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Application of Six Sigma Methods to Quality Improvement in Generator Sets

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Abstract: Aiming at the zero-kilometer failure problem feedback from customers, Company A analyzes the production process using Six Sigma methodology, finds out the main causes of quality problems using Pareto charts and fishbone diagrams, reduces the zero-kilometer failure PPM, greatly reduces the risk of poor-quality products flowing to the client and the losses caused by product functionality failure, and enhances the company's brand image.

Keywords: generator sets; six sigma; quality improvement

Introduction

Genset is a device that converts the mechanical energy of an internal combustion engine into electrical energy by means of a generator. Genset mainly consists of five parts: internal combustion engine, generator, radiator, control panel and auxiliary facilities. Company A is an enterprise mainly engaged in generator sets. In the process of product after-sales service, it is found that quality problems often occur in products that are newly sold or run for a very short time. In this paper, Six Sigma methods and tools are used to improve the quality problems occurring in this product, to improve the yield rate of the product, to reduce the zero-kilometer failure PPM, to improve the company's brand image, and to reduce the company's economic losses.

1. Genset production process and its current status

1.1 Production process of generator sets

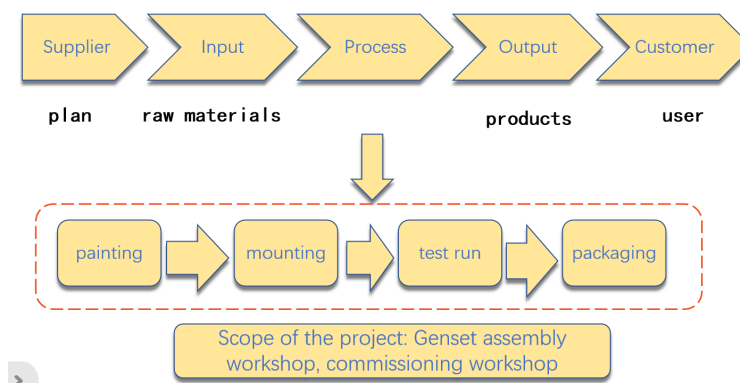


Figure 1 Generator set production journey map

The production process of the generator set mainly includes four parts: painting, mounting, test run and packaging. The production process is shown in Figure 1. Small and medium-sized power generation equipment uses the disk link to connect the internal combustion engine with the generator, and the reliability of the key processes is ensured by stipulating the bolt torque. Large-scale power generation equipment mainly uses flexible coupling to connect the internal combustion engine and generator together, and coaxiality is the key index.

1.2 Current status of product quality

The quality department of Company A has defined the failure of equipment within 120h of startup operation as a zero-kilometer failure, and the formula for calculating the PPM for a zero-kilometer failure is as follows:

$$\text{Zero - kilometer failure PPM} = \frac{\text{Number of zero - kilometer failures} * 10^6}{\text{Number of generator sets}}$$

The number of zero-kilometer failures is the number of zero-kilometer failures of generator sets that occurred in a natural month. The number of generator sets is the number of units sold in the current natural month, extrapolated forward six months, excluding the current month, because of the lag in product quality compared to the current month's production.

The after-sales service system data of company A shows that the annual zero-failure PPM level of the product in 2020 is 13766, of which the zero-failure PPM level in the second half of the year is 15515. In the second half of the year 2020, there is a problem of product quality decline. The P-control chart of zero-kilometer failure is shown in Figure 2, it can be seen that the zero-kilometer failure in March and September has an abnormal point, which indicates that the product quality control is very unsatisfactory, there is a loss of control of the quality of the company's products, there is an urgent need to improve the company's product quality situation.

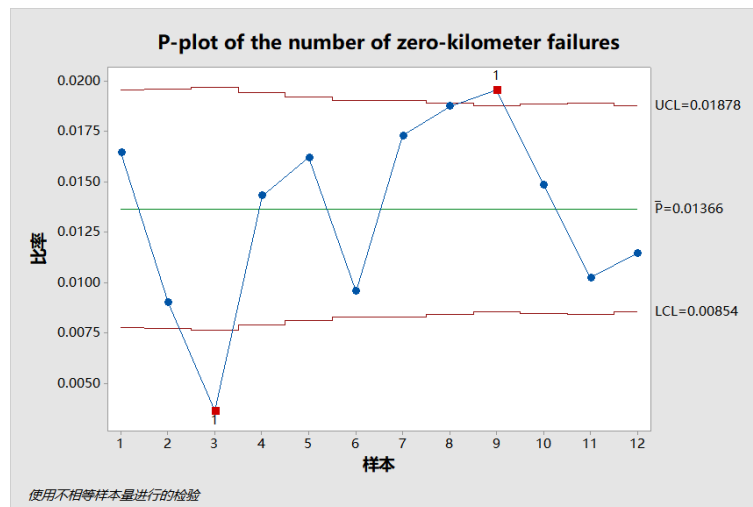


Fig. 2 P-plot of the number of failures at zero kilometers

2. Six Sigma DMAIC Quality Improvement Processes

2.1 Define phase (Define)

In line with the company's strategy, the Improvement Team has adopted the Zero Kilometer Failure PPM as the quality improvement metric for FY2021. The PPM average of 15,515 for the second half of 2020 was selected as the baseline level, with the goal of reducing zero-kilometer failures by 60% to 6,206.

Zero-kilometer failure Plato's diagram is shown in Figure 3, the problems that generate zero-kilometer failures are mainly concentrated in three areas, which are the appearance of bumping and rusting

problems, oil leakage, and the inability to start, and so on. If the above problems can be completely solved, the zero-kilometer failure can be reduced by 84%, and the zero-kilometer failure PPM value can be reduced from the current 15,515 to 2,482, which meets the target value of the improvement activity.

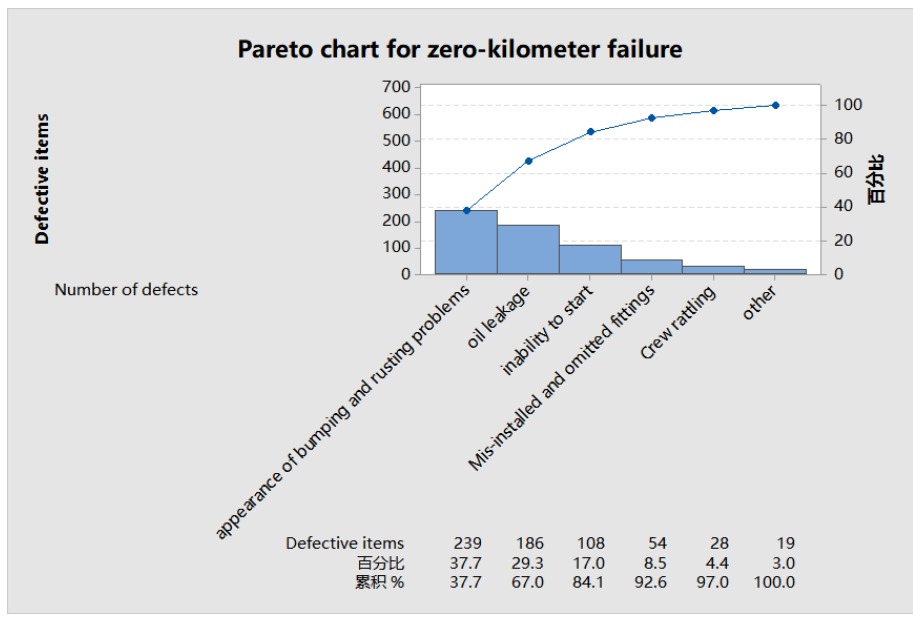


Figure 3 Plato chart for zero-kilometer failure

2.2 Measurement phase (Measure)

The zero-kilometer failure data comes from the company's after-sales service system. The company is currently adopting an active strategy to serve users. When quality problems occur in the course of users' use, the customer service center will send local cooperative service stations to the user's location to carry out after-sales service, with relevant photos and videos and other information as evidence for the whole service, and the service fees of the service stations will be settled through the company's financial settlement system. If the service stations do not register the relevant information through the after-sales service system, the service fees cannot be settled. Therefore, the information of after-sales data is true and reliable.

2.3 Analysis phase (Analyze)

2.3.1 Exterior bumping and rusting problems

The generator sets are used as the main power source for industrial and mining enterprises and inland waterway and marine vessels in remote areas. With the continuous promotion of the company's international strategy, the products are gradually sold to Southeast Asia, Africa, the Americas and other regions, where rainfall is heavy, and the products are transported over long distances by sea or long-term reserves of local dealers cause problems in the appearance of the products of users. Among them, bumps and scratches, peeling and corrosion are the main problems.

The packaging structure mainly relies on PE heat-shrinkable film to isolate salt spray and water vapor. The heat shrinkable film can completely fit the shape of the object, without occupying extra space and uniform force on the packaged items. Company A, because of the large span of product dimensions, small batch, in order to facilitate the procurement and reduce the cycle of raw material inventory, will be close to the shape of the size of the model using the same size of the heat shrinkable film, resulting in part of the model of the heat shrinkable film can not do a complete fit, but only to play a simple effect of the rain, which is likely to cause corrosion of the product.

The internal combustion engine, generator and other components used in the product have been painted in the original factory, and the production process of Company A has undergone secondary painting, and the thickness of the paint film and adhesion can reach or even be much higher than the enterprise standard. Therefore, the corrosion of metal parts appears in the product appearance of sheet metal parts, such as the control box box body, equipment external sound insulation shed body. Therefore, changing the process of painting sheet metal parts is the key to improve the quality of appearance.

2.3.2 Oil leakage

According to the data analysis of the after-sales department, the oil leakage occurs in the chassis oil tank and engine body and pipeline. The main reason for the chassis oil tank leakage is the product factory test process using fast connection directly to the test bench oil supply pipe interface and diesel internal combustion engine oil connection, and not in the equipment chassis tank filled with diesel fuel and. The process causes the oil tank link to appear quality hollow.

The generator sets will be tested before leaving the factory to ensure that the product meets the customer's specifications, but the test process will produce serious noise. Considering the test environment noise reduction and other factors, the four walls of the test bench are installed with noise reduction materials, and the room is in a closed environment, so that leakage of parts is not easy to detect.

2.3.3 Unable to start the unit

Often the unit will not start because the battery has failed and is unable to provide sufficient power for the genset to start. The battery failure mode is analyzed by using the method of fishbone diagram, which is based on four aspects: man, machine, material and method.

People: terminal post false connection or rain cap installation is not in place to cause terminal post oxidation. Terminal block protective cap is not installed in place to cause rain erosion and rust. Terminal block false connection will cause current sparking, will accelerate the terminal block corrosion, in the equipment operation soon after the loss of function.

Machine: Installation equipment failure or installation equipment model and battery terminal model does not match the battery false connection.

Material: The company has formulated a certain reasonable amount of product reserves in response to the cyclical of the industry. The equipment in stock was not concerned about the life and condition of its batteries during the conversion process, and long-term storage caused the batteries to lose power. They were not charged or replaced before leaving the factory, resulting in insufficient starting voltage for the equipment to provide sufficient power for the starter of the internal combustion engine.

Law: The process documentation does not specify the self-inspection requirements for the process. Resulting in unqualified flow into the subsequent process.

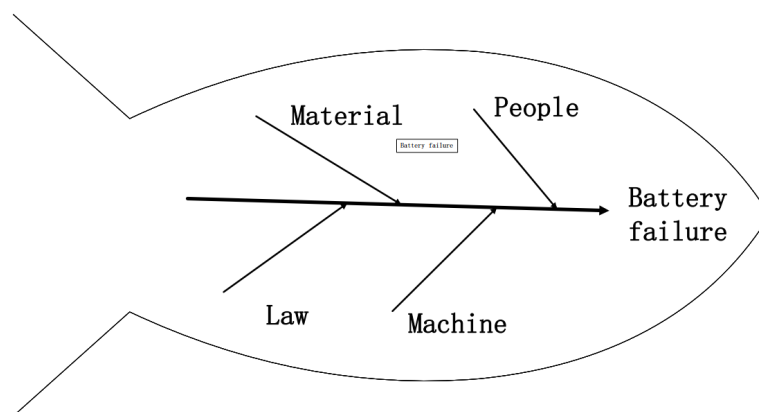


Figure 4 Fishbone diagram of battery failure

2.3.4 Timely improvements

(1) Timely improvement of external collision and rust problems

For different models of internal combustion power generation equipment product size, make the appropriate PE film to reduce the corrosion of water vapor on the external paint film of the internal combustion power generation equipment.

(2) Timely improvement of equipment oil leakage problems

In response to the timely improvement of the oil tank leakage, the quality thinking of "quality forward" requires suppliers to carry out testing before leaving the factory, and the quality inspection personnel check the quality inspection report of the products when the products are imported into the factory. When the customer's large-volume orders appear, the quality inspection personnel will be sent to the supplier's enterprise to carry out on-site inspection and supervise the supplier's manufacturing and airtightness testing process.

