of knowledge that a prospective or existing customer has about the services and functions of a product. It is measured by consumer attention and recognition. According to relevant literature, all consumer behavior is based on their understanding and knowledge of a product. Users form subjective judgments based on their perceived results, which can determine their value assessment of the product. Therefore, the following hypothesis is proposed:

H1: Product awareness positively influences customer perceived value.

### 5.2.2.2 Online reviews

Online reviews are common and important information cues in the online environment that provide feedback on product performance and usage. Consumers often use online reviews to assess the quality and value of a product. The higher the level of product reviews, the stronger the consumer's perceived trust and the more likely they are to maximize the perceived value, thus influencing their purchasing decision. Based on the above, the following hypothesis is proposed:

H2: Online reviews positively influence customer perceived value.

### 5.2.2.3 Advertising characteristics

Advertising refers to a communication method that delivers brand image information to target customers through multimedia, television, radio, telephone, and other media. In studies on customer value transfer strategies in online advertising operations, it is found that advertising can affect consumers' perceived value and thereby help companies profit through value transfer (purchasing behavior). From the customer's perspective, research on the application of advertising strategies in brand building shows that advertising has a strong positive impact on consumers' perceived value. Based on the above, the following hypothesis is proposed:

H3: Advertising characteristics positively influence customer perceived value.

### 5.2.2.4 Perceived value

Purchase intention refers to the likelihood that consumers will engage in a particular purchasing behavior and is generally used to predict consumer purchasing behavior. Customer perceived value reflects the customer's subjective perception of the value of the product or service provided by the company. The higher the perceived value, the stronger the consumer's purchase intention, and the more likely it is to lead to purchasing behavior. In studies using the S-O-R model on the influence of price and evaluation on consumer purchase intention, the results show that consumer

perceived value significantly positively influences their purchase intention. Based on the above, the following hypothesis is proposed:

H4: Customer perceived value positively influences purchase intention.

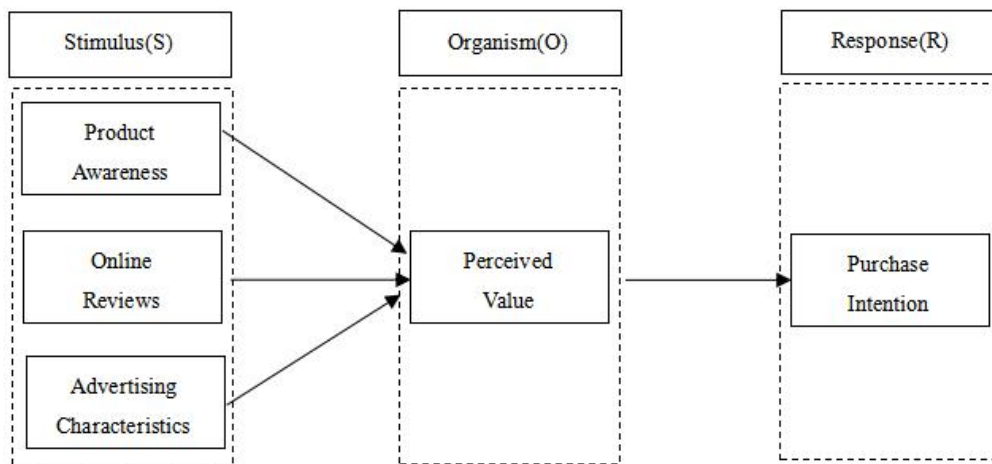


Figure 5 S-O-R research model

5.2.3 Questionnaire scale design

This study collects sample data through a questionnaire survey. To ensure the validity and scientific rigor of the questionnaire, the scale was designed based on existing mature scales and the definitions of each variable in the model. The final design includes 5 dimensions and 1 measurement item per dimension. All items are rated on a 5-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree," with scores from 1 to 5.

Table 12 Questionnaire Scale Design

Variable Name	Code	Item Content
Product Awareness	RZ1	I understand the product's design philosophy.
	RZ2	I understand the price level of new energy vehicles.
	RZ3	I understand the pros and cons of new energy vehicles.
	RZ4	I understand the differences between new energy vehicles and traditional vehicles.
Advertising Characteristics	TZ1	I often see advertisements for new energy vehicles.
	TZ2	I find the advertisements for new energy vehicles attractive.
Online Reviews	PJ1	I believe that user reviews on online platforms are genuine.
	PJ2	I think online reviews help me better understand new energy vehicles.
Purchase Intention	YY1	I think new energy vehicles are worth purchasing.
	YY2	I will consider purchasing new energy vehicles in the future.
	YY3	I prefer new energy vehicles over traditional vehicles.
Perceived Value	JZ1	I believe that new energy vehicles can meet my usage needs.
	JZ2	I believe that new energy vehicles offer high cost-effectiveness.
	JZ3	I believe that new energy vehicles are excellent.

5.3 Empirical Analysis

5.3.1 Discriminant validity test

As shown in the table below, the bold values in each column are greater than the other values in that column, indicating that the questionnaire's variable scales have good discriminant validity.

**Table 13** Discriminant Validity Test Results

Variable	Online Reviews	Advertising Characteristics	Product Awareness	Perceived Value	Purchase Intention
Online Reviews	0.795				
Advertising Characteristics	0.716	0.662			
Product Awareness	0.596	0.462	0.988		
Perceived Value	0.613	0.614	0.368	0.790	
Purchase Intention	-0.005	-0.005	-0.003	-0.007	1.246

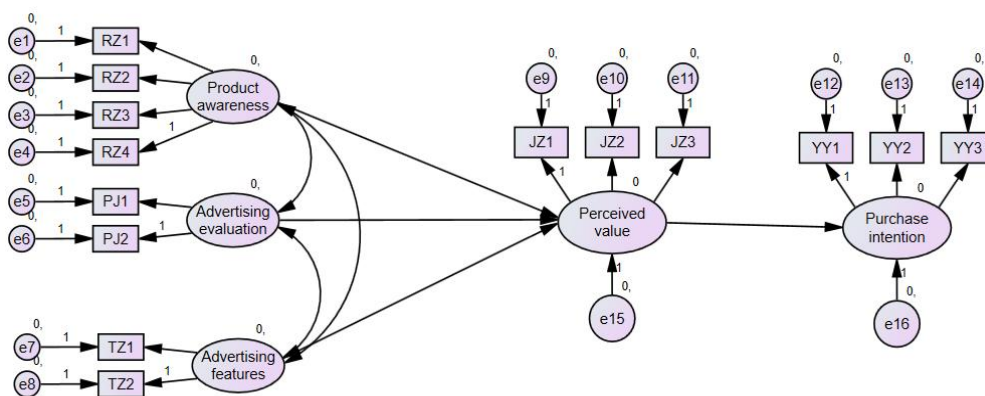
The purpose of conducting a model fit test is to compare the fit of the model results to the actual situation. In empirical research, the following six indicators are commonly used to analyze the degree of fit between the theoretical model and the actual data: chi-square to degrees of freedom ratio (CMIN/DF), GFI, CFI, TLI, IFI, and RMSEA. Results: Chi-Square/DF (CMIN/DF): 1.412 ( $p < 0.05$ ); CFI (Comparative Fit Index): 0.981; GFI (Goodness of Fit Index): 0.904; IFI (Incremental Fit Index): 0.981; TLI (Tucker-Lewis Index): 0.871; RMSEA (Root Mean Square Error of Approximation): 0.057.

**Table 14** Structural Equation Model Fit Indices and Results

Index	Model Fit Value	Evaluation Standard	Conclusion
CMIN/DF	4.423	<3 Excellent; <5 Reasonable	Good Fit
GFI	0.904	>0.9 Excellent; >0.8 Reasonable	Excellent Fit
CFI	0.901	>0.9 Excellent; >0.8 Reasonable	Excellent Fit
IFI	0.901	>0.9 Excellent; >0.8 Reasonable	Excellent Fit
TLI	0.871	>0.9 Excellent; >0.8 Reasonable	Good Fit
RMSEA	0.057	<0.05 Excellent; <0.08 Reasonable	Good Fit

**5.3.2 Model fit results and analysis**

Using AMOS 24.0 software, the final S-O-R model results are obtained as shown in the Figure 6, where the numbers represent the path coefficients.



**Figure 6** Standardized path coefficient diagram of S-O-R model

**5.3.2.1 Research findings**

Based on the results and combining the P-values with the standard coefficients, the hypotheses H1 ("Product awareness positively influences customer perceived value"), H2 ("Online reviews positively influence customer perceived value"), and H4 ("Customer perceived value positively influences purchase intention") are supported. However, H3 ("Advertising characteristics positively influence customer perceived value") is not supported.

**Table 15** Main Effect Test Results for S-O-R Model

Hypothesis	Path	Standard Coefficient	P-value	Result
H1	Product Awareness → Perceived Value	0.679	**	Supported
H2	Online Reviews → Perceived Value	0.641	**	Supported
H3	Advertising Characteristics → Perceived Value	-0.514	0.189	Not Supported
H4	Perceived Value → Purchase Intention	0.580	***	Supported
	Product Awareness ↔ Online Reviews	0.225	***	
	Product Awareness ↔ Advertising Characteristics	0.212	***	
	Online Reviews ↔ Advertising Characteristics	0.414	***	

\*p<0.05 \*\*p<0.01 \*\*\*p<0.001

### 5.3.2.2 Research conclusions

This study, based on the S-O-R environmental psychology model and previous research, explores the mechanisms influencing consumers' purchase intentions for new energy vehicles (NEVs). By analyzing questionnaire data, the related hypotheses were verified, leading to the following conclusions:

#### 1. Impact of Stimuli on Organism

Product awareness and online reviews both have a significant positive impact on consumers' perceived value. Advertising characteristics negatively influence consumers' perceived value.

#### 2. Impact of Organism on Response

Perceived value positively influences purchase intention.

#### 3. Internal Interactions Among Stimuli

Product awareness, online reviews, and advertising characteristics interact with each other.

## 5.4 Mining Potential Consumer Characteristics Based on K-means Clustering

### 5.4.1 Model selection and establishment

#### 5.4.1.1 Definition of potential consumers

Potential consumers refer to individuals who currently do not purchase or use new energy vehicles but may convert into actual consumers at some point in the future.

#### 5.4.1.2 Establishment of potential consumer model

Using questionnaire data, the most valuable potential consumers are identified and mined through clustering analysis. First, respondents who chose "Yes" to the question "Have you purchased a new energy vehicle?" are excluded. Next, respondents who chose "Neutral," "Agree," or "Strongly Agree" to the question "I will consider purchasing a new energy vehicle in the future" are selected.

Therefore, this filtered group consists of people who have not purchased or used new energy vehicles but have a purchase intention. We define these individuals as potential consumers, totaling 102 people.

### 5.4.2 Model application and analysis

#### 5.4.2.1 Selection of clustering factors

Based on the results of previous studies, seven factors were selected from the survey questionnaire as clustering indicators: gender, age, highest educational level, occupation, monthly income, marital and parental status, and reasons for not purchasing new energy vehicles.

Since these seven indicators are not numeric, they are converted into numerical variables. Clustering analysis groups samples based on distances between them, so these eight indicators are assigned values, such as "1, 2, 3, 4,...".

#### 5.4.2.2 Determining the number of clusters using principal components analysis

Principal component analysis (PCA) reflects the proportion of variance in the data explained by each principal component. This proportion indicates the amount of information from the original data included. As shown in the table below, three principal components were retained. The first principal component contributes 36.789%, while the second



and third principal components contribute 18.646% and 15.387% of the information from the seven original variables, respectively.

The cumulative contribution rate of the first three principal components reaches 70.822%, which exceeds 70%. Thus, it is appropriate to retain three principal components.

**Table 16** Total Variance Explained

Ingredients	Initial eigenvalue			Extracting the sum of squared loads		
	Total	Variance percentage	Accumulated	Total	Variance percentage	Accumulated
1	2.575	36.789	36.789	2.575	36.789	36.789
2	1.305	18.646	55.435	1.305	18.646	55.435
3	1.077	15.386	70.822	1.077	15.386	70.822
4	0.896	12.801	83.623			
5	0.642	9.177	92.799			
6	0.380	5.423	98.222			
7	0.124	1.778	100.000			

Extraction method: Principal component analysis.

#### 5.4.2.3 Potential consumer value model based on clustering results

##### 1) Clustering Results

Based on the results of principal component analysis, the K-means clustering method was applied using SPSS 26.0 to categorize potential new energy vehicle (NEV) consumers into three groups. The results are shown in the following table 17.

**Table 17** Cluster Structure

	clustering		
	Cluster I	Cluster II	Cluster III
Gender	2	1	2
Age	1	3	2
Education Level	3	4	4
Occupation	8	2	7
Monthly Income	1	3	3
Marital and Parental Status	1	3	3
Main Reason for Not Purchasing NEVs	6	3	2

The values assigned to each option are converted back to the original option data in each cluster. The detailed results are as table 18.

**Table 18** Original Data After Clustering

Potential Consumer Type	Cluster I	Cluster II	Cluster III
Gender	Female	Male	Female
Age	18-30 years	41-50 years	31-40 years
Education Level	Associate Degree	Bachelor's Degree	Bachelor's Degree
Occupation	Student	Third Sector Service Staff	Corporate Employee
Monthly Income	Below 2000 RMB	5000-9999 RMB	5000-9999 RMB
Marital and Parental Status	Unmarried	Married with Children	Married with Children
Main Reason for Not Purchasing	No Demand	Concerned About NEV Safety	High Product Price



NEVs

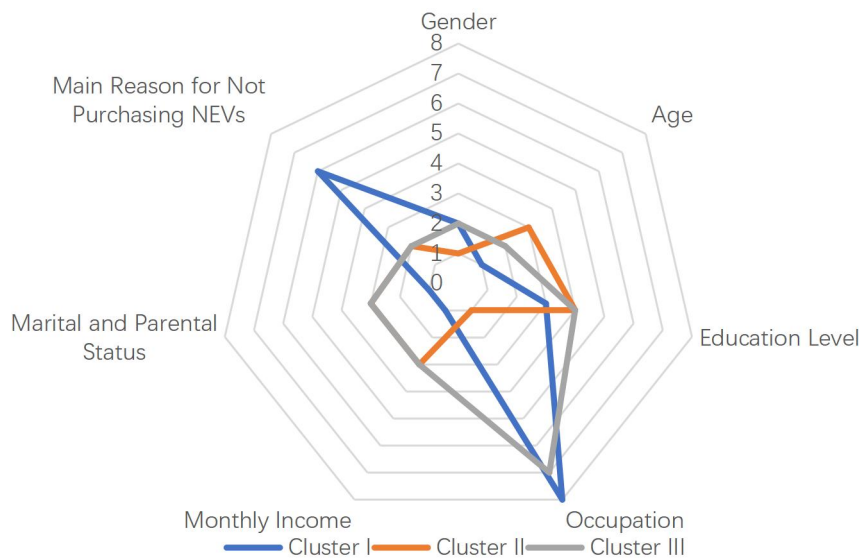
By analyzing the number of cases of three types of potential consumers and calculating their proportions, the results are shown in the table 19.