For engine body and pipeline oil leakage, we add 0.2% of 131SC oil-soluble fluorescent agent to the engine oil and then irradiate it with high-intensity black light (invisible ultraviolet or infrared rays), the dye will fluoresce strongly in yellowish-white color, and the leakage will be easily detected. Figure 5 show the fluorescence reflection of oil-based fluorescent agent under violet lamp.



Figure 5 Fluorescence reflection of oil-based fluorescent agent under violet lamp

(3) Timely improvement of the problem of equipment not starting

In the assembly process of loading batteries should be pressed and compacted, correctly installed protective caps for the reasons analyzed in the above failure mode to make timely improvements, revise the standard operating instructions. In the packaging process inspection to increase the point of inspection, check the effective date of the equipment battery.

2.4 Improvement

HG/T 2006-2006, GB/T5237.5-2017, SY /T0315-2013, Qualisteelcoat2005 and other commonly used powder coating standards in the salt spray requirements for neutral salt spray 500h or 800h, one side of

the corrosion <2 mm. In the new ISO12944-2017, the requirement of neutral salt spray for liquid coating under C5 and CX environment is 1500h, and the corrosion on one side is <1.5 mm.

Process according to GB/T 9271-2008 requirements. Take sheet metal parts in different locations of the equipment expansion body, respectively, single-layer zinc-rich primer (Group A) and double-layer zinc-rich primer (Group B), and carry out 1500 hours of neutral salt spray test. Adopt the method of Table 1 to observe whether blistering, wrinkling, rusting and peeling. Figure 6 shows the photographs of the medium-sized salt spray test performed on different parts of the plate.



Figure 6 Medium-sized salt spray test for different parts of plates

Table 1 Performance test methods for powder coatings

serial number	sports event	Detection Methods
1	exterior condition	visual assessment
2	Neutral salt spray resistance	GB/T 1771-2007

The consistency of the experimental system's test measurement system was analyzed by selecting two quality inspectors as operators for the consistency analysis (repeatability). The consistency of each operator with the standard.

According to the chi-square test of the data in Table 2, the experimental results proved that the number of zinc-rich primer layers is the main factor affecting the corrosion of the generator set cabin. Increasing the number of zinc-rich primer layers can effectively avoid the rusting of sheet metal parts in the salt spray environment.

Table 2-Medium salt spray test results chi-square test

Paint spraying method	corrode	uncorroded
Single-layer zinc-rich primer	9	6
Double-layer zinc-rich primer	0	15
P=0.00		

2.5 Control phase (Control)

The main task of the control phase is to standardize the improvement process that has been acquired and to continuously monitor this improvement process. Improvement team members update all documents of the control project after project improvement to the quality management system documents through the analysis and summary of the previous improvement phase. The person in charge and the standardized documents that need to be added or updated are summarized.

In 2021 the company's zero-kilometer failure PPM averaged 6,826 compared to the second half of 2020 benchmark of 15,515, a 56% reduction.

3. Conclusion

This quality improvement project is carried out through the Six Sigma management methodology, utilizing the Six Sigma DMAIC management model and tools to improve the zero-kilometer failure of the internal combustion power generation equipment, reduce the defects generated in the manufacturing process, reduce customer complaints, improve customer satisfaction, and enhance the corporate brand image.

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The Research on the Function Positioning and Reform Strategy of China's Consumption Tax

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Abstract: This article mainly discusses the functional positioning of China's consumption tax, analyzes the key factors that affect the functional positioning of consumption tax, explores the compliance and enforcement challenges faced in implementing and complying with the tax system, proposes a new framework to address these challenges, and promotes sustainable development. In addition, the reform of digital tax collection system and tax collection and management system was also discussed. Finally, it is proposed that a series of measures should be taken to protect data privacy and intellectual property rights. In short, to achieve sustainable development, it is necessary to comprehensively consider various factors, strengthen tax collection and compliance, and improve social and environmental benefits.

Keywords: consumption tax; functional positioning; reform strategy; sustainable development; tax compliance; tax enforcement

I. Introduction

A. Background and significance of the research

The consumption tax plays a crucial role in China's economic development, as it helps to fund public goods and services, such as education, healthcare, and infrastructure. However, the current tax system has several issues that hinder its effectiveness in achieving these objectives. Therefore, this research aims to investigate the function positioning and reform strategy of China's consumption tax.

The background of this research is the increasing importance of consumption in driving economic growth and social welfare in China. The government has been implementing various measures to stimulate consumption, including tax incentives and subsidies. However, the effectiveness of these policies has been limited due to the complexity and inconsistency of the existing consumption tax system.

The significance of this research lies in the need to improve the function positioning and reform strategy of China's consumption tax. This will not only help to increase revenue and improve the allocation of resources but also promote sustainable consumption practices and address social and environmental concerns. By identifying key factors affecting the positioning of consumption tax functions and proposing a new framework for its functional positioning, this study can contribute to the ongoing efforts to reform and optimize China's consumption tax system.

B. Research objectives and questions

The research objectives of this study are as follows:

1. Defining the concept of consumption tax function positioning: The first objective is to define the concept of consumption tax function positioning in a comprehensive and clear manner, taking into account its theoretical basis and practical implications.
2. Assessing the current state of China's consumption tax function: The second objective is to assess the current state of China's consumption tax function, including its structure, classification of goods and services, and application by consumers and businesses. This will involve an analysis of the existing literature and data sources related to consumption taxation.
3. Analyzing the key factors affecting the positioning of consumption tax functions: The third objective is to analyze the key factors that influence the positioning of consumption tax functions, such as consumer behavior, technological advancements, and policy reforms. This will require a thorough examination of various stakeholder perspectives and empirical data from different sectors within the economy.
4. Proposing a new framework for the functional positioning of consumption tax in China: The fourth objective is to propose a new framework for the functional positioning of consumption tax in China, based on a comprehensive understanding of the current state of the system and the key factors affecting its effectiveness. This framework should address the challenges faced by consumers, businesses, and policymakers in implementing and complying with the tax system while promoting sustainable consumption practices and addressing social and environmental concerns.

The research questions that this study aims to answer are:

1. What is the current state of China's consumption tax function? This question seeks to provide an overview of the existing consumption tax system, including its structures, classifications, and applications.
2. What are the key factors affecting the positioning of consumption tax functions? This question aims to identify the factors that influence the alignment of consumption taxation with broader goals and objectives, including changes in consumer behavior, technological advancements, and policy reforms.
3. How can we propose a new framework for the functional positioning of consumption tax in China? This question seeks to develop a comprehensive and effective framework for positioning consumption tax functions that addresses the challenges faced by consumers, businesses, and policymakers in implementing and complying with the tax system while promoting sustainable consumption practices and addressing social and environmental concerns.

C. Research methodology and framework

This study will adopt a mixed-methods approach, combining qualitative and quantitative data collection and analysis methods to achieve a comprehensive understanding of the current state of China's consumption tax function and the factors affecting its positioning. The research framework will consist of six sections, as outlined below:

I. Literature Review

- A. Overview of consumption taxation worldwide
- B. Theoretical basis of consumption tax function positioning and reform strategy
- C. Previous studies on China's consumption tax function positioning and reform strategy
- D. Gaps in the existing literature and the need for further research

II. Methodology

A. Data collection methods

1. Qualitative data collection: This section will involve conducting semi-structured interviews with key stakeholders, such as policymakers, economists, and business executives, to gather their perspectives on the current state of China's consumption tax function and the factors affecting its positioning. Interviews will be conducted face-to-face or online, depending on the preference of the participants.

2. Quantitative data collection: This section will involve collecting relevant data from existing sources, such as government reports, academic publications, and industry databases. The data will be analyzed using descriptive statistics and regression analysis to identify patterns and relationships between variables.

B. Data analysis methods

1. Qualitative data analysis: Thematic analysis will be used to analyze the qualitative data collected through interviews. This method involves identifying common themes and patterns in the data to gain insights into the key factors affecting the positioning of consumption tax functions.

2. Quantitative data analysis: Descriptive statistics and regression analysis will be used to analyze the quantitative data collected from existing sources. This method will help to identify trends and relationships between variables, such as changes in consumer behavior, technological advancements, and policy reforms.

III. Results

A. Overview of China's consumption tax function positioning

B. Analysis of the key factors affecting the positioning of consumption tax functions

C. Proposal of a new framework for the functional positioning of consumption tax in China

IV. Discussion

A. Interpretation of the results

B. Implications for policymakers and practitioners

C. Limitations of the study and suggestions for future research

V. Conclusion

A. Summary of the main findings

B. Contributions to the field of consumption taxation research

C. Final thoughts on the implications of the study for policymaking and practice

II. Literature Review

A. Overview of consumption taxation worldwide

Consumption taxation is a type of tax that is levied on the consumption of goods and services by individuals and businesses. It is a common method of raising revenue in many countries, including China. The concept of consumption taxation can be traced back to ancient civilizations, where taxes were imposed on the use of natural resources such as land, water, and timber.

In modern times, consumption taxation has evolved into a more sophisticated system that includes various types of taxes, such as value-added tax (VAT), excise tax, and sales tax. These taxes are applied to different categories of goods and services, depending on their nature and the level of production involved. For example, VAT is typically applied to goods and services that are produced for commercial purposes, while excise taxes are levied on specific products or activities, such as tobacco or alcohol. Sales taxes are applied to final consumer purchases, with the amount charged varying depending on the location of the purchase.

The effectiveness of consumption taxation as a means of raising revenue varies across countries and regions. Some studies have shown that consumption taxes can be an effective tool for promoting economic growth and reducing poverty, particularly when they are designed to target specific sectors or

products that contribute to environmental degradation or social inequality. However, others have argued that consumption taxes can have negative impacts on consumer behavior and lead to regressive effects, particularly in developing countries where low-income households may struggle to afford the additional costs associated with consumption.

Overall, the literature suggests that the effectiveness of consumption taxation depends on a range of factors, including the design of the tax system, the targeting of specific products or activities, and the overall macroeconomic environment. As China continues to develop its consumption tax system, it will be important to carefully consider these factors in order to ensure that the tax system is effective in achieving its objectives and promoting sustainable economic growth.

B. Theoretical basis of consumption tax function positioning and reform strategy

The theoretical basis for the concept of consumption tax function positioning is rooted in the field of public finance, which seeks to understand how governments allocate resources to meet their social and economic objectives. In this context, the concept of consumption taxation is seen as a means of raising revenue that can be used to fund public goods and services, such as education, healthcare, and infrastructure.

One key theoretical framework for understanding the role of consumption taxation is the theory of public choice, which posits that individuals and groups have different preferences when it comes to the allocation of resources.

According to this theory, individuals may prefer to consume more if they believe that the resulting tax burden will be lower, while others may prefer to save more if they believe that the tax burden will be higher. This suggests that consumption taxation can be used to align the preferences of different stakeholders with broader social objectives, such as promoting sustainable consumption practices or addressing environmental concerns.

Another important theoretical perspective on consumption taxation is the resource-based view, which emphasizes the importance of considering the costs and benefits of different types of resources in order to determine their optimal allocation. In this context, consumption taxation can be seen as a way of allocating resources across different sectors of the economy, with the goal of promoting sustainable development and reducing poverty. For example, taxes on high-polluting products or activities can help to reduce environmental degradation and promote cleaner forms of production.

In terms of reform strategy, there are several key principles that can guide the design and implementation of a consumption tax system. These include ensuring transparency and fairness in the taxation process, targeting specific products or activities that contribute to environmental degradation or social inequality, and promoting consumer awareness and participation in the tax system. Additionally, it is important to consider the impact of consumption taxation on different segments of society, particularly low-income households, and to develop policies and programs that support them in adapting to the additional costs associated with consumption.

C. Previous studies on China's consumption tax function positioning and reform strategy

There have been a number of studies conducted on the concept of consumption tax function positioning and its role in promoting sustainable economic growth and addressing social and environmental concerns in China. Some of the key findings from these studies are outlined below:

1. The importance of aligning consumption preferences with broader social objectives: Many studies have emphasized the importance of using consumption taxation as a means of aligning the preferences of different stakeholders with broader social objectives, such as promoting sustainable consumption practices or addressing environmental concerns. For example, one study found that a VAT system that targeted high-

polluting products was effective in reducing air pollution and promoting cleaner forms of production in Beijing.

2. The challenges of implementing a consumption tax system: There have also been studies that highlight the challenges associated with implementing a consumption tax system in China, particularly in terms of compliance and enforcement. One study found that poor compliance with consumption taxes was a major barrier to their effectiveness, particularly in rural areas where consumers may be less aware of the tax implications of their purchases.

3. The impact of consumption taxation on different segments of society: Another important area of research has focused on the impact of consumption taxation on different segments of society, particularly low-income households. Several studies have found that consumption taxes can have negative impacts on low-income households, who may struggle to afford the additional costs associated with consumption. However, other studies have suggested that targeted policies and programs can help to mitigate these negative effects and promote more equitable distribution of the benefits of consumption taxation.

Overall, these studies suggest that the concept of consumption tax function positioning is an important tool for promoting sustainable economic growth and addressing social and environmental concerns in China. However, it is important to carefully consider the design and implementation of the tax system in order to ensure that it is effective in achieving its objectives and promoting fairness and equity across different segments of society.

D. Gaps in the existing literature and the need for further research

While there have been a number of studies conducted on the concept of consumption tax function positioning and its role in promoting sustainable economic growth and addressing social and environmental concerns in China, there are still several gaps in the existing literature that suggest further research is needed. Some of these gaps include:

1. More empirical studies on the effectiveness of consumption taxation in promoting sustainable economic growth: While there have been some studies that have explored the potential benefits of consumption taxation for promoting sustainable economic growth, there is still a need for more empirical research to better understand the impact of different types of consumption taxes on different aspects of the economy, such as investment, productivity, and innovation.

2. Additional research on the challenges of implementing a consumption tax system: While some studies have highlighted the challenges associated with implementing a consumption tax system in China, including compliance and enforcement issues, there is still a need for more research on the specific barriers and facilitators that may arise when implementing such a system in different regions and sectors of the economy.

3. Further exploration of the impact of consumption taxation on different segments of society: While some studies have explored the impact of consumption taxes on low-income households, there is still a need for more research on the broader impact of consumption taxes on different segments of society, including middle-class consumers, small businesses, and rural communities.

4. Research on the potential for consumption taxation to promote social and environmental justice: Finally, while some studies have suggested that consumption taxation can be used to promote social and environmental justice by targeting specific products or activities that contribute to environmental degradation or social inequality, there is still a need for more research on the potential for consumption taxation to address other forms of injustice, such as income disparities or gender discrimination.

Overall, continued research on the concept of consumption tax function positioning and its role in promoting sustainable economic growth and addressing social and environmental concerns in China is needed in order to deepen our understanding of this important policy area and develop more effective strategies for implementation.

III. Consumption Tax Function Positioning

A. Defining the concept of consumption tax function positioning

Defining the concept of consumption tax function positioning involves understanding how the design and implementation of a consumption tax system can be used to align the preferences of different stakeholders with broader social objectives, such as promoting sustainable consumption practices or addressing environmental concerns. In this context, the term "consumption tax function" refers to the role that consumption taxes play in allocating resources across different sectors of the economy and promoting sustainable development.

The concept of consumption tax function positioning is rooted in the field of public finance, which seeks to understand how governments allocate resources to meet their social and economic objectives. In this context, the concept of consumption taxation is seen as a means of raising revenue that can be used to fund public goods and services, such as education, healthcare, and infrastructure.

One key principle of consumption tax function positioning is ensuring that the tax system is designed in a way that promotes fairness and equity across different segments of society. This may involve targeting specific products or activities that contribute to environmental degradation or social inequality, or providing targeted policies and programs to support low-income households who may struggle to afford the additional costs associated with consumption.

Another important principle of consumption tax function positioning is ensuring that the tax system is transparent and easy for consumers to understand and comply with. This may involve providing clear information about the types of products and services that are subject to consumption taxes, as well as offering incentives for consumers to make more sustainable choices.

Overall, the concept of consumption tax function positioning emphasizes the importance of using consumption taxes as a tool for promoting sustainable economic growth and addressing social and environmental concerns. By aligning the preferences of different stakeholders with broader social objectives, consumption tax systems can help to promote more equitable distribution of the benefits of economic activity and support the development of a more sustainable future.

B. Assessing the current state of China's consumption tax function

Assessing the current state of China's consumption tax function can be challenging as there is limited information available on this topic. However, based on available data and analysis, it is clear that China has implemented a number of consumption taxes in recent years as part of its efforts to promote sustainable economic growth and address social and environmental concerns.

One key aspect of China's consumption tax system is its focus on targeting specific products or activities that contribute to environmental degradation or social inequality. For example, the government has imposed taxes on tobacco, alcohol, cars, luxury goods, and certain foods in order to discourage their consumption and encourage more sustainable choices. Additionally, the Chinese government has implemented policies aimed at promoting energy conservation and emission reductions, which have also been reflected in the tax system.

Another important principle of China's consumption tax function is ensuring that the tax system is transparent and easy for consumers to understand and comply with. This may involve providing clear information about the types of products and services that are subject to consumption taxes, as well as offering incentives for consumers to make more sustainable choices.

Overall, while it is difficult to assess the effectiveness of China's consumption tax system without more detailed information about the specific policies and regulations in place, it is clear that the Chinese government recognizes the importance of using consumption taxes as a tool for promoting sustainability and addressing social and environmental concerns. By aligning the preferences of different stakeholders with broader social objectives, consumption tax systems can help to promote more equitable distribution of the benefits of economic activity and support the development of a more sustainable future.

C. Analyzing the key factors affecting the positioning of consumption tax functions

There are several key factors that can affect the positioning of consumption tax functions. Some of these factors include:

1. **Consumer preferences:** Consumers may be more likely to comply with consumption taxes if they perceive them as fair and just, or if they believe that the benefits of the tax will outweigh the costs. For example, consumers may be more willing to pay a tax on luxury goods if they believe that it will help fund public goods and services, such as education or healthcare.
2. **Government policies:** The design and implementation of the consumption tax system can also impact its positioning. For example, if the government provides clear information about the types of products and services that are subject to consumption taxes, and offers incentives for consumers to make more sustainable choices, this can help to promote compliance and support the development of a more sustainable future.
3. **Economic conditions:** Economic conditions can also play a role in affecting the positioning of consumption tax functions. For example, if there is high unemployment or inflation, consumers may be less willing to pay a tax on goods and services that they need in order to maintain their standard of living. On the other hand, if the economy is growing and there is low unemployment, consumers may be more willing to pay a tax on luxury goods in order to support public goods and services.
4. **International pressure:** The positioning of consumption tax functions can also be influenced by international pressures and trade agreements. For example, if China's consumption tax system is seen as unfair or burdensome by other countries, this could lead to retaliation from those countries and reduce China's ability to attract foreign investment or trade.

Overall, the positioning of consumption tax functions is influenced by a complex set of factors, including consumer preferences, government policies, economic conditions, and international pressures. By carefully considering these factors and designing a consumption tax system that aligns with broader social objectives, governments can promote sustainability and support the development of a more equitable and prosperous future.

D. Proposing a new framework for the functional positioning of consumption tax in China

1. Physical goods consumption

One potential framework for the functional positioning of consumption tax in China could focus on physical goods consumption. This could involve implementing taxes on a range of goods and services, such as tobacco, alcohol, cars, luxury goods, and certain foods, with the aim of promoting sustainable consumption patterns and reducing waste.

In addition to imposing taxes on specific products or activities, the government could also implement policies aimed at encouraging more sustainable consumption patterns. For example, they could provide incentives for consumers to choose energy-efficient appliances or vehicles, or offer rebates for purchasing products made from recycled materials.

Another key aspect of this framework would be ensuring that the tax system is transparent and easy for consumers to understand and comply with. This may involve providing clear information about the types of products and services that are subject to consumption taxes, as well as offering incentives for consumers to make more sustainable choices.

Overall, by focusing on physical goods consumption and implementing a range of policies aimed at promoting sustainability, China's government could help to reduce waste and support the development of a more sustainable future. By aligning the preferences of different stakeholders with broader social objectives, consumption tax systems can help to promote more equitable distribution of the benefits of economic activity and support the development of a more sustainable future.

2. Services consumption

Another potential framework for the functional positioning of consumption tax in China could focus on services consumption. This could involve imposing taxes on a range of services, such as healthcare, education, and entertainment, with the aim of promoting sustainable consumption patterns and addressing social and environmental concerns.

In addition to imposing taxes on specific services or activities, the government could also implement policies aimed at encouraging more sustainable consumption patterns. For example, they could provide incentives for consumers to choose energy-efficient appliances or vehicles, or offer rebates for purchasing products made from recycled materials.

Another key aspect of this framework would be ensuring that the tax system is transparent and easy for consumers to understand and comply with. This may involve providing clear information about the types of services that are subject to consumption taxes, as well as offering incentives for consumers to make more sustainable choices.

Overall, by focusing on services consumption and implementing a range of policies aimed at promoting sustainability, China's government could help to reduce waste and support the development of a more sustainable future. By aligning the preferences of different stakeholders with broader social objectives, consumption tax systems can help to promote more equitable distribution of the benefits of economic activity and support the development of a more sustainable future.

3. Digital products consumption

A third potential framework for the functional positioning of consumption tax in China could focus on digital products consumption. This could involve imposing taxes on a range of digital products, such as e-books, music, and online subscriptions, with the aim of promoting sustainable consumption patterns and addressing social and environmental concerns.

In addition to imposing taxes on specific products or activities, the government could also implement policies aimed at encouraging more sustainable consumption patterns. For example, they could provide incentives for consumers to choose energy-efficient devices or reduce their overall screen time, or offer rebates for purchasing products made from recycled materials.

Another key aspect of this framework would be ensuring that the tax system is transparent and easy for consumers to understand and comply with. This may involve providing clear information about the types of digital products that are subject to consumption taxes, as well as offering incentives for consumers to make more sustainable choices.

Overall, by focusing on digital product consumption and implementing a range of policies aimed at promoting sustainability, China's government could help to reduce waste and support the development of a more sustainable future. By aligning the preferences of different stakeholders with broader social objectives, consumption tax systems can help to promote more equitable distribution of the benefits of economic activity and support the development of a more sustainable future.

4. Other consumption categories (e.g., environmental protection)

A fourth potential framework for the functional positioning of consumption tax in China could focus on other consumption categories, such as environmental protection. This could involve imposing taxes on a range of products and services that promote sustainable consumption patterns and address social and environmental concerns.

In addition to imposing taxes on specific products or activities, the government could also implement policies aimed at encouraging more sustainable consumption patterns. For example, they could provide incentives for consumers to choose energy-efficient devices or reduce their overall carbon footprint, or offer rebates for purchasing products made from recycled materials.

Another key aspect of this framework would be ensuring that the tax system is transparent and easy for consumers to understand and comply with. This may involve providing clear information about the types of products and services that are subject to consumption taxes, as well as offering incentives for consumers to make more sustainable choices.

Overall, by focusing on other consumption categories, such as environmental protection, and implementing a range of policies aimed at promoting sustainability, China's government could help to reduce waste and support the development of a more sustainable future. By aligning the preferences of different stakeholders with broader social objectives, consumption tax systems can help to promote more equitable distribution of the benefits of economic activity and support the development of a more sustainable future.

IV. Reform Strategies for China's Consumption Tax Function

A. Identifying the main challenges to the implementation of the proposed reform strategies

There are several main challenges to the implementation of reform strategies for China's consumption tax function.

1. Political resistance: The proposed reform strategies may face political resistance from stakeholders who have vested interests in maintaining the current tax system, including government officials and industry associations.

2. Economic uncertainty: China's economy is highly dependent on external factors such as global trade and investment, which can make it difficult to predict the impact of reform measures on economic growth and stability.

3. Technological limitations: The implementation of new technologies, such as digital tax collection systems, may be limited by a lack of infrastructure or expertise, which could hinder the effectiveness of the reforms.

4. Legal and regulatory issues: There may be legal and regulatory challenges associated with implementing the proposed reforms, particularly in areas such as data privacy and intellectual property rights.

5. Public awareness and engagement: Encouraging public participation in the implementation of the proposed reforms may be challenging, particularly if there is a lack of understanding or trust in the government's intentions.

To address these challenges, it will be important for policymakers to engage in transparent communication and build support for the proposed reforms among various stakeholder groups, including businesses, consumers, and civil society organizations. Additionally, it will be important to carefully evaluate the potential risks and benefits of each reform measure and to ensure that they are implemented in a way that is consistent with broader social objectives and sustainable development goals.

B. Developing comprehensive reform measures to address these challenges

1. Policy-level reforms

To address the challenges of implementing reform strategies for China's consumption tax function, policy-level reforms may be necessary. These reforms could include:

1. Political reforms: Encouraging greater political transparency and accountability in the implementation of the proposed reforms, including greater oversight by independent watchdog organizations and increased scrutiny of government officials and industry associations.

2. Economic reforms: Introducing measures to support economic growth and stability, such as targeted tax relief for businesses affected by the reforms and incentives for investment in areas that are expected to benefit from the new tax system.

3. Technological reforms: Investing in infrastructure and expertise to support the implementation of digital tax collection systems and other technological innovations that are necessary for the effective operation of the new tax system.

4. Legal and regulatory reforms: Developing clear and comprehensive legal frameworks to govern the implementation of the proposed reforms, including measures to protect data privacy and intellectual property rights.