**Table 19** Cluster Case Counts (n=102)

Cluster Type	Cluster Case Count	Proportion
I	49	48.04%
II	25	24.51%
III	28	27.45%

2) Potential Consumer Value Analysis

Analyze the characteristics of potential consumers based on the clustering structure, analyze the characteristics of three types of potential consumers, and then summarize the group characteristics of each category.



**Figure 7** Feature analysis diagram

Based on the characteristic analysis, it can be observed that potential consumers of each type possess distinct features, indicating significant differences among them. Based on these feature profiles, we categorize potential consumers into three groups: Important Development Consumers, General Potential Consumers, and Low-Value Potential Consumers, with each type of potential consumer characterized as follows:

**Important Development Consumers:** Representing the third category of potential consumers, this group consists of females aged 31-40, holding undergraduate degrees, employed as corporate staff, with a monthly income ranging from 5000 to 9999 RMB. They are married with children and perceive the prices of new energy vehicles as excessively high. As working professionals, it is imperative to consider the demographic characteristics of this group when promoting new energy vehicles. Emphasizing the cost-effectiveness of the products could stimulate consumption within this demographic.

**General Potential Consumers:** Representing the second category of potential consumers, this group comprises males aged 41-50, holding undergraduate degrees, with a monthly income ranging from 5000 to 9999 RMB. They are employed in the tertiary sector and are married with children. Their primary reason for not purchasing new energy

vehicles is concerns regarding their safety. In addressing this group, companies should intensify their promotional efforts for new energy vehicles, enhancing awareness and understanding among this demographic to dispel safety concerns and foster their willingness to purchase and utilize such vehicles.

**Low-Value Potential Consumers:** Representing the first category of potential consumers, this group consists of female students aged 18-30 with a monthly income below 2000 RMB, indicating a low-income level. They lack surplus disposable income to support the purchase of new energy vehicles. Furthermore, as most students lead campus-centered lives, their demand for new energy vehicles is minimal, and they exhibit little inclination to make purchases. Consequently, the value of this customer segment is limited.

## 5.5 Model Analysis Summary

In summary, the main conclusions drawn from the analysis of potential user value are as follows:

Firstly, through the clustering and characteristic analysis of potential consumers, it is found that approximately 27.45% of potential consumers are Important Development Consumers, while 24.51% are General Potential Consumers, making up a total of 51.96% of potential consumers who are relatively inclined to purchase new energy vehicles. These two consumer groups should be regarded as the long-term target audience for new energy vehicles. Marketing efforts should be tailored to address the reasons for their non-purchase behavior, aiming to better meet the needs of these two consumer segments.

Secondly, 48.04% of potential consumers are classified as Low-Value Potential Consumers. While some of these consumers are essentially silent customers, new energy vehicle companies should still pay attention to them. Even though this group has minimal demand for new energy vehicles, promotional efforts can still be directed towards them, thereby facilitating a preliminary transition from low-value consumers to general-value consumers.

## 6. CONCLUSION AND RECOMMENDATIONS

### 6.1 Conclusion

This chapter combines relevant literature with descriptive analysis based on questionnaire data and model analysis results to draw conclusions and provide targeted recommendations. In today's Guangxi new energy vehicle market, under the guidance of new productive forces, emerging forces are continuously emerging, and an increasing number of consumers are expecting new energy vehicles to deliver superior performance. Based on the survey data presented in the questionnaire, the following conclusions are drawn:

Firstly, through chi-square tests, it is determined that age, occupation, monthly income, and marital and parental status significantly influence the purchase of new energy vehicles. Older age groups tend to have more new energy vehicle users, while industries with higher incomes such as corporate employees and drivers (passenger transport) have a higher proportion of new energy vehicle users. The purchase rate of new energy vehicles is also higher among married individuals with children.

Secondly, purchasers of new energy vehicles prioritize technological innovation and functionality. They tend to prefer new technologies introduced by emerging brands. Current purchasers generally have stable evaluations of various aspects of new energy vehicles. However, as the automotive market develops, new energy vehicles need to break through in terms of features. Only 26% of current purchasers intend to continue buying new energy vehicles, and only 22% express high confidence in the market prospects of new energy vehicles. Therefore, continuous breakthroughs in various aspects are necessary to better meet purchasers' needs. Structural equation modeling indicates that customers' perception of high quality in new energy vehicles is key to improving customer satisfaction, which in turn positively influences repeat usage intentions and recommendations to others, thus enhancing customer loyalty. Therefore, focusing on and improving customers' perception of the quality of new energy vehicles is a crucial factor in enhancing customer satisfaction.

Thirdly, the main reason for the non-purchase among the unconsumed population is concern about the safety of new energy vehicles. To increase the number of new energy vehicles purchased by consumers, improvements are needed in safety, battery life, cost-effectiveness, etc. Additionally, 81% of potential purchasers hope for improved performance of new energy vehicles. According to the S-O-R structural equation model, product awareness and online evaluations positively affect perceived value among potential consumers, which in turn significantly influences purchase intentions. Product awareness, online evaluations, and advertising characteristics also have mutual positive effects.

Through clustering analysis of potential consumers' characteristics, it is found that approximately 27.45% of potential consumers are Important Development Consumers, while 24.51% are General Potential Consumers, totaling 51.96% of potential consumers who are relatively inclined to purchase new energy vehicles. These two consumer groups should be regarded as the long-term target audience for new energy vehicles, with targeted marketing efforts addressing the reasons for their non-purchase behavior to better meet their needs. Additionally, 48.04% of potential consumers are Low-Value Potential Consumers. Although some of these consumers are essentially silent customers, new energy vehicle companies should still pay attention to them. Even though this group has minimal demand for new energy vehicles, promotional efforts can still be directed towards them to facilitate a preliminary transition from low-value consumers to general-value consumers.

## **6.2 Recommendations**

The new productive forces rely on new technologies such as digitization, networking, and intelligence, emphasizing the deep application of high-tech and causing revolutionary impacts on the socio-economy. This study can provide strategic guidance for enterprises and governments on how to implement and adapt to new productive forces in the new energy vehicle industry, promoting its sustainable development and better serving the overall layout of new productive forces. From the perspectives of enterprises and governments, the following recommendations are proposed:

(1) Enterprises should leverage digitalization, networking, and intelligent technologies as the foundation, fully utilize cutting-edge technologies such as big data and artificial intelligence, to enhance the performance and user experience of new energy vehicles. Addressing the current challenges faced by the new energy vehicle industry such as the demand for technological innovation, market competition, and diverse consumer needs, enterprises should strengthen technological innovation and promote the upgrading of products and services. Specific recommendations include developing intelligent and personalized solutions for new energy vehicles, integrating advanced information and networking technologies to enhance the intelligence level of vehicles, such as intelligent driving assistance systems, and vehicle networking services. Additionally, enterprises should enhance cooperation with internet and big data companies to optimize data analysis and user experience, enabling personalized marketing and services. Furthermore, enterprises need to enhance the digital transformation of internal management and production processes to improve operational efficiency and flexibility, reduce costs, and enhance market competitiveness.

(2) Governments should promote the healthy development of the new energy vehicle industry and create a favorable environment for the realization of new productive forces. Addressing the development bottlenecks of the new energy vehicle industry such as inadequate infrastructure, inconsistent technical standards, and low market acceptance, governments should enact relevant policies and measures. Specific recommendations include increasing policy support and funding for the new energy vehicle industry, promoting the construction of charging stations and related infrastructure, improving new energy vehicle standards and regulatory systems, and promoting technological exchanges and the coordinated development of the industry. Moreover, governments should strengthen public education and awareness campaigns to enhance societal understanding and acceptance of new energy vehicles and the concept of new productive forces. Additionally, governments should encourage cooperation and competition among enterprises, support industry-academia-research collaboration, accelerate the research and application of new technologies, and promote innovation and upgrading in the new energy vehicle industry, thus serving the overall layout of new productive forces.

## **COMPETING INTERESTS**

The authors have no relevant financial or non-financial interests to disclose.

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# RESEARCH ON THE TEACHING OF CLASSICAL CHINESE POETRY RECITATION IN VOCATIONAL EDUCATION

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**Abstract:** Renowned for its elegant form, concise language, and profound emotions, classical Chinese poetry holds a significant place in Chinese language instruction within vocational education. The longstanding tradition of poetry recitation in Chinese culture is not only a vital means of cultural transmission but also a key component of classical poetry teaching in secondary vocational schools. Through the process of reciting classical poetry, students can appreciate the rhythmic and aesthetic beauty of the verses while developing their language expression skills and aesthetic sensibilities. In vocational education, the teaching of classical poetry has unique importance. It reflects the cultivation of linguistic competence and serves as a conduit for the transmission of China's rich cultural heritage. By engaging in the recitation of classical poetry, students can subtly enhance their cultural literacy, foster patriotic sentiments and strengthen their cultural confidence. Moreover, the philosophical insights and emotional depth contained in classical poetry can enlighten students' minds, contributing positively to their character development and emotional education. This paper primarily draws on the author's teaching practice to meticulously summarize the significant importance of poetry recitation in education and to explore feasible measures for integrating poetry recitation into Chinese language teaching in vocational education.

**Keywords:** Vocational Education; Chinese Language Instruction; Classical Chinese Poetry Recitation

The subject of Chinese language is a fundamental discipline aimed at cultivating students' reading, expression and critical thinking skills, as well as enhancing their cultural literacy and aesthetic appreciation. Classical Chinese poetry, renowned for its aesthetic form, concise language, and profound emotions, is a crucial component of language instruction in vocational education. Through the study of classical poetry, the "aesthetic" philosophy is actively promoted, its aesthetic values are fully explored, and students' cultural literacy is enhanced, guiding them to develop a refined aesthetic sense. In the teaching of classical poetry, the four essential activities of "reading, listening, writing and observing" have always been emphasized, with "reading" and "listening" being particularly indispensable and reliant on recitation. It can be said that recitation is the key to classical poetry instruction; without it, effective teaching of classical poetry cannot be achieved. Recitation is also regarded as one of the most effective methods for learning classical poetry. In that way, how should vocational schools conduct classical poetry recitation instruction? This paper drawing from personal teaching practice and experience, meticulously summarizes the importance of classical poetry recitation instruction and explores the methods and approaches for teaching classical poetry recitation in vocational schools.

## 1 THE SIGNIFICANCE OF CLASSICAL POETRY RECITATION INSTRUCTION

The importance of poetry recitation has long been recognized in Chinese culture. An ancient saying states: "Read three hundred Tang poems thoroughly; even if you cannot write poetry, you will be able to chant," and "Read a book a hundred times, and its meaning will naturally become clear," highlighting the high regard that previous generations had for poetry recitation[1]. The modern eminent writer and educator Ye Shengtao also strongly endorsed recitation, stating, "Read more literatures, practice linguistic sense frequently, then you will inevitably master the language." These perspectives underscore the critical role of recitation in the teaching of classical poetry.

### 1.1 Enhancing Students' Language Expression Skills

The <Curriculum Standards for Chinese Language in Secondary Vocational Schools outline> specific instructional requirements for students' expressive abilities, including oral communication and writing[2]. Classical poetry, with its concise, refined and philosophical verses, can significantly enhance students' communicative and writing skills if they can apply these verses adeptly in everyday interactions and compositions. This application can make their speech and writing more compelling and impactful.

In Su Shi's renowned masterpiece <Shui Diaoge Tou·Ming Yue Ji Shi You> the poignant line "But I hope people can last forever, and we share the beauty of the moon thousands of miles apart" encapsulates the essence of the author's longing for someone during the Mid-Autumn Festival. Using concrete descriptive techniques, in just ten Chinese characters, Su Shi creates an atmosphere of a bright moon in the sky, loneliness and vast distance, vividly contrasting the poet's independent character. Classical poetry is replete with such profound and boundless imagery, guiding students to pay attention to daily accumulation, which plays a crucial role in enhancing their expressive abilities.

### 1.2 Assisting Students in Appreciating the Charm of the Chinese Language

Classical poetry literatures also contain various rhetorical devices such as metaphor, parallelism, parallelism, juxtaposition and allusion. The application of rhetorical devices not only enables authors to express their thoughts vividly but also allows readers to deeply appreciate the unique charm of language and writing.

Taking <Spring River Flowers Moon Night> (Chun Hua Jiang Yue Ye) as an example, the author extensively employs metaphorical rhetorical devices, vividly and concretely presenting the five elements of "spring(chun), river(jiang), flowers(hua), moon(yue) and night(ye) " to the readers, leaving endless imagination[3]. Classic lines such as "The spring river tide joins the sea level, and the bright moon rises with the tide on the sea" and "The river meanders around the fragrant fields, and the moon shines on the flower forest like hail" use vivid and imaginative metaphorical techniques to interpret the splendid and moving scenes into a marvelous artistic realm, evoking profound emotions.

By delving into these verses, understanding their expression methods, further appreciating and understanding the linguistic charm of the Chinese language, students can deepen their understanding and appreciation of the content and implications of the literatures.

### 1.3 Inspiring Students to Engage in Philosophical Thinking

Classic lines in ancient poetry often contain profound philosophical insights and distant imagery through superb expression techniques, providing inspiration for thought.

In the famous verse "When will there be a bright moon" from <Shui Diao Ge Tou: Ming Yue Ji Shi You>,"the phrase "People have joys and sorrows, partings and reunions; the moon has its waxing and waning, fullness and emptiness; these ancient matters are hard to grasp in their entirety" not only reflects the author's broad-minded and free-spirited contemplation of life but also conveys a sense of resignation towards the inevitability of life's uncertainties. Repeated recitation of such philosophical and paradoxical verses can inspire students to engage in philosophical reflection, laying a foundation for them to establish correct life views and values.