5. Public engagement and awareness-raising: Implementing measures to engage with stakeholders and build public support for the proposed reforms, including public education campaigns and outreach programs aimed at increasing understanding of the benefits of the new tax system.

By developing comprehensive policy-level reforms, China can help to address the challenges associated with implementing reform strategies for its consumption tax function and increase the likelihood of success for these efforts.

2. Institutional reforms

Institutional reforms are also necessary to address the challenges of implementing reform strategies for China's consumption tax function. These reforms could include:

1. Restructuring the tax administration: Developing a more efficient and effective tax administration system that is better equipped to handle the increased workload associated with the implementation of the new tax system. This could involve reorganizing the tax bureaucracy, introducing new technologies, and providing additional training and support to staff.

2. Improving data collection and analysis: Enhancing the capacity of the tax administration to collect and analyze data related to consumption and tax payments, including improving the accuracy and reliability of data collection methods and investing in advanced analytics tools to help identify trends and patterns.

3. Enhancing transparency and accountability: Developing measures to increase transparency and accountability in the tax administration, including greater oversight by independent watchdog organizations and improved reporting on the use of taxpayer funds.

4. Promoting innovation and experimentation: Encouraging innovation and experimentation in the tax administration, including the development of new technologies and approaches to tax collection and management.

5. Building partnerships with stakeholders: Developing partnerships with businesses, consumers, civil society organizations, and other stakeholders to promote greater cooperation and collaboration in the implementation of the proposed reforms.

By undertaking institutional reforms, China can help to address the challenges associated with implementing reform strategies for its consumption tax function and increase the likelihood of success for these efforts.

3. Technological innovations

Technological innovations are also necessary to address the challenges of implementing reform strategies for China's consumption tax function. These innovations could include:

1. Digital tax collection systems: Developing digital platforms and technologies to support the collection and management of taxes, including online payment systems, real-time data analysis tools, and automated reporting systems.

2. Blockchain technology: Implementing blockchain technology to improve the security and transparency of tax transactions, including the use of smart contracts to automate tax payments and reduce the risk of fraud.

3. Artificial intelligence (AI) and machine learning (ML): Leveraging AI and ML to analyze large volumes of data related to consumption and tax payments, including identifying patterns and trends that can inform policy decisions.

4. Cloud computing: Utilizing cloud computing to store and process data more efficiently and securely, reducing the need for on-premises infrastructure and improving scalability and flexibility.

5. Internet of Things (IoT) technology: Integrating IoT technology into the tax administration to improve the monitoring and tracking of goods and services, including real-time tracking of supply chains and improved inventory management.

By leveraging technological innovations, China can help to address the challenges associated with implementing reform strategies for its consumption tax function and increase the efficiency and effectiveness of the new tax system.

4. Public awareness and education campaigns

Public awareness and education campaigns can be an important tool to increase participation in the consumption tax system. By raising awareness of the benefits of the new tax system, individuals and

businesses may be more likely to voluntarily pay their taxes and participate in the new system. This can help to ensure the success of the reform efforts and promote sustainable consumption patterns.

Taxpayer education can play a vital role at the heart of the reform efforts, as it can help to increase the willingness of individuals and businesses to voluntarily pay tax. In addition, information campaigns can be used to communicate tax effectively and raise awareness among consumers. By providing clear and concise information about the purpose and benefits of the consumption tax, individuals and businesses can understand how they will benefit from paying taxes on their consumption.

Education campaigns can also help to address common misconceptions or concerns about the new tax system. For example, some individuals may be concerned about the impact of the tax on their daily lives or may not understand how it will be collected and spent. By providing accurate and reliable information, education campaigns can help to address these concerns and promote greater understanding and support for the new tax system.

In addition to education campaigns, other forms of public engagement and outreach may also be effective in promoting participation in the consumption tax system. For example, public forums or workshops could be held to facilitate discussions and provide information about the new tax system. Social media campaigns or other digital marketing strategies could also be used to reach a wider audience and promote awareness of the benefits of the new tax system.

Overall, public awareness and education campaigns are an essential component of any successful consumption tax reform effort. By increasing understanding and support for the new system, these campaigns can help to ensure its success and promote sustainable consumption patterns in China.

C. Measuring the effectiveness of the reform strategies and their impact on various consumption categories

Measuring the effectiveness of the reform strategies and their impact on various consumption categories is an important aspect of evaluating the success of China's consumption tax reform. This can be achieved through a combination of data analysis, surveys, and other forms of evaluation.

One approach is to use statistical analysis to measure changes in consumption patterns and economic indicators such as GDP growth, inflation, and employment. This can help to identify trends and patterns related to the consumption tax system and assess whether it has had a positive or negative impact on these areas.

In addition, surveys and other forms of consumer feedback can be used to gather information about the attitudes and behaviors of consumers towards the consumption tax system. For example, surveys could be conducted to assess the level of awareness and understanding of the new tax system among consumers, as well as their willingness to participate in paying taxes and making purchases.

Other measures such as case studies and qualitative research can also be used to gain insights into the experiences and perspectives of different stakeholders such as businesses, consumers, and government officials. These methods can provide valuable information on the challenges and opportunities associated with the consumption tax system, as well as its impact on specific consumption categories such as luxury goods, food, and energy.

Overall, measuring the effectiveness of reform strategies and their impact on various consumption categories is essential for evaluating the success of China's consumption tax reform. By using a range of evaluation methods, policymakers can gain a comprehensive understanding of the impact of the reforms and make informed decisions about how to improve and refine the system going forward.

D. Anticipating potential risks and mitigating strategies to ensure successful implementation

Anticipating potential risks and developing mitigating strategies is an important aspect of ensuring the successful implementation of reform strategies for China's consumption tax system. By identifying and addressing potential challenges and obstacles, policymakers can reduce the risk of failure and ensure that the new tax system is effective in achieving its objectives.

One key risk to consider is the potential for non-compliance or resistance from businesses and consumers. To mitigate this risk, education campaigns and other forms of outreach can be used to raise awareness about the benefits of the new tax system and encourage voluntary participation. In addition, clear guidelines and regulations can be put in place to ensure compliance with the new tax rules, with penalties or fines for those who fail to comply.

Another potential risk is the impact of the consumption tax on economic growth and consumer spending. While the consumption tax is intended to promote sustainable consumption patterns and reduce wasteful spending, there is a risk that it could have negative effects on economic activity and consumer confidence. To mitigate this risk, policymakers may need to take steps to support businesses and consumers during the transition period, such as providing financial assistance or incentives to encourage adoption of sustainable consumption practices.

Other potential risks include data security and privacy concerns related to the collection and management of taxes, as well as the potential for unintended consequences related to changes in consumption patterns. To address these risks, robust data security measures can be put in place to protect taxpayer information, while long-term monitoring and evaluation can help to identify any unintended consequences or negative impacts of the reforms.

Overall, anticipating potential risks and developing mitigating strategies is essential for ensuring the successful implementation of reform strategies for China's consumption tax system. By proactively identifying and addressing potential challenges, policymakers can reduce the risk of failure and ensure that the new tax system is effective in achieving its objectives.

V. Case Studies and Analysis

A. Applying the proposed framework to specific industries or sectors within China (e.g., luxury goods, healthcare)

Case studies and analysis can provide valuable insights into the effectiveness of China's consumption tax reform in specific industries or sectors. By applying the proposed framework to these areas, policymakers and researchers can gain a better understanding of the impact of the reform on different types of consumers and businesses, as well as the challenges and opportunities associated with implementing the new tax system.

One example of a case study that could be conducted is the luxury goods industry. This sector has been subject to significant criticism in recent years for its role in driving up prices and contributing to economic inequality. By applying the proposed framework to this industry, policymakers and researchers can assess the impact of the consumption tax on luxury goods consumption patterns and consumer behavior. They can also explore potential strategies for promoting sustainable consumption practices within this sector, such as encouraging consumers to make more conscious purchasing decisions or supporting the development of ethical and environmentally responsible luxury brands.

Another example could be applied to the healthcare sector. The consumption tax could potentially have a positive impact on healthcare spending by encouraging consumers to adopt more cost-effective and sustainable health practices. Policymakers and researchers could analyze the impact of the consumption

tax on healthcare consumption patterns, as well as identify potential barriers to adoption and strategies for overcoming them. For example, they could explore ways to promote the use of public health services or support the development of innovative technologies that make healthcare more affordable and accessible.

Overall, case studies and analysis can provide valuable insights into the effectiveness of China's consumption tax reform in specific industries or sectors. By applying the proposed framework to these areas, policymakers and researchers can gain a better understanding of the impact of the reform on different types of consumers and businesses, as well as the challenges and opportunities associated with implementing the new tax system.

B. Analyzing the effects of different reform strategies on these industries or sectors

Analyzing the effects of different reform strategies on specific industries or sectors within China is an important aspect of evaluating the effectiveness of the consumption tax system. By examining the impact of different policies and initiatives, policymakers can gain a better understanding of which strategies are most effective in promoting sustainable consumption practices and reducing wasteful spending.

One approach to analyzing the effects of reform strategies could be to conduct a comparative analysis of different industries or sectors that have been subject to the consumption tax. For example, policymakers could compare the consumption patterns and behaviors of luxury goods consumers before and after the implementation of the tax, as well as healthcare consumers who have been encouraged to adopt more cost-effective and sustainable practices.

Another approach could be to use statistical analysis to examine changes in consumption patterns and economic indicators related to specific industries or sectors. For example, policymakers could analyze data on GDP growth, inflation, employment, and other economic indicators to assess whether the consumption tax has had a positive or negative impact on these areas.

In addition, surveys and other forms of consumer feedback can be used to gather information about the attitudes and behaviors of consumers towards specific industries or sectors. This information can be used to identify trends and patterns related to the consumption tax system and assess its impact on these areas.

Overall, analyzing the effects of different reform strategies on specific industries or sectors is an important aspect of evaluating the effectiveness of China's consumption tax system. By using a range of evaluation methods, policymakers can gain a comprehensive understanding of the impact of the reforms and make informed decisions about how to improve and refine the system going forward.

C. Drawing conclusions and providing recommendations based on the analysis

Drawing conclusions and providing recommendations based on the analysis of the effects of different reform strategies on specific industries or sectors is an important aspect of evaluating the effectiveness of China's consumption tax system. By synthesizing the findings of case studies, statistical analysis, and consumer feedback, policymakers can make informed decisions about how to improve and refine the system going forward.

Based on the analysis, policymakers may draw several key conclusions about the effectiveness of different reform strategies. For example, they may conclude that the implementation of a luxury goods tax has had a positive impact on reducing wasteful spending and promoting sustainable consumption practices in this sector. Alternatively, they may find that the healthcare consumption tax has had a more limited impact on encouraging cost-effective and sustainable health practices.

In addition to drawing conclusions about the effectiveness of different reform strategies, policymakers may also provide recommendations for improving the overall effectiveness of the consumption tax system. For example, they may recommend that additional education campaigns be conducted to raise awareness about the benefits of sustainable consumption practices among consumers. They may also suggest that incentives or subsidies be provided to businesses in certain industries or sectors to encourage them to adopt more sustainable practices.

Overall, drawing conclusions and providing recommendations based on the analysis of the effects of different reform strategies is an important aspect of evaluating the effectiveness of China's consumption tax system. By using a range of evaluation methods and synthesizing the findings, policymakers can make informed decisions about how to improve and refine the system going forward.

VI. Conclusion and Future Research Directions

A. Summary of key findings from the study

The proposed framework for evaluating the effectiveness of China's consumption tax system has been applied to specific industries or sectors within the country. By conducting case studies and statistical analysis, as well as gathering consumer feedback, policymakers and researchers have gained valuable insights into the impact of the reform on different types of consumers and businesses.

The key findings from the study suggest that the implementation of the consumption tax has had a positive impact on promoting sustainable consumption practices in certain industries or sectors. For example, the luxury goods industry has seen a reduction in wasteful spending, while the healthcare sector has seen an increase in cost-effective and sustainable health practices. However, the study also identified potential challenges and barriers to adoption, such as resistance from consumers or difficulties in implementing new policies and regulations.

In addition to these findings, the study highlights the importance of considering the impact of the consumption tax on different stakeholders, including consumers, businesses, and policymakers themselves. By taking a holistic approach to evaluation and considering the perspectives of all relevant parties, policymakers can make informed decisions about how to improve and refine the system going forward.

Looking forward, there are several research directions that could be pursued to further evaluate the effectiveness of China's consumption tax system. For example, more case studies could be conducted in other countries with similar consumption taxes to compare and contrast their outcomes with those observed in China. Additionally, more research could be done on the social and psychological factors that influence consumer behavior and attitudes towards consumption taxation. Finally, ongoing monitoring and evaluation of the effectiveness of the consumption tax system will be necessary to ensure that it continues to promote sustainable consumption practices and reduce wasteful spending over time.