### 1.4 Promote National Pride Among Students

In vocational education Chinese language instruction, classical poetry, as a significant carrier of Chinese traditional culture, serves as an important resource for fostering students' national confidence and providing patriotic education. The "Curriculum Standards for Chinese Language in Secondary Vocational Schools" proposes that language education should "stimulate interest in learning ancient poetry and prose and enhance affection for Chinese traditional culture[4]." Therefore, teachers should fully utilize classical poetry as a valuable resource and, through innovative teaching methods, transform its inherent ideological and artistic qualities into spiritual wealth for students.

Xin Qiji's "Yong Yu Le: Jing Kou Bei Gu Ting Huai Gu" is a poem full of patriotic sentiment and historical significance. The lines "Over thousands of years, heroes are nowhere to be found, like where Sun Zhongmou used to be. Dance pavilions and singing platforms, always blown away by the wind and rain" depict the vicissitudes of history and the disappearance of heroes in a desolate tone, showcasing the poet's broad patriotic sentiment and extraordinary heroism. "Sun Zhongmou" here refers to Sun Quan, the ruler during the Three Kingdoms period. Xin Qiji expresses profound nostalgia and endless regret for those heroes in history who dedicated themselves to the country and the people through his tribute to Sun Quan. "Slanting sun, grass and trees, ordinary streets and alleys, where slaves once lived. Remembering the past, with golden spears and iron horses, swallowing thousands of miles like a tiger" contains fervent yet subdued emotions, sincere and full feelings. These lines not only outline the image of a patriot who is deeply concerned about the rise and fall of the nation, but also convey Xin Qiji's profound concern for the future and destiny of the country. Regular recitation of these verses helps cultivate students' patriotic enthusiasm, enabling them to experience the weight of history and the heroism of heroes, thereby inspiring their sense of national pride and responsibility.

## **2 STRATEGIES FOR TEACHING CLASSICAL POETRY RECITATION**

Classical poetry recitation involves simultaneous reading and recitation, merging the "sound," "form," and "meaning" of the poetry, thereby transforming static language learning into dynamic teaching effects.

In vocational school Chinese language instruction, teachers not only need a solid understanding of classical poetry but also must grasp modern educational theories. They should integrate the background of contemporary reforms and employ innovative teaching methods to enhance students' literary literacy and aesthetic abilities. Additionally, teachers should consciously place classical poetry within the context of contemporary reforms and modern educational theories. Through modern teaching methods, they vividly present the creative background of classical poetry and the biographies of the poets, enabling students to more intuitively experience the mood and beauty of the poetry. This approach emphasizes the active role of students, guiding them to experience the emotions expressed by the authors and appreciate the artistic conception conveyed in the works.

### **2.1 Clarifying Teaching Objectives and Reforming Teaching Methods**

When formulating teaching objectives for the Chinese language subject, teachers can prioritize classical poetry recitation and devise detailed weekly recitation plans and objectives. Assuming one to two classical poems are recited per week, students can complete the recitation of around twenty to thirty classical poems in one semester. This not only helps students accumulate literary knowledge but also enhances their language expression abilities and aesthetic appreciation.

Building upon clarified teaching objectives, teachers should actively improve the classroom teaching methods for classical poetry. Modern information technology provides rich resources and means for teaching classical poetry. Teachers can fully utilize multimedia tools such as images and videos to vividly present the teaching content of classical poetry to students. For example, when explaining "Shui Diao Ge Tou·Ming Yue Ji Shi You," teachers can showcase serene moonlit images and relevant video materials to help students more intuitively feel the poet's longing for a lost loved one, guiding students to incorporate the joys and sorrows of human life into the philosophical pursuit of the universe and life. This combination of visual and auditory stimuli not only captures students' attention but also deepens their understanding and memory of the poetry's content.

### **2.2 Improving Teaching Methods and Advocating Tailored Instruction**

The development of modern education has provided a theoretical foundation for innovative teaching methods in vocational education. The "Two-Step Teaching Method" centered around recitation, focusing on comprehensive reading and detailed reading accumulation, has been proven to be an effective approach for teaching classical poetry recitation.



The Two-Step Teaching Method can be understood simply as a process of "two steps": the first step involves comprehensive reading of the poetry. After understanding background knowledge such as unfamiliar words and phrases and the era of composition, students grasp the general content of the poetry through comprehensive reading. The second step is detailed reading and accumulation. Building upon comprehensive reading, students engage in meticulous recitation of the poetry, capturing the essence of the splendid phrases within classical poetry through repeated recitation, aiming to achieve proficiency.

In Class A, the "Two-Step Teaching Method" was applied for the first lesson of "Shui Diao Ge Tou – Ming Yue Ji Shi You" with the following learning outcomes:

**Table 1** learning outcomes of Class A

Class A	Number of Students	Class Participation in the Two-Step Teaching Method	Mastery Level	Class Feedback
Step One	30	29 students showed high participation	28 students mastered the content as required	Very Satisfactory
Step Two	30	28 students showed high participation	26 students mastered the content as required	Very Satisfactory

According to Table 1, although the overall difficulty of learning increased according to the "Two-Step Teaching Method" and there was a slight decline in students' mastery, the overall classroom satisfaction remained at a very high level. Compared to regular Chinese language classes, students exhibited higher classroom participation and enthusiasm. Additionally, their feedback on classroom learning exceeded that of regular classes.

In addition to the Two-Step Teaching Method, differentiated instruction and teaching according to students' abilities are also indispensable. Each student is an independent individual; thus, teachers need to adopt various teaching methods tailored to different students to stimulate their interest and engagement in classical poetry. For students in vocational schools, targeted teaching arrangements can be made based on their actual situations. For academically capable students, teachers can integrate classical poetry recitation into daily learning activities, such as assigning poetry recitation tasks in groups or organizing poetry recitation competitions, to stimulate their enthusiasm and participation. As for students who are struggling, teachers should provide personalized guidance and support, harnessing the spirit of teamwork among students. More proficient students can engage in one-on-one peer tutoring with those lagging in class, gradually enhancing their recitation abilities. By implementing differentiated instruction, students' learning needs can be better met, fostering their motivation and sense of achievement. This approach not only promotes individualized development but also effectively enhances the efficacy and attractiveness of classical poetry teaching[5].

### 2.3 Emphasizing Recitation Teaching and Understanding Recitation Techniques

In the teaching of classical poetry, memorization is a crucial task, which teachers should prioritize in their instruction. Apart from recitation, memorization helps students deepen their understanding and appreciation of the content and form of classical poetry, enhancing their linguistic sensibility and aesthetic capabilities.

Memorization of classical poetry is not achieved overnight but requires adherence to psychological memory principles and the application of specific memorization techniques. Firstly, teachers should guide students to engage in memorization during optimal times, such as in the morning or evening, and create a relatively quiet learning environment to facilitate better concentration. During the memorization process, students should focus not only on the phonetic rhythm of the verses but also on comprehending the imagery and emotions conveyed, thereby grasping the poetic mood and sentiment more effectively. Additionally, teachers should adhere to the forgetting curve and encourage students to cultivate habits of consistent and repetitive practice over the long term. By committing to daily memorization and reviewing previously learned verses, students can gradually solidify their memory, prevent forgetting,

and enhance the efficiency and quality of their memorization. This consistent learning attitude and approach enable students to achieve better results in memorizing classical poetry and develop good study habits.

Furthermore, teachers can introduce specific memorization techniques to help students complete the task more efficiently. For instance, the "verse chaining" method assists students in linking related verses to form coherent sentence structures, while the "music-accompanied memorization" method enhances memory retention by pairing verses with melodious music, facilitating easier recollection of rhythm and cadence. Additionally, the "scenario-based memorization" method aids memory by encouraging students to imagine the scenes or contexts described in the verses, fostering a more vivid understanding and expression of the poetic mood. Through the application of these memorization techniques and methods, students can more effectively accomplish the task of memorizing classical poetry and gradually improve their memorization proficiency. Teachers should flexibly apply these techniques based on students' individual circumstances and learning needs to help them achieve better results in the memorization process. In this way, students not only deepen their understanding and memory of classical poetry but also cultivate their language expression abilities and aesthetic interests, ultimately achieving the goal of classical poetry teaching.

#### **2.4 Innovative Teaching Models to Extend Classroom Instruction**

Teachers should innovate teaching models to extend classroom instruction beyond the confines of traditional class time, thereby reinforcing and enhancing the effectiveness of classical poetry recitation learning.

For example, an innovative teaching model could involve organizing lectures or seminars on the appreciation of classical poetry. During extracurricular hours, teachers can invite literary experts or scholars to campus to conduct lectures or seminars, exploring the artistic charm, cultural connotations, and stories behind poets of classical poetry. By participating in these activities, students not only gain additional knowledge about classical poetry but also deepen their understanding of its essence through expert interpretation, facilitating a smoother recitation of classical poetry. Teachers can also organize seminars or workshops on the appreciation of classical poetry during extracurricular hours, allowing students with the capacity to engage in these activities to gain expanded knowledge about classical poetry and enhance their recitation skills.

Another innovative teaching model involves watching television or online programs related to traditional culture, such as "Chinese Poetry Competition" or "Classic Recitation," for instance. Through viewing these programs, students can listen to classic recitations and naturally immerse themselves in the charm of poetry, experiencing the emotional depth and artistic ambiance of poetry interpretation. Teachers can integrate the content of these programs into classroom discussions or appreciation activities, guiding students to a deeper understanding and appreciation of the artistic beauty of classical poetry.

Additionally, schools, departments or institutions can organize classical poetry recitation competitions to stimulate student engagement in learning. Through competitive selection and recognition, these competitions effectively encourage student participation in classical poetry recitation activities, enhancing their learning enthusiasm and competitive awareness, thereby promoting the smooth development of classical poetry recitation activities.

Through innovative teaching models and extending classroom instruction, students can experience a more diverse and enriched learning environment, fostering a deeper understanding and appreciation of classical poetry. Such teaching models not only enhance students' learning interests but also cultivate their literary literacy and aesthetic taste, laying a solid foundation for the enhancement of their humanistic literacy and comprehensive abilities.

### **3 CONCLUSION**

In vocational education and Chinese language teaching, classical poetry serves as a crucial carrier of Chinese traditional culture, constituting a key component of instruction. Teachers need to fully recognize the necessity of classical poetry recitation in language learning and its importance for students' growth. In the actual teaching process, teachers should not only focus on imparting the content of classical poetry but also innovate teaching methods to stimulate students' interest in learning and their autonomous learning ability. Classical poetry embodies the essence of Chinese culture,

with its rich connotations and profound emotions, serving as an important pathway for students to understand Chinese language, history, culture, and philosophical thoughts. Through the study of classical poetry, students can better comprehend the historical development and cultural accumulation of the Chinese nation, while enhancing their proficiency in the mother tongue, cultural identity, and pride. Additionally, the linguistic beauty, melodic charm, and artistic conception of classical poetry significantly enhance students' language proficiency. The concise language and profound artistic conception of classical poetry, experienced through repeated recitation, enable students to appreciate the rhythm and beauty of the Chinese language, thereby improving their language expression ability and literary literacy—a practical skill that can accompany students throughout their lives.

To improve the quality of Chinese language teaching in vocational education, teachers should actively innovate both content and form in the teaching process. For example, methods such as situational teaching, poetry creation, integrated teaching, and competitive activities can be employed. Through these innovative teaching methods, teachers can effectively stimulate students' interest in learning classical poetry, enabling them to truly appreciate its linguistic beauty, melodic charm, and artistic conception during recitation and comprehension. This, in turn, enhances the overall quality of Chinese language teaching in vocational education. Moreover, the improvement in Chinese language and classical poetry skills contributes to the cultivation of students' cultural literacy and aesthetic abilities, laying a solid foundation for their comprehensive development. Classical poetry teaching is not only an integral part of language education but also a vital means of fostering students' humanistic literacy and cultural confidence. As vocational Chinese language teachers, it is our responsibility and obligation to help students find joy in the study of classical poetry and enhance their overall language and cultural literacy through innovative teaching methods.

#### **COMPETING INTERESTS**

The authors have no relevant financial or non-financial interests to disclose.

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# RESEARCH ON ALEXANDER VON HUMBOLDT'S ANTISLAVERY THOUGHT AND HIS PHASED REFORMATIVE SOLUTIONS TO ABOLISH SLAVERY IN LATIN AMERICA

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**Abstract:** Humboldt was a humanitarian abolitionist as well as a physical geographer whose antislavery thought has exerted a positive influence on Latin American Independence Movement in the early-to-middle 19th century. However, with the intense focus on his scientific expeditions and discoveries, previous studies have failed to examine his antislavery thought. In view of this, the present study systematically reviewed academic works, diaries and letters of Humboldt himself and previous researches on him, and presents findings as follows: a). The seed of his Anti-slavery thought was planted by the Enlightenment thinkers of Prussia in his early youth; b). The miserable living conditions of the enslaved and the inhumane scenes of slave trade that he had witnessed during his expeditions hardened his determination to abolish slavery; c). Irritated by the slaveholders' insatiable avarice for wealth at the cost of lives of the enslaved, Humboldt envisioned a phased reformative solution to end slavery gradually in Latin America. This is the first comprehensive research regarding Humboldt as a abolitionist. The research findings can serve as significant implications for a better understanding of the formation and influences of anti-slavery thought of scientific travelers like him in the early post-colonial era.

**Keywords:** Alexander von Humboldt; antislavery thought; Latin America; slave trade; Abolitionist Movement

## 1 INTRODUCTION

Humboldt(1769-1859), the Prussian born observant scientific traveler, was not only the founder of modern physical geography whose discoveries in geology, climatology, botany, and magnetism, etc. contributed to widening the bounds of human knowledge, but also a humanitarian Scholar who 'questioned the heritage of Spanish colonial rule, and spoke out against slavery' [1]while conducting his scientific explorations in the Spanish colonized Americas. The scientific thought and the views of anti-colonialism and anti-slavery of this man, whom Charles R. Darwin formerly admired and later adored, have exerted a great influence on the development of science and humanities for more than 200 years and is still shaping our thinking today. However, A close look into the previous studies suggests that most of the recent journal articles on Humboldt have wrestled with his scientific travel Narrative and his Latin American expedition, few have explored his scientific activities, discoveries and their references for practitioners of modern science today, even fewer have probed into his Environmental Protection Theory which is also an integral part of his great thoughts, shedding lights on natural resource preservation today. Only one of the journal articles has mentioned his anti-slavery thought while discussing his anti-colonial and anti-racist views. Although these previous researches have contributed much from different perspectives to revive the 'Humboldtian Science' and have opened new areas for its development, they have failed to regard his anti-slavery view as a non-negligible part of his humanistic thought and one basic guiding principle of his scientific expeditions. Therefore, based on the academic works, diaries and letters of Humboldt himself, and the books, newspaper reports and academic papers on him, the present research explores, for the very first time, Humboldt's anti-slavery thought and the phased reformative solutions he envisioned to abolish slavery in Latin America gradually. And the theme is discussed in this paper from three aspects: education that germinated his anti-slavery thought, scientific expedition to 'Spanish Americas' that forged his view on slavery and solutions he envisioned to end slavery in Latin America.

## 1 EDUCATION THAT GERMINATED HUMBOLDT'S ANTI-SLAVERY THOUGHT

Although Humboldt was said to be the revolutionary scientific traveller 'standing on the Old World with his left leg and on the New World with his right leg'[2], his view on the abolition of slavery was not germinated in the New World—the Spanish colonized Americas, but in the 'liberal Jewish intellectual circles' of Berlin where he was arranged an elite education and in the lecture halls of Frankfurt, Göttingen and Hamburg where he received his academic education.

Alexander von Humboldt was born on 14 Sep. 1769, the same year as Napoleon Bonaparte. Born into an intellectually connected aristocratic family whose name was held high in regard in the principality of Prussia, Young Alexander von Humboldt, together with his elder brother, Wilhelm von Humboldt, was granted an elite education and even privileged to have the future king, Friedrich Wilhelm III, as his godfather. Hardly had Alexander reached the age of nine, his beloved father who had always been charming and affectionate towards the boys died suddenly of illness. Though this domestic calamity disheartened his mother who became a rich widow for the second time, nothing changed in the way she educated her sons. As always, this formal, rigid and emotionally cold woman who seldom cared much about her sons' need for maternal love and familial intimacy, hired a series of enlightenment thinkers like J.H. Campe, the German translator of *Robinson Crusoe*, botanist K.L. Willdenow, physicist M. Herz and others who were the followers of Rousseau's educational philosophy like them, to provide the boys with the best education available in the then Prussia right at home. And this string of enlightenment thinkers were the very ones who had planted the seeds of views on liberty, equality, tolerance of 'otherness' and 'connectedness' of natural forces in Alexander while lecturing him on classic aristocratic learning course. With maternal warmth he had longed for so desperately never satisfied, and independent and liberal thinking gradually and fully inspired by these tutors, Alexander von Humboldt (henceforth simply referred to as Humboldt), from a very young age on, enjoyed being outdoors, collecting insects, observing plants and stones, and hoping one day he could be far away from this landlocked country 'which has no direct communication with either the East or the West Indies', and travel into 'distant regions little known to Europeans'. [3]

Humboldt was raised at a changing time characterized by increasing globalization via colonization, with European colonial powers expanding their holdings to tropical countries in Asia, Africa and Americas. Fittingly, this particular period also witnessed great scientific discoveries, technological breakthroughs and epic explorations. New scientific inventions made the industrial revolution possible in Europe, which in turn gave an impetus to technological innovations that affected various aspects of life all over the world. Newton's discovery of mechanical laws underlying physical phenomena, the invention of telescopes and microscopes, sextant, barometers, compasses, thermometers and hygrometers among many others which Humboldt's earliest youth had seen, were facilitating scientists' revealing of the laws that govern the natural world and would be of great importance in his exploration of the Spanish Americas when the time came.

Living through the age of Enlightenment and coming of age before the dawn of Romanticism made Humboldt 'a child of the Enlightenment'[4] who yearned to launch explorations and adventures in distant regions, especially the tropic countries in South America where he could possibly see the palms and other tropical plants in their natural environments. Discoveries of Benjamin Franklin and Lavoisier, invention of James Watt and books of Captain Cook and others about their circumnavigations enhanced his innate curiosity in nature study and fueled his desire for freedom and exploration in the tropics. However, being totally dependent on his emotionally distant mother for financial support, Humboldt could not pursue his heart's desire as he wanted. In compliance with his mother's wish for him to enter the civil services of the Prussian court, Humboldt enrolled himself in the University of Göttingen to study textile manufacturing and finance. But rather than study the courses that he was supposed to take in this university, Humboldt, the boy fed up with the atmosphere of repression imposed by his mother back at home for the past two decades, chose to attend the scientific lectures such as 'botany, literature, archaeology, electricity, mineralogy and the natural sciences', especially those in geology, that interested him to a great deal.

It was in Göttingen that Humboldt studied with Johann F. Blumenbach (1752-1840), the well established scholar in anatomy, physiology and anthropology. Although Blumenbach is mistakenly regarded as the one who proposed the

white-centrism and was frequently demonized for identifying five races, with the white race as the original form from which the other four had ‘degenerated’, he firmly believed and ardently defended the view that every race had the capacity for intellectual and moral improvement. And in order to prove the validity of his view, he showed every visitor his collection of books written by black skinned Africans who, in the eyes of the champions of white supremacy, were all ‘savage’, to show that these so called primitive and inferior people were actually the most distinguished with their admirable capacity for ‘scientific culture’. This anti-racist view of Blumenbach deeply influenced Humboldt who attended every lecture of his on anthropology and greatly fueled the student’s thought on liberty and freedom which had already been planted in him by the enlightenment thinkers back in Berlin.

Like Blumenbach, Humboldt believed that only the society endowed with freedom can function well. Therefore, in 1792, after a brief period of study in the Freiburg School of Mining where he had been exposed to the renowned geologist J. Werner’s latest theories in mineralogy and geology, Humboldt was appointed by the Prussian government an Inspector of Mines in the Upper Franconia region of the Kingdom of Prussia as his mother’s wish. This job enabled him to travel across the vast domains of Prussia, collecting data concerning minerals, rocks and flora growing in various mining areas. Driven by his belief of liberty and freedom as well as his concern for the mine laborers who were usually slaves ‘dragged in chains’ from Africa, Humboldt established the first training school in Europe for miners. As a reward for this unprecedented interest granted upon them, the slave miners broke all previous records of productivity.

Although Humboldt was nourished with the views of Enlightenment thinkers and thus, can be said to be ‘a product of the Enlightenment’ or ‘a child of Enlightenment’, one fact that can not be denied is that he was receptive to romantic influences at the same time since he had come of age shortly before the dawn of Romanticism, and gained friendship and partnership of the famous German poet Goethe and other romantic writers. Besides, Humboldt was also a devoted follower of Adam Smith whose philosophy of plutonomy roused his deeply rooted ‘love of political freedom and his hatred of slavery’<sup>1</sup> and thus, established in him a determination to be a liberal and a resolute abolitionist of slavery.

## 2 EPIC EXPEDITION to ‘SPANISH AMERICAS’ THAT FORGED HUMBOLDT’S VIEW on SLAVERY

As discussed above, Humboldt’s view on slavery was germinated by the education he had received since his earliest childhood, among Enlightenment thinkers of Berlin and Göttingen, and also under the direct or indirect influence of eminent figures like Goethe, Schiller, James Cook and Louis Antoine de Bougainville through their friendships or writings. However, it did not even begin to come into a clear shape until he launched his epic expedition to the ‘Spanish Americas’, because it was what he saw and heard during his explorations to those slave-holding Spanish colonies that matured and forged his anti-slavery thought and made him an ardent abolitionist.

Reading the books and journals of capt. James Cook and Louis Antoine de Bougainville who had circumnavigated the globe, Young Humboldt always imagined himself far away in the tropical regions rarely known to Europeans. The short passage from his *Personal Narrative* confirms this well:

From my earliest youth I felt an ardent desire to travel into distant regions, seldom visited by Europeans. This desire is characteristic of a period of our existence when life appears an unlimited horizon, and when we find an irresistible attraction in the impetuous agitations of the mind, and the image of positive danger. Though educated in a country which has no direct communication with either the East or the West Indies, living amidst mountains remote from coasts, and celebrated for their numerous mines, I felt an increasing passion for the sea and distant expeditions. And the pleasures we were deprived of seem to possess a fascinating power, compared with all we daily feel.[5]

This then explains where Humboldt’s wanderlust came: the desire to follow the footsteps of great navigators who had travelled around the world through storms on the top of sea waves and the desire to escape from home where pleasure and familial warmth had been deprived of by his emotionally cold mother ever since his beloved father had died when he was only a nine-year old little boy. Having resolved to visit Americas when adulthood was hardly reached, Humboldt prepared himself by taking a four-month trip across Europe, visiting some of the most interesting landscapes outside of the mining areas of Prussia where he had grown up and would be exploring as an inspector still for several years once graduated from the Mining Academy at the age of 25. This short time exploration was joined by a much older friend of

his, George Forster, whom he had become acquainted with in Göttingen. This companion of his is the one who 'at Humboldt's age had accompanied Captain Cook on his second expedition to the Pacific'[6] and some other parts of the world. They talked about that great voyage of Captain Cook during this trip and Forster's vivid descriptions of the natural panorama, humane landscapes and cultural relics of the alien lands, especially those of the South Pacific islands, made Humboldt's wanderlust to Americas even more irrepressible.

The death of his mother at the end of 1796 made Humboldt a rich man who could finally pursue his life dream without any emotional or financial constraints. Therefore, Humboldt quit his job as a mining inspector appointed by the Prussian government, purchased 40 some pieces of scientific instruments available at that time, including compasses, telescopes, Thermometers, Hygrometers, etc. with the substantial inheritance that his mother had left him and started preparing for the epic expedition of fact-finding which shaped his highly mobile life, forged his anti-slavery thought and made him legendary across the whole world. After two years of preparation, including exploration of various places in Europe that 'might enable himself to compare the geological structures of these two portions of the globe and acquiring a practical acquaintance with the instruments best adapted for aiding him in his observations'[7], Humboldt launched, with his companion Aimé Bonpland, the significant expedition that has been called 'the scientific discovery of the New World'. [8] Having learned after the best French naturalists in Paris, Aimé Bonpland at this period of time, had greatly distinguished himself by his numerous discoveries in botany. Humboldt found in this twenty-five-year old French botanist the same passion for long distant adventures and mutual adoration for Botany and Geology after bumping into each other and talking for a few times in the corridors of their rented accommodation in Paris.

Thrilled by the shared scientific interests, Humboldt set off with this young French botanist and a few others on their journey to the Spanish kingdom to apply for the permission to travel to Spanish American colonies. Having acquired the Royal passport from the Spanish king, Carlos IV, he boarded the corvette Pizarro with his team on 7 June 1799, shortly before his thirtieth birthday, setting sail from the Spanish port of La Coruña for the destination of Spanish possessions in Latin America. He and Bonpland would eventually explore six-thousand-mile swath through the unspoiled New Continent-Cuba, New Granada (now Columbia), Ecuador, Peru, Ecuador (a second time ), New Spain (now Mexico), Cuba (a second time) during this great expedition. Though in essence, this best-known journey of Humboldt's was a scientific exploration, aimed at 'studying different species and their characteristics—a subject that is still being pursued far too exclusively' and discovering 'how nature's forces act upon one another and how the geographic environment works on animals and plants.' But a systematic study of Humboldt's letters, academic works and Diaries concerning this expedition suggests that Humboldt's research interest in this New World was not only limited to the scientific exploration, but also in the inhumanity of mass slavery in the context of the world economy.

### **3.1 First Impression of Slavery in Venezuela**

Having drifted at sea for 41 days, Humboldt and his small team saw on the horizon, the coast of New Andalusia(today part of Venezuela). Humboldt had known from his previous education that Latin America, the New World he had always dreamed of, had long become colonies of European countries headed by Spain after the age of Great Navigation. The aborigines had almost been slaughtered out by the colonial Powers from Europe and the tiny fraction of the native people who had been 'lucky' enough not to be killed, were reduced to coolies in mines and sugar plantations. Besides, those colonists had been importing black slaves from Africa, especially from South Africa, to replenish manpower because plantations' demand of slave labor was huge and slave mortality was high. Therefore, Humboldt noticed both of these two forms of slavery as soon as he went ashore at New Andalusia's capital city Cumaná, a city founded by the Spanish in the early 16<sup>th</sup> century at the beginning of its global colonization, in the most eastern part of the New Continent they had occupied by force and diplomatic conspiracy.

The political situation in Spanish Latin America was not favorable for Humboldt. Since the early sixteenth century, the Spanish had imported slaves to their colonies in Latin America and other places around the world, and continued to do so when Humboldt arrived in 1799. The plantation owners there, who were at the same time slave owners and traders, were Creole colonizers of Spanish Empire. they had been kept on a tight leash by their own kingdom from the very

beginning of Spanish Colonization and especially so, ever since the American War of Independence had fired the opening shot and spread very soon, through the entire British North American colonies, and what was later known as the Haitian revolution broke out in French colonized San Domingo in the last quarter of the 18<sup>th</sup> century. They, though still Spaniards if seen from the perspective of nationality, were required of grant from the king himself every time their trading ships entered the port of the colonies, demanded of absurdly high taxes by their mother country but forever excluded from local government institutions for fear of their following of the Americans' suit. Therefore, the relation between the local Creole elites with their mother country was tense when Humboldt arrived in 1799. While Humboldt, the scientific traveler, was the one who had received his Royal passport from the Spanish King to explore at his own will all the Spanish holdings in Americas and arrived on the vessel 'named after one of the most brutal conquistadors of all'[9], Pizarro. All these facts inevitably drew their suspicion to him, thinking that he was financially aided by the Spanish King and in the King's service in return. This means that Humboldt, although financed his own expedition largely with his inheritance from his mother and not really in service to the Spanish crown at all, had to tread very carefully in his scientific exploration of Spanish Americas, especially when observing and analyzing slave trade of the local Creole elite of Venezuela and Cuba, the regions with the most developed plantation economy among all the Spanish colonies in Latin America.