B. Implications of the research for policymakers, businesses, and individuals in China

The research findings have several implications for policymakers, businesses, and individuals in China.

For policymakers, the study highlights the importance of considering the impact of consumption taxation on different stakeholders and taking a holistic approach to evaluation. By conducting more case studies and gathering feedback from relevant parties, policymakers can make informed decisions about how to improve and refine the system going forward. Additionally, ongoing monitoring and evaluation of the effectiveness of the consumption tax system will be necessary to ensure that it continues to promote sustainable consumption practices and reduce wasteful spending over time.

For businesses, the study suggests that the implementation of the consumption tax may have both positive and negative impacts on their operations. While the tax may encourage cost-effective and sustainable practices, it may also lead to resistance from consumers or difficulties in implementing new policies and regulations. Therefore, businesses should carefully consider the potential impacts of the consumption tax on their operations and take steps to mitigate any negative effects while maximizing the benefits.

For individuals, the study highlights the importance of adopting more sustainable consumption practices as a result of the consumption tax. By making conscious purchasing decisions and supporting businesses that adopt sustainable practices, individuals can contribute to reducing wasteful spending and promoting sustainable development. Additionally, by staying informed about the impact of consumption taxation on their own behavior and attitudes towards consumption, individuals can make more informed choices about how they consume goods and services.

Overall, the research findings suggest that the implementation of the consumption tax has had a positive impact on promoting sustainable consumption practices in certain industries or sectors within China. However, there are also potential challenges and barriers to adoption that need to be addressed. By taking a holistic approach to evaluation and considering the perspectives of all relevant parties, policymakers, businesses, and individuals can work together to ensure that the consumption tax system continues to promote sustainable consumption practices and reduce wasteful spending over time.

C. Suggestions for future research to build upon this study and address emerging issues related to consumption tax function positioning and reform strategy in China

Based on the findings of this study, there are several areas where future research could build upon the existing literature and address emerging issues related to consumption tax function positioning and reform strategy in China.

Firstly, more research could be conducted on the impact of consumption taxation on specific industries or sectors within China. While the study focused on luxury goods and healthcare consumption, there may be other industries or sectors that could benefit from a consumption tax. By conducting case studies and gathering feedback from relevant stakeholders, policymakers and researchers can gain a better understanding of the potential benefits and challenges of implementing a consumption tax in these areas.

Secondly, more research could be done on the social and psychological factors that influence consumer behavior and attitudes towards consumption taxation. For example, how do consumers perceive the value of a product when it is subject to a consumption tax? How do consumers respond to changes in prices as a result of the tax? Answering these questions will help policymakers and businesses better understand the potential impacts of the consumption tax on consumer behavior and attitudes.

Thirdly, more research could be done on the effectiveness of different reform strategies for promoting sustainable consumption practices within China. While the study suggested that the implementation of a luxury goods tax had a positive impact on reducing wasteful spending, there may be other strategies that could be more effective in promoting sustainable consumption practices. By conducting comparative analysis and gathering feedback from relevant stakeholders, policymakers and researchers can identify the most effective reform strategies for promoting sustainable consumption practices within China.

Finally, ongoing monitoring and evaluation of the effectiveness of the consumption tax system will be necessary to ensure that it continues to promote sustainable consumption practices and reduce wasteful spending over time. More research could be done on the long-term impacts of the consumption tax on different industries or sectors within China, as well as on the broader social and economic implications of the tax.

Overall, by building upon the existing literature and addressing emerging issues related to consumption tax function positioning and reform strategy in China, future research can contribute to a more comprehensive understanding of the effectiveness of the consumption tax system and inform policy decisions related to sustainable development.

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Enhancing Management Efficiency in Natural Parks Globally through Big Data Technologies

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Abstract: The adoption of big data technologies offers significant potential for enhancing the management efficiency of natural parks worldwide, a critical component in the establishment and upkeep of international conservation systems. Innovating management techniques and improving efficiency have become urgent tasks for global natural park authorities. This study examines the present landscape of natural park management and highlights primary challenges faced when incorporating big data. Using human activity data as a model, the paper discusses the processes of data collection, analysis, treatment, and deployment, arguing that leveraging big data technologies to scientifically regulate human activities is essential for boosting natural park management efficiency. In addressing challenges related to the use of human activity data for enhancing management efficacy, recommendations are provided, focusing on refining overarching strategies, creating monitoring systems, broadening talent acquisition, utilizing big data to resolve management challenges, and emphasizing data governance.

Keywords: Natural Parks; Human Activity; Big Data; Management

1. Introduction

In recent years, global guidelines have underscored the need to develop a cohesive international conservation system, with natural parks at its core. These parks, celebrated for their ecological, aesthetic, cultural, and scientific merits, are designed for sustainable utilization and span a diverse range including forest parks, geological parks, marine parks, and wetland parks. They play a pivotal role in safeguarding invaluable natural assets, such as forests, oceans, wetlands, glaciers, grasslands, and biodiversity, along with their associated landscapes, geology, and cultural nuances.

Historically, various international bodies have initiated unified management strategies for natural conservation areas, promoting the holistic preservation of ecosystems while encouraging collaborations among stakeholders to advance the growth of the global conservation system. This notable evolution in management practices has set the stage for further innovations in the realm of natural parks. With ongoing global integrations and adjustments, while the number of natural parks may fluctuate, their overall importance and scope remain vast. Therefore, pioneering new management approaches and enhancing efficiency emerge as top priorities for worldwide natural park governing bodies. A major goal moving forward is to guarantee efficient conservation while allowing sustainable development and sensible utilization, catering to the global populace's aspiration for enhanced ecological well-being.

To attain a balance between conservation and sensible utilization, it's pivotal to monitor and regulate human activities. This ensures that these activities do not trespass the environmental boundaries set by natural parks. Advances in digital technologies have been instrumental in transforming ecological

governance, amplifying the efficacy of ecological administrators. For natural parks globally, it's vital to capitalize on contemporary technology for real-time supervision of human interactions, gather extensive human activity data, appropriately manage human footprints, and thereby elevate overall managerial productivity.

Current State of Natural Park Management and Challenges Faced with Big Data Utilization in a Global Context

The concept of natural parks, encompassing areas of scenic beauty, forested regions, and other ecological assets, has been prevalent since the early 1980s, marking over 40 years of development. Throughout this period, natural park management bodies globally have actively sought to enhance operational efficacy and find a balanced approach to conservation and utilization, amassing a wealth of managerial experiences that signify a high standard of operational capability. With the profound integration of big data technology and managerial innovation, leveraging big data has become a primary method to boost managerial efficiency. However, the adoption of big data technology for the management of human activities in natural parks has been sluggish and faces several practical challenges.

2 Literature review

2.1 Current State of Natural Park Management

From the 1980s onward, various natural parks were established worldwide. Due to the constraints of the times and management structures, these parks were typically categorized based on ecological features such as landscapes, forests, lakes, grasslands, and deserts. This resulted in diverse sectors overseeing different types of parks; for instance, scenic areas might be governed by construction authorities, geological parks by land and resource agencies, marine parks by marine departments, and forest, wetland, and desert parks by forestry departments. This fragmented approach, while beneficial in some historical contexts, inadvertently compartmentalized ecosystems, hampering the development of a holistic and efficient management model for these parks and complicating the synergy between scientific conservation and rational use.

In November 2019, a guideline was issued on integrating and defining three lines of control within territorial spatial planning, emphasizing adjustments and optimization for natural conservation areas. Most natural parks, as crucial elements of the nature conservation system, were incorporated within the ecological conservation "red lines". This pivot towards prioritization of conservation signified a major shift in the original intention and positioning of these parks, reinforcing their primary role in safeguarding natural ecosystems, landmarks, and landscapes. Nevertheless, natural parks also serve unique roles in improving livelihoods, addressing surplus labor, and enhancing the quality of life for the masses. Therefore, while prioritizing conservation, sustainable development and rational utilization must also be considered, ensuring a balance in aspects like tourism, ecology, culture, and scientific research. Achieving this balance is challenging due to the intrinsic tension between conservation and utilization, especially when guidelines stress restricting human activities to preserve the parks. The crux of the issue revolves around how to strike a balance between protection and rational use, particularly when determining the extent of human activities allowed. The main challenges faced by park management are to moderately restrict the number of visitors and the frequency of their visits.

In 2013, a directive was released emphasizing the integration and innovative application of information technology in forestry, pointing towards a comprehensive merger from isolated to integrated applications. Grounded in big data technology, this direction supports information-driven approaches for natural conservation systems, focusing primarily on significant natural ecosystems, landmarks, landscapes, and biodiversity. Furthermore, it offers policy support for natural parks to monitor, collect, and utilize big data related to human activities.

2.2 Issues with Leveraging Big Data Technology

Currently, big data technology has become an effective means to enhance governance capabilities globally. National parks, despite their international prominence, have been sluggish in innovating their management approaches using big data technology. Their management often remains tethered to conventional models, with inadequate utilization of big data to improve administrative efficiency, resulting in less targeted and systematic management strategies.

There is a lag in shifting mindsets and insufficient emphasis on human activities. The establishment of a nature conservation system, primarily revolving around national parks, has integrated these parks within eco-sensitive zones. Despite facing major paradigm shifts towards conservation, park managers still harbor a preference for utilization over conservation. Some parks even prioritize economic gains, neglecting moderate restrictions on human activities and not monitoring or controlling them in real-time.

Monitoring methods of human activities are homogenous, leading to unsatisfactory results. To scientifically manage human activities, real-time big data, encompassing metrics like frequency, trajectory, and volume of human activity in parks, is essential. Due to the unique resources and terrains of these parks, diversified monitoring methods are required. However, current monitoring primarily relies on entrance checks and video surveillance, which fall short in collecting comprehensive real-time data on human activities.

Inadequate utilization of big data on human activities. Because of outdated perceptions held by decision-makers and a scarcity of expertise in big data, there's an underutilization of data on human activities. While some data is used in formulating development plans and annual work agendas, day-to-day management rarely leverages this information to elevate the overall management quality of the parks.

3. Pathways to Enhancing Management Efficiency Using Human Activity Data

Reforming management structures and operational mechanisms, strengthening the synergy between conservation and utilization, and innovative management using big data are pivotal to improving the efficacy of park management. The level of synergy between conservation and utilization acts as a barometer for management efficiency in national parks. Particularly, real-time regulation of human activities using big data to confine the intensity and frequency of activities within a permissible range is a primary approach to achieve this synergy and elevate the management standards.

Based on a search of global academic databases, there's a limited number of studies focusing on effective management of national parks based on their intrinsic features. Most research categorizes parks, such as scenic areas, geological parks, and desert parks, and studies them accordingly. Few have delved into the application of big data in managing different types of parks, mainly emphasizing the sustainable development and optimization of human activity trajectories. Hence, centered around preserving vital natural ecosystems, geological diversity, and the myriad values they hold, employing human activity data to enhance management efficiency is of great practical significance. The essence of restricting human activity lies in understanding the carrying capacity of the park's environment and continuously monitoring human activity, making environmental capacity and real-time human activity data the central elements.

Using human activity data as a foundation to moderately restrict human activities is a valid approach to further improve park management efficiency. This includes four steps: Monitoring units in national parks should employ an integrated terrestrial and aerial surveillance system to gather human activity data. The amassed data should undergo necessary cleaning and labeling, forming a value-driven database. Analysis of this data should be carried out to derive conclusions, which should be promptly submitted to the decision-making units. Management and decision-making units, based on these analyses, should formulate precise strategies for moderating human activities, effectively elevating the management efficiency of the parks.

4. Human Activity Big Data Collection, Analysis, and Application in a Global Context

The demographic in natural parks worldwide encompasses not only local inhabitants and visitors but also individuals involved in agriculture, transportation, commercial services, volunteer services, and more. As major forest and grassland tourist destinations, these parks experience an influx of visitors each year. Consequently, the primary human activities in these areas revolve around visitor movements. For instance, during the start of 2017, 14 sites within a famous natural park recorded approximately 78 million visitor location data entries over 29 days, averaging nearly 200,000 entries per site per day. As per the global forestry and grassland annual report of 2020, there were around 31.68 billion visits to these areas, with just the forest parks accounting for 7.4 billion of these visits. This paper emphasizes the count and activity trajectories of visitors entering these natural parks, highlighting the significance of choosing scientific collection methods and the real-time capture of these data.