Needless to say, Humboldt's primary intention of taking this epic Latin American expedition was to conduct scientific researches on geology, climatology, botany, mineralogy, etc. since he was a scientific explorer in essence. But the barbarism and slavery he saw everywhere along the way left him no other choice, but to silently observe and note down in his manuscript which would eventually come out in public five years later when He and his companion Aimé Bonpland finished their American expeditions and returned safely back to Europe. Therefore, his manuscript which would be published within the next 20 years as 'some thirty volumes relating to the findings of this expedition'[10] contained many passages condemning explicitly the Spanish slavery and their greedy extraction of resources at the expense of massive deforestation and starvation of the aborigines.

Cumaná was the first city where Humboldt lived at the very beginning of his mobile exploratory life in the New world. This is also the place which presented him with the very first vivid picture of slavery. His diplomatic talents allowed him to enter without much difficulty the Spanish colonial circle, the highest class in Spanish colonies, and enabled him to collect fullest and newest first-hand information about slave economy from his interactions with them. The more information he collected and the more merciless remarks concerning the sufferings of slave laborers he heard, the more his heart was dampened. But what made him furious was the scenes of slave trading and miserable living conditions of slave laborers he saw with his own passionate eyes in Cumaná and other coastal cities of Spanish Latin America. In a letter to his dear elder brother Wilhelm, Humboldt depicted the miserable living conditions of the aborigines who had been reduced to slave workers in mines and plantations as follows:

Outside of the town(Cumaná) live the copper-colored Indians of which the men are almost completely nude. The huts are made of bamboo covered with coco leaves. I went into one of the huts. The mother was sitting with her children, in place of chairs on branches of coral thrown up by the sea. Each of them had before them a coconut shell in place of a plate out of which they were eating some fish.[11]

And this aforementioned fish was not fresh fish caught by the householder from any nearby river or sea, but the salted fish allotted by their masters to supplement for the small amount of pickled meat which was worth no more than 12 riyals, corn, and sweet potatoes that could hardly meet their basic need for survival.

What saddened his heart even more and what hardened his determination to become 'a life-long abolitionist' was the scenes happened everyday right under his window. Humboldt and his companion Aimé Bonpland rented a house on the main Square of the city Cumaná. This house was right opposite the slave market on the same square where young black slaves raided and smuggled from Africa were put on sale. Every morning these young men aged no more than twenty were forced by the slave wholesalers, to rub their black skin with coconut oil to render it gleam and glossy. Then they were paraded in rows, waiting to be sold to plantations or mines. Then Prospective buyers would shoulder their way through the captives and jerked open their mouths to judge their age and health from their teeth just like what horse



buyers usually do to horses on sale in an animal market then, and sometimes these proud buyers would sear their newly purchased slaves with a red-hot branding iron to recognize them again at the first sight if they would escape one day. This treatment bestowed by the rapacious Creole colonizers who were supposedly Christian, on those black slaves who would save other men the labour of sowing, tilling, and reaping incited Humboldt's fury so much that he could not help but question sorrowfully and rhetorically, 'What are the duties of humanity, national honor, or the laws of their country, to men stimulated by the speculations of sordid interest?'[12]

Indeed, It is Cumaná that gave Humboldt the first impression of slavery, but other cities along the Caribbean coast of Venezuela and its capital, Caracas, were also important centers for slave trading which hurt the feelings of Humboldt who believed that 'the best air of all is breathed in liberty'[13]to a great extent. Slaves were sold on Bazaars of those cities along with traditional commodities like sugar, cocoa, coffee, livestock, tobacco, etc. Caracas is also the place where Humboldt started to notice a change in the use of slaves before the Bolivarian War which led to Latin America's gradual independence in early 19<sup>th</sup> century. During his stay in Caracas From 22 November 1799 to 7 February 1800, Humboldt witnessed a sharp increase in the number of black slaves in the warehouses he called in his works 'House of Black Slaves' but actually served as barracks where slave soldiers were kept. Humboldt wrote in his manuscript, 'Before the outbreak of the impending war, slavery surged so much that merchants from Grenada and Jamaica wanted to build new houses of black slaves in Caracas.'[14] These slave soldiers were forced to work on the plantations of those Creole elites like Simón Bolívar himself in the day time and locked up in big barracks when night fell.

Besides that, Humboldt was exposed to other forms of barbarism and slavery during his stay in Venezuela. His interactions with the Creole elites enabled him to know the miserable living conditions of slaves which interested him so much and dampened his heart no less after seeing with his own eyes, and at the same time, deepened his hatred of slavery and violence against slaves even more. Fernando Peñalver Pellón was a slave Owner and Jacobin in Venezuela like Bolívar who would launch the Independence Movement of Latin American colonies together with other historical figures in 1810 and lead six Latin America countries (Colombia, Venezuela, Ecuador, Panama, Peru, and Bolivia) to achieve their independence one by one within 15 years. But unlike Bolívar who wanted to abolish slavery system and establish a republican regimes in Venezuela and other Latin American countries, This man dreamed of launching a Jacobin style revolution to establish 'a White Republic' that would reserve slavery in Venezuela. A dairy of Humboldt written on 22 February,1800 depicted the Creole elites' celebration of a local carnival in the house of Fernando Peñalver Pellón and the fury of Humboldt after hearing Peñalver's assumption of the so called 'White Republic':

The circle of Valencia( Where Peñalver's house was located) seems more cultivated than that of Caracas. Talk is more casual. Mr.Fernando Peñalver received the same education as his brother, also thin like a dog, but taller, and boasted himself as Adonis. Poor vanity! For the first few days is always about Renard, encyclopedia, human freedom..., then, to common humanity. The Portuguese Think that a White Republic should be established [...];In the White Republic, even the free mulattoes should not have rights, slaves should kneel while serving their masters. They(the masters) should sell the sons of slaves... this is the result of the American Enlightenment! Throw away your Encyclopedia and Renard, you bastards![15]

In Humboldt's view, Slavery was absolute tyranny forced upon the maroon aborigines and the raided African blacks. Due to the personal intercourse with the Creole elites, Humboldt had the chance to witness the real living conditions of the slave laborers. His diary was filled with horrendous scenes of suffering of the slaves besides the miserable living conditions of them as discussed above: one plantation owner in Caracas tortured his slaves with needles, whereas another forced his slaves to eat their own excrement, not to mention the scars of whiplash on the backs of slaves and iron marks on their faces or arms wherever and whenever he turned his eyes to. Horrible stories concerning the extreme cruelty with which the slaves were treated even by Christian missionaries who had been supposed to be the one spreading Love and Saving Grace of God to all sufferers were also recorded in his diary:

An aboriginal slave boy's testicles were bitten off by his master, a missionary in his Mission Station, just because he had kissed a slave girl. This means that Indians who had been reduced to be free laborers were not treated any better than the black slaves smuggled from Africa.[16]

The vivid pictures of slavery Venezuela presented before the eyes of Humboldt horrified and irritated him, and finally forged him into a resolute adversary of slavery who firmly believed that ‘Slavery is no doubt the greatest evil that afflicts human nature’[17] and inaction in the face of slavery was simply a crime.

### 3.2 An In-Depth Observation of Slave Trade in Cuba

Slave trade is a non-negligible node in Spain and other European colonial powers' American holdings. While Venezuela left Humboldt the vivid impression of barbarism and cruelty with which the slaves, both the African blacks and the aborigines, live in their miserable enslaved life, Cuba provided Humboldt with the ‘luck’ to collect more information about slave smuggling and real living conditions of the slaves in Cuba as well.

Humboldt had been in Cuba twice during his expedition of Spanish Americas spanning five years from 1799 to 1804 and stayed there for more than four months all together. Due to his superb diplomatic skill, Humboldt not only gained for himself friendship and financial support from sucrose oligarchs such as Luis de la Questa and his father-in-law Gabriel Raymond de Azi Carat, a prominent figure in the circle of conservative Creole elites, but also secured himself an opportunity of witnessing real living conditions of slaves. Living in the magnificent house of Questa in Havana at his invitation allowed Humboldt access to the first-hand data of slave trade and slave ships. And all the sufferings of slaves and scenes of massive slave trade were recorded in his famous diary *Havana 1804* which started to come into shape page after page when he was still living in Questa’s house, but only published under the name *Isle de Cube, Antilles en général* a few years later for fear of offending Questa, the slaveholder and trader, who had provided him with free accommodation and other conveniences for him to interact with slave-owning Creole elites and conduct his humanistic research on the living conditions of enslaved maroon and black laborers working in sugar plantations. The passages attacking Spanish slavery and the unfair division of population in Castes in Cuba, especially in its capital Havana, were all included in his *Political Essays on the Island of Cuba* published in 1826 when six Latin American countries including Venezuela, had gained their independence and Humboldt had returned to Europe. These same materials were so typical in reflecting the miserable fate of slaves and the development of slave trade in Cuba that they were reemphasized in his *Personal Narrative*, the famous book published later the same year as his *Political Essays on the Island of Cuba* when his sustained indignation over slavery had been mounted to its very extreme.

Being constantly haunted by the ‘recollection of crimes produced by the fanaticism and insatiable avarice of the first conquerors ’[18], Humboldt could not help but repeat his abolitionist view of ‘slavery had no place in society’[19] throughout his expedition in Latin America, though more implicitly and tactfully when he was still in Spanish colonies in gratitude for the Spanish monarch's having granted him Royal passport and patronage to do scientific explorations in his possessions. The third volume of his *Personal Narrative*, The book published when he was in Spanish American colonies no more, included a long section explicitly exposing and attacking the barbarism of slavery conducted by the Spanish colonizers in Cuba and the plantation system there.

Cuba was of critical importance among the Spanish American colonies in Slave trading and plantation economy since the very beginning of its colonization. Its capital Havana was situated at the entrance of the Mexican Mediterranean, making it the geographical center and major seaport of Cuba and even Spanish colonies in Americas, as what New York was to English North America. Cuba had started its slave trading business since the early 16<sup>th</sup> century when it had become apparent that the native maroon Americans could never provide enough labor for the Spanish colonizers’ ever-expanding mines and sugar plantations, and continued to do so for another 80 years after Humboldt’s departure from Spanish colonized Cuba in 29 April 1804. As a resolute adversary of slavery who believed that ‘human society needed freedom in order to function well’, Humboldt angrily recorded the shameful scenes of slave trade, though quite implicitly considering his personal relationship with Questa and slave-holding sucrose oligarchs like him in Cuba, in his *Political Essay on the Island of Cuba*: ‘There was a botanical garden near Campo de Marte, a place worthy of government attention. The existence of one thing, barracks, in that garden, was both outrageous and shocking! slaves were miserably displayed in front of the barracks, waiting to be sold.’[20]

Although more than eight million Africans had been transported to or via the Port of Havana and other major seaports in

Cuba, constituting more than eighty percent of all slaves introduced to the New World, the proportion of free blacks and mulattoes in Cuba was higher than that of other Spanish possessions and higher even more than that of French Santo Domingo and English West Indies where continued inhumane slavery led to horrible social political catastrophe of bloody slave rebellion one after another in the last quarter of the 18<sup>th</sup> century, just a few years before Humboldt's first arrival there. Nevertheless, the fact that there lived a small proportion of free African blacks and mulattoes does not necessarily mean that these people could breathe the free air and live a totally independent life as they wished, but rather a miserable one not significantly better than that of the enslaved. Because in the eyes of the Whites, even the mulattoes should not have any rights[21] and should be banned from any kind of handicraft production, let alone the so called free African blacks. Their fate was to be dispersed to the inland slave-holding regions to farm the fields of the Creole Whites for fear of their rebellion following the suit of the black slaves of Santo Domingo.

However, facilitated by the British Industrial Revolution which had started in the 1760s and encouraged by French political revolution which had broken out 10 years before Humboldt launched his expedition of Spanish Latin America, Slavery that had been in existence for more than 300 years in European colonies around the world started to undergo a series of fundamental changes: Anti-colonial revolution which escalated very soon into a full-scale war of Independence; The epoch-making American Revolution which led to the independence of the 13 English North American colonies and the founding of the democratic United States of America, Broke out in North America in 1775; Then in 1791, the Haitian Revolution broke out in Santo Domingo under the leadership of François-Dominique Toussaint Louverture and finally declared the independence of Haiti on 1 January 1804. As to Cuba, not only did the anti-slavery wars elsewhere not shake the foundations of its slavery, but made, on the contrary, its slave trading industry more prosperous than any other part of the Spanish colonies because the Haitian Revolution had driven much of Santo Domingo's sugar trade to Cuba. And by the time Humboldt published his diary *Havana 1804* under the name of *Isle de Cube, Antilles en général* and *Personal Narrative* in 1826 Cuba's plantations would have become a major world producer of sugar and coffee beans. This was a dangerous economic development path for Cuba to take when the foundations of colonization and slavery economy with which the former had been built up were gradually vacillated by anti-colonial revolutions and slave-abolitionist movements, because its 'sugar market in particular, was unstable and both capital-and labor-intensive. And that labor was, of course, slave labor.' [22] According to Humboldt's statement, 'every drop of sugarcane juice costs blood and groans' [23] And this fretted Humboldt to a great extent because, although he admired the French Revolution, he held no appreciation of 'horrendous catastrophe', terrorism, caused by the Jacobin style riot of force and bloodshed: crippling slave soldiers, dismembering the slaves alive with dogs, whipping slaves 200 to 300 times before shooting them, shooting all the slave captives, etc. As to the possible ways of ending slavery, Humboldt had his own thinking.

### 3 HUMBOLDT'S PHASED REFORMATIVE SOLUTIONS to END SLAVERY in LATIN AMERICA

Although Venezuela, Cuba and other Spanish colonies in Latin America showed Humboldt slavery softener that what it was in French West Indies or back in Europe, yet his concern about slavery there was no less when he and his companion finished their scientific exploration and humanistic research in Spanish Latin America and set out for the newly founded independent United States of America: 'I preserved, on quitting America, the same horror of slavery which I had felt in Europe.' [24] That horror was roused by what Humboldt had experienced in slave-holding regions in Latin America: He had seen the Creole colonizers' burning desire of breaking the leash of their mother country, Spain, and establishing several independent White republican countries in its Latin American colonies at the expense of bloodshed and tears of slaves. At the same time, he had felt on the slaves' part, the 'courage of despair, and a desire of vengeance, nourished by the rigor of the Whites'. [25] That horror was also enhanced by the haunted memory of how he and Bonpland backed off for fear of potential danger when a maroon young man, one of the slaves escaped from the prison where they were chained, asked for help, and how the ship-men conspired to seize the poor fugitives who were all clothed only in heavy chains, and sell them secretly at another coastal city far away from where they had been found. His own reaction of not having trusted the poor slave boy and the ship-men's conspiracy of raiding him and his

companions troubled Humboldt so much that he could not help but ask himself: Has slavery deadened the ennobling instinct of pity in human beings?[26] The answer was No. As a matter of fact, The more Dampened his heart was, the more hardened his determination to abolish the shameful slavery was. And that determination prompted him to ponder over the possible solutions to put an end to the sufferings of the enslaved African blacks and aborigines in Latin America.

In Humboldt's view, Slave trade was not only barbarous, but also unreasonable: On one hand, slave economy was fundamentally inefficient: Slave-holding regions, taking Cuba as an example, could hardly produce enough food to feed its population with its large amount of arable land and at the cost of life of vast multitudes of slaves ruthlessly exploited and used up 'as a beast of burden'.[27] On the other, slave trade was a political crime against the enslaved and was dangerous for the slaveholders in turn. In the eyes of the white colonizers, Haitian Revolution was due to nothing worse than loose governance and could never shake the foundation of their colonial ruling power. Although Humboldt held no sympathy for his fellow Whites and held a sincere appreciation for the great success the black slaves had achieved in the French Santo Domingo, The complacency of the white slave-holding colonizers troubled him to a great extent, because he believed that if slaves were deprived of the innate rights granted by the laws of nature, they would surely rise and seize those rights for themselves and things would become uncontrollable then. This attitude of Humboldt was understandable. He was a humanitarian who admired the achievement of the French political revolution but kept some distance from the Haitian Revolution because he was always in disfavor of radicalism and loathed barbarous killing of bloodthirsty extremists on either side.

Humboldt believed that ending slavery was not only the hearts' cry of the enslaved, but also in line with the economic and political interests of the Creole elites who wanted to establish new forms of local government independent from their mother Countries. He also held a firm faith that 'slave states did not have to end in violence'[28], they could gain their independence by adopting a peaceful repairing solution that could avoid massive bloodshed while eradicating the most inveterate moral evil of slavery and consoling the misfortunes of the enslaved. However, Humboldt was realistic, he knew that the abolition of slavery without violence would not happen overnight(Humboldt was right, slavery continued till 1888, nearly 30 years after Humboldt's death, in various evolved forms in some independent countries that used to be former slave-holding regions of the Americas). Accordingly, the solution he envisioned to end slavery in Spanish Americas was one of peaceful repairing reforms with prudent humane measures to 'prevent the destruction of the blacks'[29], to avoid bloody slave rebellion and bring about the final victory in the abolition of slavery, though probably gradually.

The first phase of reforms, Humboldt argued, was to improve the living conditions of the blacks from various aspects: a).to exempt female slaves from labor during pregnancy; b).to establish good child care system to ease slave parents' burden and to improve infant survival rates; c). to provide separate dwellings for every slave family; d). to provide food of good quality and in sufficient quantity; and e).to allow slaves days of rest to make them less unhappy and less perishable. While the second phase of reforms was to make the slave-holding regions one or several self-governing republican country or countries: to free all the enslaved, both the maroon aborigines and imported African blacks and their native born children as well, and to transform the slave population into an agricultural one to ensure that every cultivator tills on his own share of farmland. Humboldt explained his reason for this reformative solution to abolish slavery in his manuscript of *Isle de Cube, Antilles en general*: 'If it is dangerous for the government to give the blacks freedom at once, they could at least improve the situation of them and make them less unhappy. Inaction is a crime'[30]. For Humboldt, If there was no hope to end slavery in the short term. the slaveholders should at least reform their slavery practices to lessen the suffering of the enslaved who should have enjoyed their natural inborn liberty but were mercilessly deprived of by them. It was a crime to do nothing in the face of bloodshed and tears of the enslaved population.

#### 4 CONCLUSION

This paper investigated the great Prussian born natural scientist and a humanitarian scholar Alexander von Humboldt's anti-slavery thought and his solution to abolish slavery in Latin America. A systemic reading of his academic works, diaries and letters, and of those books, newspaper reports and academic papers about his well-known scientific expeditions to North and South Americas reveals that Humboldt was a fierce critic of slavery and supported the revolutions in Latin America though kept some distance from the Jacobin style radicalism. Humboldt was an uncompromising abolitionist who never stopped condemning slavery in his manuscripts recorded during his scientific explorations to the slave-holding regions of the Americas. The seed of his anti-slavery thought was planted by the Enlightenment thinkers who tutored him in his early youth and nurtured by the associations with intellectuals like Blumenbach and Goethe, etc. in his young adulthood. The epic expedition to Spanish Americas which presented him with unbearably cruel scenes of slave trading and the miserable living conditions of the enslaved aboriginal Indians and the smuggled African blacks forged his anti-slavery thought and made him an ardent abolitionist. Fretted by slaveholders' insatiable avarice for wealth at the expense of the lives of slaves, and grieved by the sufferings of the enslaved 'colored fellowmen' Humboldt envisioned a phased reformatory solution to end slavery gradually in Spanish Americas. Although he failed to witness the success of Latin American abolitionism in his lifetime, his anti-slavery view exerted great influence on liberals and abolitionists all over the world and made him 'a visionary, a thinker far ahead of his time' and the 'second Columbus' of the New World who was hailed and is still being hailed by the admirers of liberty and equality worldwide even today.

This is the first comprehensive study into the anti-slavery thought of Alexander von Humboldt. Although it is possible that there are still important questions remain to be found out and clarified, the aforementioned research findings can serve as significant implications for a better understanding of the formation and influences of anti-slavery views of scientific travelers like Humboldt in the early post-colonial era. The main weakness of this study was the paucity of materials from journal articles and other forms of works written in German and French due to the difficulties of data collecting and the authors' insufficient proficiency of those two languages. Therefore, it is recommended that further research be conducted in aspects as follows: a). collecting original manuscripts of Humboldt, and other relevant materials of him and about him written not only in English, but also in German, French and other possible languages to obtain a fuller understanding of the essence of Humboldt's anti-slavery thought; b). exploring Humboldt's anti-colonial thought as for Humboldt, colonialism and slavery were basically one and the same'; and c). analyzing the relationship between these two thoughts and his concepts of 'connectedness', because colonialism and slavery are interwoven with man's relationship to nature and the exploitation of natural resources.

### **COMPETING INTERESTS**

No potential conflict of interest exists between the authors.

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# BALANCING, CHALLENGES, AND OPPORTUNITIES: KAZAKHSTAN'S MULTI-VECTOR FOREIGN POLICY AFTER UKRAINE CRISIS

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**Abstract:** Kazakhstan has long pursued a multi-vector foreign policy, balancing relations with major powers like Russia, China, and the West. However, the Ukraine Crisis and escalating Russia-West tensions challenged this approach. This article examines how the crisis impacted Kazakhstan's multi-vector diplomacy. It analyzes Kazakhstan's efforts to preserve economic and security ties with Russia while maintaining favorable Western relations. Kazakhstan's strategy involves distancing from Russia, intensifying collaboration with China, cautiously engaging the U.S. and Europe, and strengthening Central Asian partnerships. The future trajectory of its multi-vector policy hinges on adapting to regional shifts while safeguarding national interests. The article illuminates complexities small and medium states face in pursuing autonomous foreign policies amid multipolar rivalries. It enhances understanding of how such states navigate major power conflicts to uphold sovereignty and strategic autonomy. The analysis contributes insights into foreign policy dynamics in post-Soviet Eurasia.

**Keywords:** Kazakhstan; Russia; Ukraine Crisis; Multi-vector Foreign Policy

## 1 INTRODUCTION

The geopolitical landscape of Eurasia experienced a significant shift following the Ukraine crisis in 2014. This event, particularly Russia's annexation of Crimea and the ensuing conflict in Eastern Ukraine, not only altered the dynamics of relationships among post-Soviet states and Russia but also had extensive implications for the global order. In this context, Kazakhstan, strategically located at the crossroads of Europe and Asia, plays a pivotal role. The country's foreign policy decisions are influential, affecting not just neighboring countries but also the wider international community. Historically, Kazakhstan has adopted a multi-vector foreign policy, aiming to maintain balanced relations with major global powers such as Russia, China, the European Union, and the United States[1,2]. The Ukraine crisis was a defining moment in post-Soviet geopolitics, testing existing security and diplomatic paradigms in the region. For Kazakhstan, which shares an extensive and complex history with Russia, the crisis required a nuanced diplomatic balancing act. Kazakhstan endeavored to preserve its strategic partnership with Russia, particularly in security and economic aspects, while simultaneously asserting its sovereignty and independence [3].

This article aims to demystify the evolution of Kazakhstan's foreign policy since the crisis. It examines how the country has navigated the increased tensions between Russia and the West and discusses the implications of these maneuvers for regional stability and global diplomacy. By analyzing Kazakhstan's response to the Ukraine crisis and its subsequent diplomatic strategies, this paper offers valuable insights into the challenges and opportunities faced by Kazakhstan and similar states in managing complex international relations. The article contributes to the academic discourse on Eurasian geopolitics and the strategic considerations of post-Soviet states in the current global order.

Kazakhstan's foreign policy is characterized by multi-vectorism, a pragmatic, non-ideological approach aimed at fostering relations with key global players[4]. This principle was foundational to the Strategy on the Formation and Development of Kazakhstan as a Sovereign State, outlined in May 1992, which prioritized creating a conducive external milieu to bolster the nation's stable growth through political and economic reforms. Multi-vectorism has enabled Kazakhstan to navigate dependencies in asymmetrical relationships, leveraging its position to balance the influences of major powers like Russia, China, and the United States, thereby securing enhanced benefits and agreements [5,6].

A multi-vector foreign policy is a strategic approach that aims to foster strong relationships with a variety of countries and international organizations. The term, known as "multi-vectorism", is grounded in pragmatism and eschews ideological biases, allowing governments to remain neutral and avoid taking sides in international disputes or forming overly close alliances with specific nations or political group. Governments that adopt a multi-vector strategy strive to be seen as reliable partners, facilitating cooperation and dialogue among nations, with their actions driven purely by the state's interests in achieving its policy objectives.

Kazakhstan has been particularly persistent in applying multi-vectorism in its foreign policy, a practice it has honed since the early 1990s[7]. Following the Soviet Union's collapse, the shift towards a multipolar world order, and the acceleration of globalization, Kazakhstan's strategic location and abundant resources have made it a focal point of great power competition. Initially, multi-vectorism served as a strategy for Kazakhstan to navigate Russian dominance in the region and carve out an independent foreign policy path. Moreover, Kazakhstan's independence brought significant economic challenges, with the early years marked by instability and a sharp GDP decline in 1994 [8]. The need for

substantial capital investment and diverse market access for its growing energy sector in the late 1990s further propelled Kazakhstan towards a multi-vector approach, seeking multiple partners in direct competition with Russian interests. With both domestic and international objectives in mind, the Nazarbayev administration explored all options to ensure state security and economic growth. This multi-vector strategy enabled Kazakhstan to navigate complex international dynamics while making strides towards its policy goals. Shortly after gaining independence, Nazarbayev laid the groundwork for Kazakhstan's foreign policy, identifying key regions and countries for strategic partnerships, including the CIS states, Europe, Asia, North America, and the Pacific Basin, with a special focus on Russia, China, and the United States[9]. Beyond these powers, Kazakhstan has sought to foster relations with Western Europe, Central Asia, and other regions to gain economic support and development experiences. The country has also prioritized joining various international organizations, engaging in multilateral diplomacy, and taking on international responsibilities, significantly boosting its global image.

Kazakhstan's foreign policy formulation and implementation reflect a deep understanding of the international and domestic strategic landscape. Its "diversified and balanced" diplomacy, tailored to the nation's needs at the onset of independence, not only solidified its standing in the international community in a relatively short period but also created a conducive external environment for economic development. This approach has positioned Kazakhstan as a key player in the economic and social progress of the Central Asian region[10,11].

## 2 MATERIALS AND METHODS

This article employs a qualitative research methodology, relying on a comprehensive literature review and analysis of primary and secondary sources. The primary sources include official government documents, such as the Foreign Policy Concepts of Kazakhstan, presidential speeches, and official statements from the Ministry of Foreign Affairs. Secondary sources encompass academic articles, policy papers, and reports from think tanks and international organizations. The collected data is analyzed using a thematic approach, focusing on the key aspects of Kazakhstan's foreign policy, including its multi-vector strategy, the impact of the Ukraine crisis, and its diplomatic practice in relation to Russia, the West, China, and Central Asian countries. The analysis is guided by the theoretical framework of neo-classical realism, which considers the interplay of systemic and domestic factors in shaping foreign policy decisions.

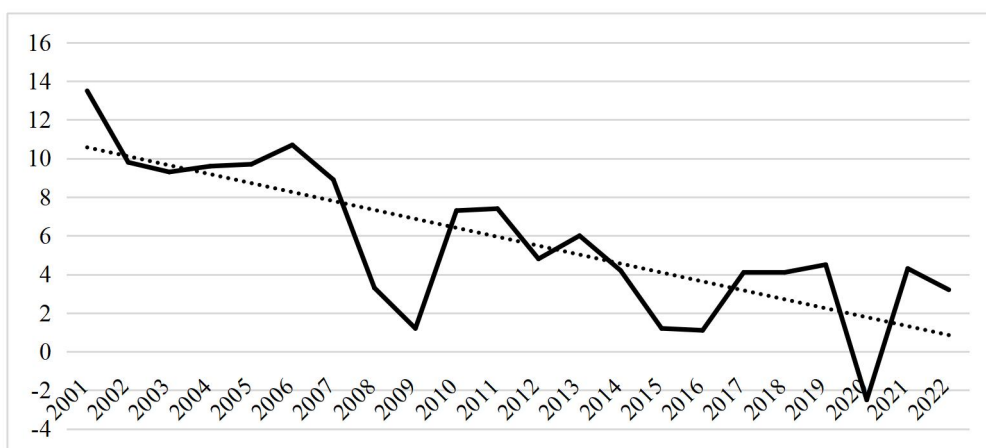
## 3 RESULTS

### 3.1 The Impact of the Ukraine Crisis on Kazakhstan

At the end of 2013, Ukraine's situation spiraled out of control, evolving into a political crisis following widespread protests over political issues and the signing of free trade agreements. This crisis extended beyond Ukraine's borders, significantly altering the geopolitical dynamics of the Eurasian region. Kazakhstan, a key player in the post-Soviet realm, experienced adverse effects in its economy, security, and diplomatic relations as a result.