Currently, human activity data collection predominantly relies on ticket sales systems, park entrance turnstiles, video surveillance, drone footage, online reviews, and mobile phone location services (based on GPS or other satellite-based systems, mobile network-based positioning, and WiFi or Bluetooth-based positioning). While ticket sales systems offer data, they may not account for visitors who purchase tickets but never enter, and they may lag in determining the carrying capacity of the environment. Park entrance turnstiles are infeasible for open natural parks, and even in closed parks, they could hamper emergency evacuations and fail to capture in-park congregation points. Mobile positioning, whether through GPS or WiFi, requires visitor cooperation and has its limitations. Online reviews lag in real-time data, hindering timely action. Mobile network-based location data, stored by telecommunication providers, includes positional and timestamp information, allowing for all-weather, continuous recording without disturbing visitors. This method's cost-effectiveness, expansive time span, and geographical coverage make it a preferred choice. However, its accuracy largely depends on the density of mobile towers, and natural parks might have areas with no coverage. These shortcomings can be addressed using ground-level video surveillance and aerial drone footage.

To effectively leverage mobile network-based location services, forestry and grassland authorities need to forge strategic data-sharing alliances with major telecommunications providers. This ensures real-time access to visitor location data, encompassing overall visitor count, popular sites, and visitor movement patterns. Furthermore, installing surveillance cameras at entrances, pathways, popular spots, diversion points, and rest areas would offer real-time visitor data. Utilizing drones equipped with necessary gear can capture data from areas with weak mobile signals. Combining these methods would create a comprehensive, three-tiered (sky, land, air) monitoring system, ensuring complete real-time coverage.

Natural park monitoring departments must clean and label the collected data. With a vast amount of unstructured data, including visitor location and activity data, initial steps involve tagging, cleaning, employing predefined rules to validate the data, and filtering out incomplete, erroneous, or redundant entries to ensure logic and completeness. Analysis of this data provides insights into visitor count, duration of stay, hourly visitor flow, popularity rankings of sites, historical trends, and more. By understanding these metrics, management can formulate data comparison reports catering to specific temporal and spatial needs, ensuring timely decisions and necessary adjustments to human activities. By conducting real-time monitoring of human activities in global natural parks, there is a comprehensive grasp of park visitor flow and the trajectory of big data. Statistical analysis of this data helps understand the patterns of visitor flow and the correlation of crowd aggregation between popular sites. This aids in issuing timely alerts, assisting managerial divisions in making appropriate managerial decisions.

Big data technology enhances the emergency management level of natural parks. Monitoring departments, through real-time surveillance systems, acquire big data on human activities within the park. By comparing and forecasting using historical data, alerts are sent to decision-making bodies if the predicted visitor flow in the park or at popular sites approaches or exceeds safety thresholds. Quick assessments are made, determining the need to activate emergency protocols and implement emergency measures.

Decision-making divisions constantly monitor the real-time number and movement of visitors across the park. Based on changing trends and alerts from monitoring systems, human activities are adjusted timely. For incoming visitors, strategies are devised according to their primary purposes, implementing measures like flow limitation, diversion, cutoff, or even rapid evacuation, ensuring visitor flow remains within safe boundaries and preventing overtaxing of the park's ecological and cultural capacity.

To mitigate the adverse effects of human activities on the ecology and cultural landscape, route optimization is employed based on the analysis of big data. Depending on the specific distribution of natural resources and cultural sites within the park, key locations are categorized. Theme-based routes, such as landscape routes or cultural heritage paths, are established. Visitors are guided to choose various routes, effectively diverting the crowd.

Through big data analysis, there's an understanding of whether existing or under-construction infrastructure impacts the park's natural ecosystem and landscapes. Based on sustainable development principles, eco-friendly methods are employed for infrastructure construction or remodeling. As per visitor flow monitoring, recreational stops are strategically placed, not only offering visitors rest spots but also diverting crowd concentrations. Signage and auditory cues are continually refined, elevating the park's public service standards.

Emergency medical response involves immediate assistance provided before professionals arrive at unexpected incidents. Each park establishes emergency medical centers and dedicates rescue teams. Plans are tailored according to the park's unique topography, traffic conditions, and other factors. With real-time alerts from monitoring systems, emergency protocols are swiftly activated, ensuring the safety and smooth operation of the park.

Based on the human activity patterns derived from big data, modern media is employed to promote the unique natural and cultural resources of the park, as well as its varied activities. This guides visitors to choose themed routes based on their interests, satisfying their requirements while avoiding sudden crowd gatherings at popular sites. Concurrently, a volunteer system is established, expanding the volunteer base. Volunteers, both online and offline, provide guidance, answer queries, and offer personalized services, continually enhancing the park's reputation and public image.

5 Discussion and Conclusion

In the context of establishing a conservation system, primarily composed of national parks, underpinned by nature reserves, and complemented by natural parks, the question arises: How can natural parks precisely implement strategies using big data from human activities? Moreover, how can they address the challenges of scientifically limiting human interventions, further enhance management efficiency, and progressively modernize the governance of these parks? The aim is to ensure that natural parks can achieve sustainable development and utilization while effectively protecting ecosystems and cultural landscapes. The management departments of natural parks should refine their overarching designs, build monitoring and evaluation systems, introduce top-tier talents, and fully utilize human activity big data while emphasizing data governance. By doing so, they can further optimize workflows and make science-based decisions, thereby genuinely enhancing the management efficiency of natural parks.

It's crucial to establish comprehensive regulations and standards for natural parks. Rapid introduction of specific ordinances for natural parks is essential, including clauses dedicated to monitoring human activities, non-biotic environmental changes, and biotic factors. Each natural park should have development planning and operational agendas that demand specific requirements for real-time data collection on human activities and biotic and abiotic changes, thus providing firm institutional support.

Building an integrated monitoring system for natural parks, which includes a subsystem for human activity tracking, is of utmost importance. This system should not only monitor changes in non-biotic factors like

water, air, and soil but also assess vegetation coverage and the distribution, quantity, and quality of wildlife. By gradually establishing a system composed of real-time monitoring platforms, dynamic databases, and unified evaluation criteria, parks can make informed decisions on human activities, ensuring the scientific conservation and sensible use of natural parks.

A lack of high-level professional talents in natural parks is a significant barrier to harnessing big data technology. First, the management staff of every natural park needs to adopt the idea of promoting park governance modernization using big data. Secondly, technical personnel should be trained intensively in big data technology to enhance their expertise and skills. Lastly, broaden talent recruitment by collaborating with forestry and grassland-related universities and formulating policies that attract talents, alleviating the scarcity of high-level big data experts. Through various measures, introducing big data management and technical personnel will offer vital human resource support to utilize big data technology effectively.

Integrating human activity big data in management practices, such as emergency management, human activity regulation, route optimization, scientific infrastructure placement, emergency rescue, and targeted promotions, is imperative. Additionally, employing comprehensive monitoring systems to gather large-scale data on non-biotic environmental changes and biotic factors can offer scientific evidence for effective protection, addressing management challenges, and promoting scientific conservation and sensible use of natural parks.

Data governance involves managing data utilization actions. When collecting and utilizing various data sources, especially human activity big data in natural parks, data governance becomes paramount. National-level standards related to data security and personal information protection set the regulatory requirements for data governance, laying the groundwork for using diverse big data sources in natural parks. Strict adherence to these regulations ensures the scientific and standardized enhancement of management efficiency using human activity big data.

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English Education based on Piaget's Cognitive Development Theory

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Abstract: As an important subject, in today's society, the importance of English teaching is self-evident. How to better conduct the English teaching classroom has increasingly become an important issue for educators to think about. This paper uses Piaget's theory of cognitive development to explore how to combine the law of cognitive development of teenagers to carry out English teaching. The article is divided into four parts, the first part is the introduction, the second part is Piaget's theory of cognitive development, the third part is how to combine the law of cognitive development of teenagers to carry out English teaching, and the fourth part is the conclusion and prospect. The purpose of this paper is to explore how to better carry out English teaching in order to provide some reference for educators in classroom teaching.

Keywords: English teaching; Piaget's theory; Cognitive development

1. Introduction

This paper discusses how Piaget's theory of cognitive development is applied to English teaching for teenagers. The education of teenagers must take into account their cognitive changes and development. English teaching plays an important role in adolescent education. It is of great significance for English educators to study how Piaget's cognitive development theory is integrated into teaching methods. With the continuous development of human society, English, as an important communication tool, has gradually been widely used all over the world.

As Chinese, we are also learning Chinese and English. As a universal language, English is playing a more and more important role in today's society and jobs. In addition to learning English to complete their studies, the reason why teenagers need to master English is also related to their future career development. Therefore, the work of educators in English teaching has become a particularly important task, and how to better carry out English teaching and better serve the learning of young people is one of the important factors.

Teenagers are a very risky age between individualization and growth. The huge growth rate, special physical condition, weakening social participation and habit formation, coupled with the promotion of subjects such as mathematics and English, make young people's desire for English learning not obvious, which increases the difficulty and urgency of English education.

How to enable students to master certain English skills and become English experts in the limited time of English education is a difficult point in English education. Therefore, in English education, students' cognition should be gradually deepened to make learning more intelligent.

2. Piaget's theory of cognitive development

2.1 Cognitive development stage

Let Piaget's theory of cognitive development be recognized as the basic theory of psychological development, especially human cognitive development.

This theory explains the development of human cognitive ability from birth to adulthood, as well as the development of specific cognitive abilities related to a particular age group (Piaget, 1954).

Piaget proposed a four-stage model of cognitive development, which explains the cognitive development from childhood to adolescence.

It includes sensorimotor stage (from birth to 2 years old), pre-calculation stage (2-7 years old), specific operation stage (7-11 years old) and post-calculation stage (11-16 years old).

The sensorimotor stage is characterized by the development of sensory and motor coordination ability; the pre-operation stage includes the development of symbolic thinking and imaginative games; the specific operation stage is the development of logical thinking and causal understanding; finally, the formal operation stage of abstract thinking and the ability to analyze complex concepts.

Piaget's development stage represents several branches of the language acquisition and learning process, and it is very important to understand these stages in the context of adolescent English teaching.

2.2 Cognitive Development and Teaching

The application of Piaget's cognitive development theory in teenagers' English teaching provides a basic understanding of the learning process.

As teenagers go through different stages of cognitive development, it is important that their learning experience keep pace with their level of cognitive development.

Piaget's theory of cognitive development refers to the development process of human thinking, knowledge and learning, which is summarized as a dynamic system of change, in which each stage of development requires different ways of thinking, abilities and processes.

Piaget's cognitive development theory mainly analyzes children's cognitive development, but it also has reference significance for teenagers' cognitive development. In Piaget's theory, human thinking and cognition is a process of continuous evolution, mutual communication and interaction, experiencing the evolution from perceptual knowledge to abstract thinking.

Children's cognitive development has gone through such four stages, namely, perceptual movement stage, pre-operation stage, concrete operation stage and formal operation stage.

The main task in the perceptual movement stage is to establish the concept of an object, and then in the pre-operation stage, children begin to learn the use of symbols and whether they can act according to instructions. Entering the specific operation stage, children can begin to think about operation and understand logic. Finally, entering the stage of formal operation, children have mastered abstract concepts, so that they have a stable and efficient level of thinking and cognition.

According to Piaget's theory, educators should design different teaching methods according to the stage of students' development. at the same time, educators should grasp the cognitive development of students as much as possible, under these conditions, in the process of education, ensure learners' autonomous, active and cooperative learning atmosphere in order to build an environment conducive to learning.

The sensorimotor stage is marked by the development of motor and sensory coordination, which is a pleasant stage for children. In language classes, similar activities can be initiated to enhance the motor and sensory abilities of young learners in learning English. Activities include singing English songs, role-playing, and using English flashcards. In the pre-computing phase, children become more imaginative, think, and make connections between images and abstract concepts. Their cognitive ability has also been improved, and they can participate in more complex games to improve their understanding of English, including telling stories, drawing pictures, making simple descriptions using pictures, and associating words with pictures.

In the specific operation stage, this stage is characterized by the development of logical thinking and understanding of the concept of relationship, including causal events.

At this stage, English teachers can integrate more complex activities and develop static logical thinking and simple English reasoning. Activities such as organizing simple dialogues and debates, solving problems through dialogue, and reading English books with background are all helpful to teenagers' learning experience.

In the formal operation stage, the final stage of cognitive development emphasizes abstract thinking, analytical skills and the ability to draw conclusions from several pieces of information received. Therefore, English teachers are encouraged to organize activities to promote the exponential growth of language skills.

Activities that include research, debate, analysis and 'if, then' discussions will enable students to strengthen their language skills.

3. The influence of Adolescent English Education on Cognitive Development

3.1 Cognitive characteristics of adolescents

The cognitive characteristics of teenagers include: rapid development, enhanced self-awareness, gradual abstraction of thinking, strong memory, gradual improvement of the ability to understand and use language, and further development of attention and thinking ability.

3.2 Influence of English Education on Cognitive Development the influence of English Education on Cognitive Development

By learning English, students' knowledge reserve and vision can be enriched and their comprehensive quality can be improved. English education can promote students' cross-cultural communication ability and cultivate their cross-cultural awareness and cognitive ability. English subjects pay attention to the way of thinking and problem-solving ability, can promote students' independent thinking and analysis ability, and cultivate students' innovative spirit.