#### 3.1.1 Economic development

The war's actual economic impact on Kazakhstan has been notably mixed. Given the close economic and trade ties between Kazakhstan and Russia, the sanctions and counter-sanctions between the West and Russia have had a serious negative impact on the economy of Kazakhstan. Kazakhstan has seen a notable drop in its GDP. While the GDP figures in the local currency, tenge, show an increase, fluctuations in the exchange rate mean these figures don't accurately capture the economic reality. When converted to US dollars, the picture changes dramatically, revealing stagnant growth or even a recessionary pattern. Between 2013 and 2016, Kazakhstan's GDP decreased from \$236.6 billion to \$137.3 billion, marking a significant slowdown. Although there was some economic recovery from 2017 to 2020, the onset of the COVID-19 pandemic triggered another economic downturn. To date, the annual GDP growth rate has not rebounded to its pre-2014 levels as seen Figure 1.



**Figure 1** Annual Growth Rate of Kazakhstan's GDP, 2001-2022.



In addition, Kazakhstan is facing problems of devaluation of the national currency, rise in unemployment, and concerns over energy and food security. Within the initial fortnight of the crisis, the Kazakhstani tenge plummeted by 15.3 percent in comparison to the dollar, mirroring the initial decline of the rouble[12]. This led to a surge in the cost of various imported items, including food, consumer goods, gas, and refined oil products, directly affecting the purchasing power of the population and, by extension, potentially the social stability. In 2022, Kazakhstan's unemployment rate stood at 4.9%, with 4.583 million people out of work. This represents an increase of 87,000 from the 4.496 million unemployed in 2021[13]. Such a rise in unemployment is likely to contribute to greater social instability, as more people face economic hardship. Kazakhstan relies heavily on Russia for imports like sugar, grain, and cooking oil. However, the Ukraine crisis has led to a decrease in these Russian exports, driving up prices. Concurrently, disruptions in production, logistics, and trade have significantly increased the cost of food and energy products. It poses a risk to Kazakhstan's food and energy security and exacerbates inflation problem. From 2014 to 2023, inflation in Kazakhstan surged by 124%[14].

At the same time, Kazakhstan might have found new opportunities to expand its economic influence in the region. In 2022, Kazakhstan's export to Russia nearly doubled, and the majority of transactions were carried out in national currencies, sparking concerns that the country might be serving as a conduit to sidestep Western sanctions, despite its declarations to the contrary. Additionally, the high prices of oil and gas positively influenced the country's trade balance. Kazakhstan could also benefit from the influx of a number of international companies compelled to exit the Russian market. In response to the invasion, Kazakhstan is actively encouraging businesses to relocate from Russia by offering incentives. The country has already secured agreements with over 50 companies, notable names include Honeywell, WEG, TikTok, Fortescue Metals Group, and Carlsberg. Furthermore, Kazakhstan aims to attract an additional 300 businesses from over 20 countries, with a significant focus on companies from Germany and the United States[15]. President Tokayev has called on the government to create favourable conditions for their relocation. This strategic move aims to capitalize on its unique geographical location at the juncture of European and Asian markets.

### **3.1.2 Security**

Russia's annexation of Crimea and destabilization of Ukraine have heightened anti-Russian sentiment in Kazakhstan. Russia's actions are seen as a warning since it shows Russia's determination to interfere with the domestic affairs of its neighbours to advance its own agenda. These actions highlight the significant costs associated with any efforts to distance oneself from Russia's influence. According to President Vladimir Putin, the primary justification for Crimea's return was to safeguard the interests of Russians living abroad due to historical reasons[16]. Given that northern Kazakhstan has a predominantly Russian population, this move has raised concerns in Kazakhstan about its own sovereignty.

The "Great Russianism" of the Russian political discourse has stirred up Kazakhstan's sense of sovereignty and exacerbated its Russophobia. In February 2014, Vladimir Zhirinovskiy, head of Russia's LDPR party, expressed support for incorporating Central Asian nations, such as Kazakhstan, into the Russian Federation as part of a proposed Central Asian Federal District. That same year, during an all-Russian youth forum, President Putin remarked that Nursultan Nazarbayev had "established a nation on a territory that had never previously been recognized as a state"[17]. After the escalation of the Ukraine crisis, the Russian politician Dmitry Drobnitsky mentioned that Kazakhstan could be Russia's next concern because of the numerous Russians living in its territory[18]. Subsequently, the Russian Ambassador to Kazakhstan, Ambassador Borodavkin, publicly stated in an interview that Kazakhstan's "ultra-nationalist" tendencies and "Russophobia" were getting worse, and that Russia would help suppress Kazakhstan's "nationalism" and "extremism" if Kazakhstan needed it[19]. The comments sparked widespread uproar and strong reactions across the country, leading to a public outcry and heightened discussions among the citizens.

Critiques of the economic collaboration have also become increasingly common. Kazakhstan openly criticized attempts to provide integration projects with a political dimension and suggested that they pose a threat to the country's political sovereignty. The Kazakh elite is strongly opposed to Kazakhstan's membership in the Eurasian Economic Union (EAEU), which it sees as a means of realizing Russia's imperial ambitions. Although Kazakhstan's involvement in the EAEU was touted to bring economic advantages, the sentiment among the populace, including civil society and the business sector, has been more skeptical over the last ten years. From 2010 to 2015, civil society organizations actively participated in debates about this issue, utilizing press conferences, forums, and roundtable discussions to voice their apprehensions regarding Kazakhstan's integration into the Customs Union and subsequently the EAEU[20]. Kazakhstan declared it would maintain the option to exit the Union should it pose a threat to the nation's sovereignty[21]. Although such declarations might seem at odds with Kazakhstan's role as a key proponent of the Union, they were mainly directed at the domestic audience and, to a degree, reflect underlying skepticism among the Eurasian project's participants. This rhetoric, highlighting a practical stance and the importance of sovereignty, continued even after the political shift in 2019[22]. The war in Ukraine has laid bare the fragility of Kazakhstan's economic ties with Russia. Russia's decision to halt specific exports to EAEU member states, aiming to safeguard its domestic market, swiftly influenced the cost and accessibility of several staple foods in Kazakhstan, underscoring the nation's profound reliance on its adjacent ally.

The future trajectory of Kazakhstan is closely linked to the outcome of the crisis in Ukraine. Political reform is more likely if the Kazakhstani government loses Moscow's support due to a Russian setback. Conversely, a Russian victory might lead to a stronger influence in the region, reinforcing the current political landscape in Kazakhstan and beyond. However, the crisis may also hinder domestic progress. Deep socio-economic frustrations had been bubbling in the population for several years and had led to recurrent protests. The crisis added further distress to the society already

deeply shaken by the traumatic events of "Bloody January". In a society divided and concerned about escalating costs due to geopolitical tensions, the government might struggle more than ever to address public discontent.

### **3.1.3 Diplomatic relations**

For many years, Kazakhstan has implemented a multi-vector foreign policy, striving to maintain a balanced relationship with key global players like Russia, China, the United States, the European Union, and its neighbors. However, the Ukraine crisis has complicated the geopolitical landscape in the Eurasian region, making it more challenging for Kazakhstan to navigate the interests of major powers and regional entities. On one hand, Kazakhstan shares a strategic alliance with Russia, marked by significant economic ties and military-security cooperation. On the other hand, it is connected with Western countries and trading partners that contribute substantially to its economy. These relationships are crucial for Kazakhstan's modernization and growth, placing its foreign policy at a crossroads. While adopting a strategy of diversified balance may alleviate some pressure to pick sides, the Ukraine crisis underscores that such an approach doesn't completely remove the necessity to make tough decisions in a complex global political context. Kazakhstan has opted for a cautious and neutral stance, avoiding a binary choice between major powers. It highlights the pragmatism and diversity of its diplomatic approach.

Although the crisis has had some negative impact on Kazakh-Russian relations, Kazakhstan continues to regard Russia as a top-priority diplomatic partner due to its special significance in terms of history, geography, economy and security. In June 2014, the Kazakh Foreign Minister Idrissov highlighted in an interview that Kazakhstan has sustained long-term strategic relationships with Russia across political, trade, economic, and cultural areas, engaging at both regional and global levels through bilateral and multilateral cooperation. However, amidst escalating tensions between Russia and the West, Kazakhstan has not aligned itself entirely with Russia's political stance. Instead, it has actively sought investments from the U.S. and Western countries, and has enhanced its collaboration with the European Union. A notable instance of this was the president's visit to the EU headquarters in October 2014, where he underscored the significance of bolstering ties with the EU. During this visit, there were substantial discussions with senior officials of the European Commission about the future of cooperation.

Russia-Ukraine Conflict in 2022 has complicated Kazakhstan's efforts to maintain a diverse and balanced diplomatic approach, prompting a reassessment of its ties with Russia. With the U.S. and Western countries imposing comprehensive sanctions on Russia and hinting at secondary sanctions, Kazakhstan has come under scrutiny. High-ranking officials like European Commission President Von der Leyen, U.S. Assistant Secretary of the Treasury Elizabeth Rosenberg, and Assistant Secretary of Commerce Matthew Axelrod have openly criticized Kazakhstan for potentially aiding Russia in circumventing sanctions and export controls. Consequently, Kazakhstan's stance has shifted from its position in 2014, as it now appears to be publicly distancing itself from Russia.

## **3.2 Diplomatic Practice of Kazakhstan After Ukraine Crisis**

### **3.2.1 With Russia – gradual distancing while maintaining priority**

Kazakhstan shares significant ties with Russia, being a founding member of the EAEU and having one of the world's longest land borders with Russia. The 2014 Foreign Policy Concept outlines Kazakhstan's commitment to "further strengthen its ties with Russia across political, trade, economic, cultural, and humanitarian sectors, grounded in the Treaty on Good Neighborliness and Friendship in the 21st Century"[23]. Under President Tokayev's leadership, Kazakhstan has continued to prioritize the "advancement of alliance relations with Russia", focusing on expanding multilateral cooperation within the frameworks of the EAEU, the Commonwealth of Independent States (CIS), the Collective Security Treaty Organization (CSTO), among others. Significantly, Tokayev's first international visit following his reelection in 2022 was to Russia, a gesture he described as "symbolically important"[24]. This underscores that Kazakhstan's "Russia First" diplomatic approach remains steadfast.

Economically, Kazakhstan is highly dependent on Russia. Since the official launch of the EAEU, the two countries have been actively promoting trade within this framework, with particularly cooperation in the fuel and energy, mining and metallurgy, agriculture, transport and communications, machine building, chemical and aerospace industries, etc. In 2020, the Heads of the EAEU member states signed the "Strategic Directions for Developing the Eurasian Economic Integration until 2025", which is designed to increase the Union's investment and innovation activity. In 2021, Prime Minister Asghar Mamin and Prime Minister Mishustin signed the Economic Cooperation Program for 2021-2025. In November 2022, at the 18th Interregional Cooperation Forum of Kazakhstan and Russia, the two countries signed 17 bilateral documents totaling \$50 million[25]. In 2022, the volume of trade between Kazakhstan and Russia reached a record high of \$27 billion. Russian companies rank among the top five investors in Kazakhstan's economy, with their total investment surpassing \$20 billion. In the first half of 2023, Russian investment in Kazakhstan exceeded \$1 billion, marking a 20 percent increase from the previous year[26]. Russia remains Kazakhstan's top economic partner.

In the area of military security, Russia and Kazakhstan share a commitment to uphold regional peace and stability, collaborating closely under CSTO framework. In October 2020, the Defense Ministers from both countries signed a military cooperation treaty. It outlines plans to enhance cooperation in various areas, including expert training, joint military drills, military technology and equipment, armaments, peacekeeping operations, and regional security initiatives. During his discussion with Minister Sergei Shoigu on the same day, President Tokayev highlighted the significance of military collaboration between Kazakhstan and Russia as a cornerstone of their strategic partnership [27]. In addition, the armed forces of the two countries regularly conduct joint exercises aimed at strengthening cooperation in regional security and combating terrorism and extremism. In January 2022, escalating gas prices sparked riots in

Kazakhstan, referred to as the "Bloody January". In response, Russia advocated for the deployment of CSTO peacekeeping forces to assist the Kazakh government in quell the situation. This action underscored Kazakhstan's ongoing reliance on Russia for security support.

However, Kazakhstan has been working to dilute the image of overdependence on Russia. While the President of Kazakhstan acknowledged the CSTO's effective response, he subtly distanced himself from the notion of Russia's dominant role in addressing the "Bloody January" events. Tokayev clarified that it wasn't Russia alone that "saved" Kazakhstan, instead, it was the CSTO that dispatched peacekeeping forces to help quell the riots[28]. Also, Kazakhstan has been making efforts to refrain from supporting Russia's geopolitical actions. For instance, during the 2014 annexation of Crimea, the Nazarbayev administration chose to abstain from UN resolutions on the matter. The situation became more complex following Russia's invasion of Ukraine in 2022, prompting Kazakhstan to distance itself from Russia more than it had in the past. The intensification of the crisis in Ukraine and the subsequent increase in sanctions against Russia have narrowed the room for neutral stances. President Tokayev affirmed Kazakhstan's respect for Ukraine's territorial integrity and expressed a desire to bolster its longstanding cooperation with Europe and the United States[29]. While Kazakhstan chose to abstain from a UN resolution that condemned the war, it made a clear stance by declaring non-recognition of the separatist republics in Ukraine's Donetsk and Luhansk regions. Additionally, the Kazakhstani government has provided humanitarian aid to Ukraine and firmly stated it would not facilitate Russia in bypassing sanctions. This declaration is particularly significant for Kazakhstan, which, as part of a customs union with Russia, could potentially face repercussions from anti-Russian sanctions. Kazakhstan has also expressed a commitment to fostering stable relations with the EU and has shown willingness to contribute to stabilizing the global energy security landscape[30]. In essence, Kazakhstan is cautiously distancing itself from Russia through both its statements and actions.