The learning process of English subject requires a lot of language input and output, which can promote the improvement of students' oral, listening and reading ability.

3.4 Case analysis

Xiaoming is a junior high school student who has been learning English for three years. In the process of learning English, he gradually established an English knowledge framework, improved his memory ability, and improved his ability to understand and use English. At the same time, English subjects pay attention to the way of thinking and problem-solving ability, in the process of learning, Xiaoming gradually formed the ability of independent thinking and analysis. In addition, by learning English, Xiaoming has come into contact with different cultures, enhanced his cross-cultural communication ability, and cultivated his cross-cultural awareness and cognitive ability. In a word, English education has a positive impact on Xiaoming's cognitive development.

4. English Education practice based on Piaget's Cognitive Development Theory

The practice of English Education based on Piaget's Cognitive Development Theory Piaget's Cognitive Development Theory is one of the most important theories of child psychology in the 20th century, and it is also one of the widely used theories in the field of education.

Piaget believes that children's cognitive development is a gradual process, children gradually adapt to the new situation through their own experience, and then self-learning and development.

Based on Piaget's cognitive development theory, this paper will explore the curriculum design, teaching methods, evaluation methods and teaching practice cases in English education practice.

4.1 Curriculum design

In the practice of English education based on Piaget's cognitive development theory, curriculum design should be as close as possible to students' cognitive development level and guide students to gradually understand and master English knowledge.

Specifically, the curriculum can be designed from the following aspects:

1. Pay attention to the interests and needs of students.

English teaching should take students' needs and interests as the starting point, and design teaching contents and tasks in line with students' age and learning level.

For example, in junior high school, students are interested in life and social topics, and comprehensive tasks of listening, speaking, reading and writing can be designed to improve students' ability to use English.

2. Emphasize the practicability of English learning.

English education should be combined with students' real life and learning needs, and pay attention to the application of English knowledge and skills in real life and workplace.

For example, in high school, tasks involving academic writing, English reports and speeches can be designed to improve students' learning and workplace application skills.

3. Establish knowledge accumulation and progressive learning.

English teaching should go from shallow to deep and gradually establish knowledge relevance so that students can learn deeply on the basis of necessary premise knowledge.

For example, when learning English grammar and sentence patterns, we can first focus on intermediate English knowledge, and then gradually go deep into advanced knowledge and language application.

At the same time, in teaching, students should be guided to form a knowledge system, establish concepts and cognitive models, and improve their ability of information processing and induction.

4.2 Teaching methods

In the practice of English education based on Piaget's cognitive development theory, teaching methods should not only guide students to explore their own cognitive abilities, but also create appropriate situations to promote students' cognitive development.

Specifically, teaching methods can be carried out from the following aspects:

1. Emphasize students' experiences and discoveries.

In teaching, we should pay attention to guiding students to explore their own cognitive ability and encourage students to find and solve problems in the process of learning.

For example, English communication scenarios can be designed in class to let students solve communication problems and stimulate their English expression ability.

Establish the thinking model of mind map and problem solving.

In the process of English learning, students should establish a thinking model of mind mapping and problem solving, which can not only effectively integrate English knowledge, but also improve students' ability of induction and reasoning.

For example, when learning English vocabulary and grammar, students can organize their own mind maps, form a knowledge system, and improve their ability to integrate and apply English knowledge.

2. Carry out English teaching according to teenagers' thinking and cognitive ability.

In English teaching, if the learning process is advanced to the "language framework" earlier, it will make students fall into passivity when meeting the requirements of teachers.

In order to help students master English further, educators need to carry out English teaching according to the law of cognitive development of teenagers.

In order to provide more comprehensive and systematic support in English learning, teachers should start with students' common sense and experience, and teaching should design teaching contents with different degrees of difficulty according to students at different stages of cognitive development.

Examples are as follows:

Classroom design ideas: Time Unit 1 gesture, verb usage, context, draw actions (nerd face or smiling face, etc.), find instructions, reasonably complete the experiment 30min Unit 2 pre-similar vocabulary identification, sum up verb past tense, learn the usage of time and interrogative words, adjectives, descriptive semantics, activity thinking form 30min Unit 3 find out the subject and predicate verbs in the textbook, confirm and modify nouns and verb actions.

Master the two emotions of tension and relaxation, as well as the concept of air molecules 30min.

3. Encourage students to actively participate in English teaching.

In the process of English teaching, educators should make students participate more actively and have a more sense of control, which is very important for students to inspire thinking and cultivate interest in learning, and at the same time enhance students' memory of English.

At the same time, encourage students to cooperate in learning and help each other, so that students can learn better in the process of interaction.

Create situations and experiential learning.

In English teaching, situations and cases suitable for students' cognitive development should be designed to enable students to learn in experience and communicate in situations.

For example, when learning British culture, students can be organized to visit British museums and explain cultural history, so that students can understand British culture in practical experience. In the process of teaching, educators can divide the classroom into many forms, such as game form, space reorganization and students' "equipment" after class.

These forms can stimulate students' interest and motivation and make them become the protagonists of learning.

For example, some game elements can be added to teaching to allow students to learn English through competitions, or to launch some works that allow students to organize their own classes to understand the achievements of sensory objects or that can only be queried in dictionaries, so that they can learn English more freely and purposefully.

4. Pay attention to students' individual differences and carry out personalized English teaching.

Teenagers have great differences in personality, including scores, learning experience and personality.

Therefore, in English teaching, we should pay close attention to students' personality differences and carry out personalized teaching.

Educators should provide special education and support according to the differences of different students.

In the teaching of educators, we can explore different teaching methods and strategies to meet the needs of different students.

Can also carry on the differential design in the language expression, lets the student choose the expression way which they like, and provides the relevant background knowledge.

In addition, students can be encouraged to inspire students by conducting some searches, broadcasting learning videos on guided, and carrying out small language tasks.

4.3 Evaluation method

In the practice of English education based on Piaget's cognitive development theory, evaluation methods should reflect students' cognitive development level and English comprehensive ability.

Specifically, it can be evaluated from the following aspects:

1. Emphasize students' self-evaluation and self-reflection.

In the process of English learning, students should establish a mechanism of self-evaluation and self-reflection in order to find problems and solve them in time.

For example, in English listening and speaking training, students should be allowed to evaluate their own performance, find out the problems and seek ways to improve them.

2. Pay attention to English application and situational communication.

In English teaching, evaluation methods should not simply examine the mastery of grammar and vocabulary, but should focus on students' English application and situational communication ability.

For example, in the evaluation of English writing, we should pay more attention to language fluency and expression effect, rather than mechanically picking words and sentences.

3. Attach importance to students' cognitive development level and personality.

In English evaluation, students' cognitive development level and personality characteristics should be taken into account and diversified evaluation methods should be adopted.

For example, English evaluation can be conducted by citing four comprehensive evaluation systems of listening, speaking, reading and writing, homework and project evaluation, and group mutual evaluation.

5. Case Analysis of Teaching practice

Taking the English unit of junior middle school as an example, this paper establishes the practice of English education in accordance with Piaget's theory of cognitive development.

5.1 Curriculum Design

The main contents are as follows: (1) according to students' interests and needs, select topics such as life, games, tourism and so on, and design corresponding listening, speaking, reading and writing tasks to improve students' English application ability.

(2) in the aspect of learning vocabulary and grammar, we should design progressive learning tasks, establish knowledge system and mind map, and improve students' ability of knowledge application and induction.

5.2 Teaching methods

The main results are as follows: (1) in the learning task of listening, speaking, reading and writing, the real communicative context is used as the situational design to promote students' situational communication and improve their English ability.

(2) in teaching, we should pay attention to students' experience and discovery, take problem-solving as the center, let students solve problems independently, and improve students' learning motivation and autonomous learning ability.

5.3 Evaluation method

The main results are as follows: (1) after the end of English unit learning, pay attention to the evaluation of students' English application ability, and adopt the comprehensive evaluation model of listening, speaking, reading and writing to evaluate students' English application and situational communication ability.

(2) in the evaluation, not only pay attention to the language skills, but also pay attention to the students' cognitive development level, using a variety of evaluation methods for evaluation.

6. Conclusion

In a word, the English education practice based on Piaget's cognitive development theory, focusing on students' cognitive development and the improvement of their English application ability, can more effectively promote students' English learning and development and improve their English proficiency and ability.

Piaget's theory of cognitive development promotes people's understanding of the development process of human cognitive ability, which is very important for educators to deal with the teaching of teenagers.

As teenagers experience various cognitive changes, teachers' teaching structure must be consistent with the level of students' cognitive development.

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The path to improve the procuratorial suggestion working mechanism in the new era

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Abstract: As one of the means of legal supervision by procuratorial organs in the new era, procuratorial recommendations bear a considerable task. The working mechanism for procuratorial recommendations has problems such as low content quality, no attention to follow-up work, and insufficient consideration of necessity in preparing and issuing procuratorial recommendations. In this regard, the working mechanism for procuratorial recommendations should be improved from both theory and practice. At the theoretical level, the optimization of the procuratorial recommendation working mechanism can be started from three aspects: adhering to the People's Congress system, complying with the principles of legal supervision, and aiming to maintain the unity of the national legal system. At the practical level, the content of procuratorial recommendations should be optimized, a tracking mechanism for procuratorial recommendations should be established after they are issued, and the evaluation mechanism for procuratorial recommendations should be improved.

Keywords: Prosecution Suggestions; Legal Supervision; Improving the Mechanism

1. Introduction

In the new era, procuratorial suggestions are a less coercive supervision method when the procuratorial organs perform their legal supervision duties. This low coercive supervision method is in line with the current trend of the new era. However, there are still many problems in the current working mechanism of prosecutorial recommendations and need to be further improved. This article points out the important issues of the procuratorial recommendation working mechanism in the new era, and puts forward suggestions for improving it from both theoretical and practical levels, so that it can fully play its role in maintaining the unity of the legal system and promoting the modernization of the national governance system and governance capabilities.

2. Legal supervision and procuratorial suggestions in the new era

As our country enters a new era, the concept of legal supervision by procuratorial organs should keep pace with the times. As one of the most commonly used supervision methods by procuratorial organs, procuratorial recommendations also need to be improved in their working mechanism. The so-called new era legal supervision concept is based on the background that our country's procuratorial work has entered a new historical period, procuratorial reform is facing new situations and new tasks, and procuratorial organs are in a reform superposition period in which legal supervision work is comprehensively deepened and adjusted of.

Procuratorial advice is one of the means by which our country's procuratorial organs perform their legal supervision responsibilities. As the name suggests, procuratorial advice is a flexible means of legal supervision. Procuratorial recommendations are a derivative of my country's characteristic procuratorial system. In the current state power system, procuratorial organs need this procedural supervision method. One of the distinctive features of legal supervision power is that it is a procedural power without substantive power of disposal. Its characteristics also include incidentalness, contingency, randomness, etc. Precisely because procuratorial recommendations are a procedural rather than substantive means of supervision, other state powers such as administrative power and judicial power can be protected from infringement by procuratorial power to a large extent. Procuratorial recommendations first appeared in the procuratorial system of the former Soviet Union. Since the procuratorial organs of the former Soviet Union implemented "general supervision", the so-called "general supervision" means that the procuratorial organs supervise all organs, citizens and organizations of the country, almost all of them. The state supervises in all directions and without blind spots, but China does not copy the procuratorial system of the former Soviet Union. It does not implement "general supervision" but limited supervision. With the continuous development of China, the supervision method of procuratorial recommendations has also developed into various types, playing an irreplaceable role in the rule of law in the country, the government, the society, and the modernization of the national governance system and governance capabilities.

The legal basis for procuratorial recommendations is Article 21 of the Organic Law of the People's Procuratorate of the People's Republic of China , which stipulates that " the People's Procuratorate, in exercising its legal supervision powers stipulated in Article 20 of this Law, may conduct investigations and verifications, and submit protests, corrective opinions, and procuratorial suggestions in accordance with the law." "Relevant units should cooperate and promptly respond to the People's Procuratorate in writing on the adoption of corrective opinions and procuratorial suggestions." The Supreme People 's Procuratorate, based on the relevant content of the Procuratorate's Organizational Law and combined with procuratorial work practice, issued the "Procuratorial Suggestions of the People's Procuratorate" in 2009 Work Regulations (Trial)" and the formal "Work Regulations on Procuratorial Recommendations of the People's Procuratorate" were released in 2018. The "Regulations on the Work of Procuratorial Suggestions of the People's Procuratorate" clarified four types of procuratorial suggestions, namely, procuratorial suggestions for retrials, procuratorial suggestions for correcting violations, procuratorial suggestions for public interest litigation, and procuratorial suggestions for social governance. At the same time, the expansion of the types of procuratorial suggestions by the procuratorial organs was retained. With abundant legislative techniques using blanket clauses, that is, other prosecutorial suggestions. As for the four types of procuratorial recommendations that have been clarified in the "Procuratorial Suggestions Work Regulations of the People's Procuratorate", retrial procuratorial recommendations are issued to the People's Court, and their function is to supervise the trial activities of the People's Court; procuratorial recommendations to correct illegal violations are mainly issued to the public security The public interest litigation procuratorial proposal is a pre-litigation procedure in our country's public interest litigation system. Paragraph 4 of Article 25 of the Administrative Litigation Law stipulates that the procuratorial organ must first Procuratorial recommendations are issued. If the administrative agency fails to perform its corresponding duties after issuing procuratorial recommendations, public interest litigation shall be filed in accordance with the law; Procuratorial recommendations for social governance are issued to the widest range of targets, including judicial organs, administrative agencies, enterprises, and institutions. The unit aims to promote social governance and promote the modernization of the national governance system and governance capabilities.

3. Examination of the dilemma of the procuratorial suggestion working mechanism in the new era

3.1. The quality of procuratorial suggestions is not high

The low quality of procuratorial recommendations issued by procuratorial organs today is a common problem. The most prominent and common problem is the inability to prescribe the right medicine and

directly address the pain points. Article 16 of the "Procuratorial Suggestions Work Regulations of the People's Procuratorate" clearly stipulates that procuratorial suggestions should be clear and specific, fully reasoned, rigorously demonstrated, concise in language, and operational. However, in practice, there are always a small number of procuratorial suggestions that meet this provision, because most of them Procuratorial recommendations are made and issued by grassroots People's Procuratorates. The number and quality of grassroots People's Procuratorates are inferior to those of higher-level procuratorates. Therefore, most of the procuratorial recommendations are unclear, not specific, have insufficient reasoning or even ignore reasoning. The argument is simple and not operational. Some procuratorial organs may issue procuratorial recommendations for the purpose of completing work assessments, which deviates from the function and mission of procuratorial recommendations. In this way, it is impossible to issue a document that satisfies and makes the supervised agency or organization satisfied. High-quality procuratorial recommendations that satisfy the people.

3.2. Not paying attention to the follow-up work of the prosecutor's recommendations

According to the "Regulations on the Work of Procuratorial Suggestions of the People's Procuratorate", after the procuratorial recommendations are issued, the subject who has received the procuratorial recommendations shall reply within a certain period of time. If the procuratorial recommendations are not responded to within a certain period, the procuratorial organ may notify its superiors or competent authorities in accordance with the law. If the administrative agency fails to respond within the time limit, the party committee and the disciplinary inspection and supervision agency will be notified and held accountable in accordance with the law. Therefore, on the surface, as long as the person being advised responds to the prosecutorial recommendation, the mission of the prosecutorial recommendation is over. However, the function and purpose of procuratorial suggestions is not just to obtain a reply, but to maintain the unity of the country's legal system, improve the level of national governance and social governance, and help the procuratorial organs perform their legal supervision responsibilities. Prosecution recommendations will be meaningless if they only receive a reply but fail to achieve the corresponding purpose.

3.3The prosecutor's recommendation was made without fully considering its necessity

Prosecution advice is a unilateral supervision of the subject of supervision by the procuratorate. As mentioned above, it is a procedural control method and does not have the function of substantive judgment. However, it is said that with power comes responsibility. The greater the power, the greater the responsibility. On the contrary With less power comes less responsibility. The cost of issuing procuratorial recommendations is lower than other supervision methods of the procuratorial organs, so the risk of abuse and misuse of procuratorial recommendations is greater than other supervision methods. In one of the series of typical cases (sixth batch) of administrative procuratorial work with the people (sixth batch) released by the Supreme People's Procuratorate on June 16, 2022, "A Case of Procuratorial Supervision by the People's Procuratorate of a City in Zhejiang Province to Supervise a City's Engineering Construction Administrative Department to Perform Its Duties in accordance with the Law" , all grassroots procuratorates in the entire prefecture-level municipal area simultaneously formulate and issue procuratorial recommendations to the local housing and construction administrative department. In this case, a more efficient approach was for the municipal procuratorate to directly issue a procuratorial recommendation to the housing and urban construction administrative department under the people's government at the same level, and then the housing and urban construction administrative department that issued the procuratorial recommendation would submit the procuratorial recommendation. The content is communicated to its lower-level housing and construction administrative agencies, so that only one administrative agency needs to respond to the procuratorial recommendations, saving national resources.

4. Improving the theory of procuratorial suggestions in the new era

4.1. Adhere to the division of power and restriction system under the People's Congress system

The People's Congress system is our country's fundamental political system and must be upheld unwaveringly. The People's Congress is the power organ of the state. Administrative organs, procuratorial organs, judicial organs, and supervisory organs are all produced by it, are responsible to it, and are supervised by it. Under the People's Congress system, administrative agencies, procuratorial agencies, judicial agencies, and supervisory agencies exercise their respective powers independently without interference from other agencies. Procuratorial recommendations represent a power of the procuratorial organ, which should be limited by the power boundaries of the procuratorial organ and must not illegally interfere with other state agencies or erode other types of state power. More importantly, the formulation and issuance of procuratorial recommendations must also be supervised by the people, and the starting point and mission should be people-centered.

4.2. Procuratorial recommendations should comply with the principles of legal supervision

The term "legal supervision" comes from a summary of the functions of the former Soviet Union's procuratorial organs (3). After decades of development by Chinese legal scholars and practitioners, its connotation and principles have evolved with Chinese characteristics. Procuratorial recommendations are one of the means of legal supervision, and they should comply with the principles of legal supervision. The type of procuratorial advice that is most likely to cross the line and deviate from the principles of legal supervision is social governance procuratorial advice. The reason is that the content covered by social governance is too broad. my country's legal supervision is different from the "general supervision" of the former Soviet Union. Legal supervision is the basis for China to understand the supervisory functions of the Soviet procuratorial organs starting from the connotation of the Soviet Union's "procuratorial supervision" concept. On the above, we have completed the self-understanding of the connotation of the concept of "procuratorial supervision" in the Soviet Union, and combined the needs of the development of China's legal system with the sinicization of the concept (4). It is mainly the supervision of public power agencies, and the procuratorial suggestions for social governance. The targets of hair-raising also include private rights subjects. The author believes that from an institutional perspective, eliminating the power of the procuratorial organs to issue procuratorial recommendations to non-public power agencies is more conducive to the establishment and improvement of the legal supervision system. This is also more in line with the principles of legal supervision. The supervision of private rights entities may be left to Administrative agencies are more appropriate.

4.3. Maintaining the unity of the national legal system as the core pursuit

One of the important manifestations of national unification is the unification of the legal system. The unification of the legal system includes two levels, one is the unification of the legal system, and the other is the unification of the application of laws. One of the most important responsibilities of our country's procuratorial organs is to maintain the unity of the country's legal system. Specific to procuratorial recommendations, they are more often used to maintain the uniformity of legal application, because my country's constitutionality review system has not yet been perfected, and procuratorial recommendations cannot yet directly face legislative acts. Among the types of procuratorial suggestions, the retrial procuratorial suggestions are to supervise the judicial adjudication behavior of the trial agencies. The procuratorial suggestions to correct illegal violations, public interest litigation procuratorial suggestions and social governance procuratorial suggestions are mainly oriented to law enforcement behaviors. Among them, the procuratorial suggestions to correct illegal violations involve criminal justice but are due to the public security organs. In our country, it belongs to the administrative system, so its administrative law enforcement attributes are stronger, and the orientation of social governance procuratorial recommendations is not limited to law enforcement behaviors. Generally speaking, procuratorial suggestions are mainly oriented towards judicial activities and law enforcement activities. Judiciary and law enforcement are two forms of legal application, and they are subordinate concepts of legal application. Therefore, in terms of procuratorial suggestions in the current new era, if we want to expand the types of

procuratorial suggestions, we must maintain the unity of the legal system as the core pursuit. This is also one of the original missions of the state's procuratorial organs.

5. Practical Path of the Procuratorial Suggestion Working Mechanism in the New Era

5.1. Optimize the content of prosecutorial recommendations

The content of procuratorial recommendations should be based on the "Work Regulations of the People's Procuratorate on Procuratorial Recommendations" as the bottom line. On top of meeting the requirements of the "Work Regulations of the People's Procuratorate on Procuratorial Recommendations", the quality of procuratorial recommendations should be further improved and high-quality production and issuance of procuratorial recommendations should be achieved. Specifically, it should be optimized from at least the following aspects: First, strengthen the positioning of legal supervision means of procuratorial recommendations, mainly focus on legality issues, and avoid the dilemma of laymen guiding experts. When handling some highly professional cases, such as cases involving intellectual property, artificial intelligence, computer software, etc., prosecutors often do not have relevant professional knowledge and skills. The procuratorial organs need to combine their own advantages in legal expertise with the technical advantages of technicians, rather than giving random guidance in unfamiliar areas. Second, pay attention to the discussion and reasoning of the procuratorial recommendation. The procuratorial suggestion is not only to point out the problems of the subject under supervision and propose corresponding countermeasures, but more importantly, whether it can persuade the other party in terms of logic, reason, and legal principles, so that the subject under supervision can actively cooperate with the procuratorial organ to perform legal supervision duties and realize Optimal supervision effect. Third, the content of prosecutorial recommendations should be as specific as possible. As mentioned above, the vague content of procuratorial recommendations has become a common problem. In most cases, the procuratorial organs, as an external supervisory body, have a shallow understanding of the subject under supervision, so they issue a vague and interpretable Strong prosecutorial advice is favored by investigators and is the safest and least error-prone situation for them. However, such vague and unspecific prosecutorial suggestions are really unhelpful to the subjects under supervision and cannot effectively help them solve practical problems.

5.2. Establish a tracking mechanism after the procuratorial recommendations are issued

The purpose of the procuratorial recommendations is to maintain the unity of the country's legal system, promote the modernization of the national governance system and governance capabilities, etc., and to solve social problems at a smaller level. Although procuratorial recommendations are only a means for the procuratorial organs to unilaterally supervise other subjects, they are also a bridge between the procuratorial organs and society. Procuratorial recommendations cannot be dismissed immediately. As long as the problem is not resolved, even if a reply to the procuratorial recommendations is received, its functions and missions will not end. Establish a tracking mechanism after the procuratorial recommendations are issued. According to the planned time nodes, the results of the implementation of the procuratorial recommendations will be tracked and the actual situation will be recorded and summarized. What situations are likely to lead to insufficient implementation of procuratorial recommendations, how prosecutors optimize the way they handle cases, and whether their case handling concepts are reasonable and reasonable should be continuously summarized based on practical feedback, and ultimately a tracking mechanism for procuratorial recommendations after they are issued will be established and improved.

5.3. Improve the evaluation mechanism for procuratorial recommendations

In order to implement the working mechanism related to procuratorial recommendations and mobilize the enthusiasm and initiative of case handling personnel, it is necessary to improve the evaluation and fundraising of procuratorial recommendations. In practice, there is an unhealthy tendency to exclude

procuratorial suggestions from the “main business” of handling cases . The reason for this problem is that the status of procuratorial suggestions in the current evaluation mechanism is too low. Therefore, improving the status of procuratorial recommendations in the evaluation mechanism is the first step. Elevating the status of procuratorial recommendations in the evaluation mechanism to the status of the “main business” of case handling or even higher. Secondly, establish a multi-level evaluation mechanism for procuratorial suggestions. The assessment of prosecutors, chief prosecutors, and the entire procuratorial office will include the quality and effectiveness of procuratorial recommendations to ensure that procuratorial recommendations receive the necessary attention. Finally, an external assessment mechanism is introduced. Agencies that receive procuratorial suggestions can conduct differentiated evaluations on procuratorial suggestions issued by the procuratorial organs on a monthly, quarterly, or annual basis at different levels based on the actual situation. The evaluation results are fed back to the procuratorial organs and can be copied to the procuratorial organ under review. The procuratorial organ at the higher level of the agency and the political and legal committee at the same level. Similarly, the implementation of procuratorial recommendations should also be included in the annual assessments of judicial organs, administrative agencies, state-owned enterprises, and public institutions, and the supervised entities should be urged to cooperate with the procuratorial organs in performing legal supervision duties.

6. Conclusion

Procuratorial recommendations are an important means for procuratorial organs to perform their duties. Faced with the shortcomings of the current working mechanism for procuratorial recommendations, the purpose and function of procuratorial recommendations must be clarified theoretically to make procuratorial recommendations better compatible with the national governance system. In view of the pain points, difficulties, and blocking points in the working mechanism of procuratorial recommendations, we should improve the quality and effectiveness of procuratorial recommendations in practice and improve corresponding supporting measures, so that procuratorial recommendations can become a shining business card of the procuratorial organs and achieve legal and social effects. of unity.

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