### **3.2.2 With West – from distancing to moderate contacting**

In the early 2000s, attempts by Western nations to promote "democratic transformation" in Central Asia led to instability and disorder, prompting Central Asian countries to strengthen their ties with Russia and reduce their engagement with the U.S. and Western countries. In 2011, the U.S. introduced the "New Silk Road Initiative" for Central Asia, aiming to assert its influence in the region by fostering trade between Central and South Asia. The Kazakh government values economic aid and investment opportunities from the U.S. Despite a temporary dip in economic interactions during the Trump era, Kazakhstan's interest in American trade and investment remained steadfast. Following the 2014 Ukraine crisis, Kazakhstan aimed to lessen its economic reliance on Russia by seeking external assistance for market development. In 2018, an invitation to the U.S. was extended to former President Nazarbayev, leading to the signing of the Enhanced Strategic Partnership for the 21st Century. This agreement spans a wide array of bilateral cooperation matters, further strengthening Kazakhstan-U.S. relations as both sides committed to enhancing their economically advantageous partnerships, particularly in boosting trade and investment[31].

Following the escalation of the Ukraine crisis, Central Asian nations, including Kazakhstan, are confronted with the dilemma of "picking sides". President Tokayev has frequently emphasized a stance of neutrality, partly to evade potential secondary sanctions from Western countries. Meanwhile, the U.S. is seeking to influence Central Asian geopolitics through initiatives like the "C5+1 Diplomatic Platform" and the "US Strategy for Central Asia 2019-2025," aiming to engage Kazakhstan and its neighbors more closely. In response, Kazakhstan is keen on broadening its strategic options, striving to safeguard its interests through balanced engagement with the United States. On the first anniversary of the Russia-Ukraine conflict, U.S. Secretary Blinken's visit to Kazakhstan was highlighted by Tokayev as a significant step towards bolstering strategic cooperation. Tokayev noted, "In crucial strategic areas such as security, energy, trade, and investment, our countries enjoy a robust foundation of mutual trust and longstanding collaboration. We are eager to further enhance this cooperation"[32]. Since then, high-ranking U.S. government officials have made frequent visits to Kazakhstan. In September 2023, the U.S. invited the heads of the five Central Asian states to New York for the C5+1 summit. This move, followed by similar engagements from its allies with Central Asian leaders, underscores the growing interest of the U.S. and Western countries in strengthening partnerships with Central Asia.

Kazakhstan stands out in Central Asia for proactively forging strong connections with the EU, aiming to secure financial and technical assistance from Western European countries and to gain their support in joining international economic organizations. The EU-Kazakhstan Enhanced Partnership and Cooperation Agreement, encompassing 29 cooperation areas, marks a significant milestone in deepening their bilateral ties. Presently, the EU is Kazakhstan's foremost investor and trade partner, with the country drawing in over \$170 billion in EU investments over the last three decades and hosting nearly 3,000 companies with EU capital[25]. In response to the intensification of the Ukraine crisis, Kazakhstan has made efforts to steer clear of the anti-Russian sanctions by openly expressing its intent to enhance economic collaboration with the EU. In the first Central Asia-EU Summit, President Tokayev affirmed that forging a strategic partnership with the EU has been a cornerstone of Kazakhstan's foreign policy. At the second summit in 2023, Tokayev highlighted Kazakhstan's potential to leverage its economic, trade, and transport-logistics capabilities to foster mutually beneficial ties with the EU. He encouraged European partners to engage in developing The Trans-Caspian International Transport Route (TITR).

Beyond the president, other senior Kazakh officials have increasingly engaged with EU counterparts to pursue economic cooperation. In November 2022, former Prime Minister Smailov and European Commission President Von der Leyen inked a Memorandum of Understanding on collaboration in emerging energy sectors, including battery technology and the green hydrogen value chain[33]. In March 2023, Kazakh Deputy Minister of Economy Abdulkarimov led a delegation to the Central Asia Energy Trade and Investment Forum in London, presenting

investment prospects in the energy area to potential partners. Furthermore, in May 2023, the Kazakh Minister of Energy convened with an EU delegation, headed by the EU Ambassador to Kazakhstan, to deliberate on energy policy cooperation[13]. Therefore, Kazakhstan's vigorous pursuit of stronger ties with EU nations primarily aims to mitigate potential adverse impacts and establish a new balance centered around "economic diplomacy".

### **3.2.3 With China – deepen friendship and cooperation**

During the Ukraine crisis, Kazakhstan was actively engaging with China's Silk Road Economic Belt initiative, introducing its own economic project, the Bright Road Plan, to complement it. Kazakhstan has made it clear that it aims to "enhance in-depth strategic cooperation with China through high-level political dialogue" and foster "a stable, comprehensive, and strategic partnership with China". The Ukraine crisis has expanded the opportunities for collaboration between China and Kazakhstan, leading to a significant improvement in their bilateral relations over recent years.

In the area of politics, China and Kazakhstan have enjoyed frequent high-level engagements, continuously improving their political trust. In September 2015, the leaders of both countries ratified the Joint Declaration on a New Stage of Comprehensive Strategic Partnership. During his state visit to China in June 2018, Nazarbayev emphasized Kazakhstan's commitment to its relationship with China, expressing a desire to align development strategies and enhance practical cooperation in areas like investment, innovation, agriculture, and energy. Tokayev's inaugural visit to China as president in September 2019 promoted the bilateral ties to a "permanent comprehensive strategic partnership", heralding a new era of high-quality development. The year 2022 marked the 30th anniversary of diplomatic relations between China and Kazakhstan, with both sides keen on advancing strategic cooperation, fostering collaboration across various sectors, and deepening their amicable ties. In June of that year, Tokayev underscored the priority of Kazakhstan's relationship with China in its foreign policy, aiming to expand the facets of their bilateral relations[34]. The two countries have engaged in profound discussions on significant international and regional matters, jointly contributing to the enhancement of their bilateral relationship. Furthermore, through platforms like the "China+Central Asia" Foreign Ministers' Meeting and the "C+C5 Summit", China and Kazakhstan have engaged in both bilateral and multilateral dialogues, reinforcing their strategic trust and commitment to mutual benefit.

In the area of economic and trade collaboration, China and Kazakhstan have been progressively enhancing their strategic partnership and broadening their economic activities. Both countries are advancing the Belt and Road Initiative and the Bright Road Plan, diligently implementing policies and engaging in various cooperative ventures in infrastructure, trade, and manufacturing sectors. The extensive and high-level economic connections have intensified the interdependence between China and Kazakhstan, with their shared interests leading to significant agreements on bilateral cooperation and regional development. Currently, China and Kazakhstan maintain seven pairs of year-round operational border ports, five cross-border oil and gas pipelines, two cross-border railways, and one international border cooperation center[35]. Key infrastructure projects like the China-Kazakhstan Logistics Cooperation Base, Khorgos port, Aktau port, and the new Kazakhstan-Turkmenistan-Iran Corridor are put into operation. At the St. Petersburg International Economic Forum in June 2022, Tokayev highlighted, "China is now Kazakhstan's primary economic and foreign trade partner, with Chinese investments in our economy surpassing \$22 billion over the last 15 years. Thus, enhancing our bilateral cooperation with China is crucial for our nation". During the Russia-Ukraine conflict, the trade between China and Kazakhstan has seen a notable rise. The total trade volume between the two countries in 2022 reached \$31.2 billion, marking a 23.6 percent increase from the previous year and setting a new record[35]. In the first half of 2023, trade between China and Kazakhstan amounted to \$13.6 billion, up 20.5 percent from the previous year, with China accounting for 20 percent of Kazakhstan's total trade volume, solidifying its position as Kazakhstan's leading trade partner[36]. The future of China-Kazakhstan economic cooperation looks very promising.

In the realm of cultural exchanges, the relationship between the two countries has grown increasingly close, enhancing the "people-to-people bond". In 2015, they reached an agreement on cultural and humanitarian cooperation, aimed at fostering comprehensive exchanges and collaboration across various humanistic fields[37]. As part of the Belt and Road Initiative, China and Kazakhstan have seen a significant uptick in people-to-people interactions, with burgeoning cooperation in education, culture, tourism, and other sectors. Kazakhstan has established five Confucius Institutes, and seven Kazakhstani centers have been set up in Chinese universities. The exchange of international students between the two nations is on the rise. During Chairman Xi's visit to Kazakhstan in September 2022, the leaders agreed in principle to establish the Luban Workshop in Kazakhstan, with construction commencing eight months later. Moreover, the two countries signed a mutual visa exemption agreement to facilitate people-to-people exchanges. The leaders of China and Kazakhstan have designated 2024 as the Year of Kazakhstan Tourism in China. Both parties are keen on unlocking the potential of regional and border cooperation, encouraging more connections between provinces and cities, and further enhancing people-to-people ties.

### **3.2.4 With Central Asian Countries – enhance intra-region integration and deepen regional cooperation**

Central Asia holds a distinctive position in Kazakhstan's foreign policy, shaped by the deep historical and cultural connections and their shared national security, political stability, and economic growth. Kazakhstan advocates for regional integration to mitigate potential conflicts, addresses socio-economic challenges, and tackles water resource issues. It is committed to confront internal and external challenges, enhancing cooperation across political, economic, cultural, and humanitarian spheres based on mutual benefit and equality.

In terms of regional bilateral relations, Kazakhstan places special emphasis on its relationship with Uzbekistan, marked by frequent interactions in recent years. State visits by the Kazakh president to Uzbekistan in 2016, 2017, 2019, and 2022 have significantly bolstered political ties. In 2022, the leaders of both nations signed the Treaty on Allied

Relations, elevating their relationship from a strategic partnership to allied status. That same year, discussions between the Kazakh and Uzbek Prime Ministers at the CIS Heads of State Council led to an agreement to boost bilateral trade to \$10 billion, aiming to strengthen trade connections. Kazakhstan also prioritizes its diplomatic relations with Kyrgyzstan, with the Kazakh head of state visiting Kyrgyzstan four times since 2014. During a 2022 visit, President Tokayev emphasized the significance of the visit in enhancing the strategic partnership and boosting bilateral cooperation, noting Kyrgyzstan's close ties with Kazakhstan[38]. Subsequently, Kazakhstan and Kyrgyzstan signed a joint statement and 13 memorandums to fortify their partnership. The strategic partnership with Tajikistan is similarly deepening. In May 2023, Tajik President Rahmon's visit to Kazakhstan led to discussions on promoting trade, education, and cultural cooperation, culminating in the signing of an Alliance Cooperation Declaration to solidify their collaborative foundation. Rahmon was awarded Kazakhstan's highest honor, the Order of the Golden Eagle. Additionally, the Kazakhstan-Tajikistan business forum in Astana saw the signing of over 40 agreements valued at \$1.8 billion[39]. Kazakhstan and Turkmenistan, both Caspian Sea neighbors, share broad mutual interests across various sectors. In October 2021, President Tokayev made his first state visit to Turkmenistan, engaging in comprehensive discussions with President Berdymukhammedov on numerous topics, including their strategic partnership. Tokayev affirmed Kazakhstan's strong support for Turkmenistan's peace-oriented policies, its efforts to enhance regional collaboration in Central Asia, its stance of permanent neutrality, and initiatives like the "Days of Turkmenistan Culture" in Kazakhstan. They also explored expanding bilateral cooperation in energy, logistics, transportation, agriculture and industry. The visit was marked by the signing of several collaborative agreements, including a Joint Declaration by the Heads of State, further propelling the strategic partnership between the two nations.

The momentum for regional cooperation in Central Asia has been increasingly evident, with the leaders of the five countries regularly engaging on international and regional matters. The fourth Central Asia Consultative Meeting in 2022 saw the successful adoption of a joint statement, the 2022-2024 Roadmap for Regional Cooperation Development, and the landmark Treaty on Friendship, Good-Neighborliness, and Cooperation for Central Asia's Development in the 21st Century. At the 5th Consultative Meeting of Central Asian Heads of State, Tokayev highlighted Central Asia's emergence as a hub of new economic prospects in trade, investment, business, science, and innovation. He stressed the coming decade's critical role in maximizing economic opportunities, urging the nations to present a united front to the global community, foster humanitarian cooperation, enhance inter-university ties, and collectively promote the Central Asia tourism brand. Kazakhstan's commitment to deepening regional cooperation and fostering close ties among Central Asian countries underscores its leading role in the region.

#### **4 DISCUSSION**

The analysis of Kazakhstan's foreign policy evolution since the Ukraine crisis reveals the country's pragmatic and balanced approach to navigating the complex geopolitical landscape of the Eurasian region. The findings highlight the challenges faced by Kazakhstan in maintaining its strategic partnership with Russia while simultaneously asserting its sovereignty and independence. The impact of the Ukraine crisis on Kazakhstan's economy, security, and diplomatic relations underscores the vulnerability of post-Soviet states to regional geopolitical tensions and the far-reaching consequences of such crises.

Kazakhstan's multi-vector foreign policy, characterized by fostering relations with key global players such as Russia, China, the United States, and the European Union, has been instrumental in enabling the country to balance the influences of major powers and secure enhanced benefits and agreements. This approach has positioned Kazakhstan as a key player in the economic and social progress of the Central Asian region. However, the Ukraine crisis has tested the resilience of Kazakhstan's multi-vector strategy, prompting the country to reassess its ties with Russia and diversify its engagements with other global and regional powers.

The findings regarding Kazakhstan's diplomatic practice after the Ukraine crisis, including its gradual distancing from Russia, moderate contact with the West, deepening friendship with China, and enhanced cooperation with Central Asian countries, demonstrate the country's adaptability and pragmatism in foreign policy decision-making. These strategic maneuvers highlight Kazakhstan's efforts to safeguard its national interests, mitigate potential adverse impacts, and establish a new balance in its international relations.

The article's analysis contributes to the understanding of the factors shaping Kazakhstan's foreign policy choices and the challenges and opportunities faced by the country in managing complex international relations. The findings have implications for policymakers, researchers, and practitioners interested in Eurasian geopolitics and the foreign policy strategies of post-Soviet states. The article also contributes to the theoretical discourse on neo-classical realism, demonstrating the interplay of systemic and domestic factors in shaping foreign policy decisions.

Future research could explore the long-term implications of the Ukraine crisis for Kazakhstan's foreign policy and regional stability, as well as the evolving dynamics of Kazakhstan's relationships with major global and regional powers. Comparative studies examining the foreign policy strategies of other post-Soviet states in the context of the Ukraine crisis could provide valuable insights into the broader geopolitical trends in the Eurasian region.

#### **COMPETING INTERESTS**

The authors have no relevant financial or non-financial interests to disclose.

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