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APPLICATION OF META-LEARNING IN MULTI-AGENT REINFORCEMENT LEARNING - A SURVEY

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Abstract: This survey provides an comprehensive overview of the application of meta-learning in the field of multi-agent reinforcement learning (MARL). Meta-learning, also known as learning to learn, has emerged as a promising approach to enhance the learning efficiency and adaptability of reinforcement learning algorithms. This article explores the challenges and opportunities in applying meta-learning to MARL, highlighting the potential benefits such as faster convergence, improved generalization, and better coordination among agents.
Keywords: Meta-learning; Reinforcement learning; Artificial intelligence

1 INTRODUCTION

1.1 Meta-Learning

Machine learning and artificial intelligence models have been widely applied in various scenarios of life. For a specific artificial intelligence application scenario, the common approach is to train the model using specific data, so that the model can have a better performance in the specific scenario. With the continuous development of machine learning and artificial intelligence technology, its task scenarios have gradually expanded to various aspects of life. For the ever-changing application scenarios of machine learning tasks, how to make AI models adapt to complex and changeable task scenarios is a direction of artificial intelligence research.
In the process of learning new knowledge, different from the process of training a model, human usually reuse the known and effective methods in similar task scenarios based on existing experience and knowledge, simplifying the learning process and reducing the cost of trial and error, and finally realizing cross-task learning. By analogy with the human learning process, the researchers expect the model to "learn to learn" in a similar way. That is, on the basis of existing knowledge, the model can quickly learn new knowledge and use it to solve tasks in new application scenarios, which is called Meta Learning[1]. Different from machine learning, which is usually aimed at solving a specific task, in a meta-learning task, it is often necessary to prepare multiple tasks and their corresponding training and test data, and train the model on the train task so that the "prior knowledge" learned by the model can perform better on the test task.

1.2 Meta-Reinforcement Learning

Reinforcement Learning (RL) primarily focuses on how an agent can maximize the rewards it receives in a complex environment. The agent learns by sensing the state of the environment and the reaction to its actions, choosing better actions to achieve higher returns[2]. Despite the successful applications of RL in path planning, robot control, games and games, finance and education, there are problems with low data efficiency and lack of universality in the generation strategy, which limit the application of RL in many aspects1. Therefore, researchers consider introducing the idea of meta-learning, abstracting the process of obtaining better RL algorithms as another machine learning problem, and thus proposing meta-reinforcement learning (meta-RL). Meta-reinforcement learning is a meta-learning approach to reinforcement learning that tries to solve the common sampling inefficiency or ineffectiveness problems in RL by introducing meta-learning, thereby enabling RL to be applied to more task scenarios.

1.3 Multi-Agent Reinforcement Learning

Multi-Agent Reinforcement Learning (MARL) is a branch of reinforcement learning that aims to train a group of multiple agents and enable them to perform better in their interactions with the environment. Compared to the typical reinforcement learning tasks, the tasks in the MARL application environment usually involve multiple agents, which form a multi-agent system together. Each agent follows the same goal of reinforcement learning, trying to maximize the reward it can obtain. Due to the presence of multiple agents, the global state change of the environment will be affected by the joint action of all agents, which requires the agent to consider the impact of joint action on the multi-agent environment during its strategy learning process. It also brings unique challenges in modeling, algorithm design, and application. In MARL, a key challenge is the balance between cooperative learning and competitive learning. In some cases, agents need to cooperate to achieve common interests, while in other cases, they may need to compete to obtain limited resources. This makes the design of MARL complex, requiring consideration of communication, coordination, and competition strategies between agents.

2 RELATED RESERCH

2.1 Multi-Agent Reinforcement Learning

At present, MARL has made significant progress in a number of areas. One of the prominent applications is multi-agent collaborative control, such as traffic management, drone cooperative flight, etc. In addition, MARL has been widely used in fields such as game theory, social sciences, and economics. However, MARL still faces many challenges, such as learning in adversarial environments, scalability of large-scale multi-agent systems, etc.

For multi-agent reinforcement learning problems, the generalization of single-agent reinforcement learning is a more direct idea, that is, each agent regards other agents as factors in the environment, and still updates the strategy according to the way of single-agent learning and interaction with the environment. This type of approach, also known as value-based methods, includes Independent Q-learning[3] and Cooperative Q-learning[4], etc. This type of approach attempts to achieve collaborative decision-making by modeling the value function of each agent.

For multiple agents, there may be a competitive, hybrid competitive or fully cooperative relationship between them, and in these relationship modes, the decision-making behavior of other agents will have different effects on the individual.

2.1.1 Competitive relationship

The Minimax Q-learning algorithm is commonly used in situations where two agents are preceded by a zero-sum random game in perfect competition. Based on the principle of least-maximum in game theory, the algorithm learns by modeling the adversarial relationship between agents to minimize the expected reward in the worst-case scenario. In Minimax Q-learning, each agent is treated as a minimized player and a maximized player. The minimized player works to minimize their expected reward, while the maximized player tries to maximize the expected reward of the minimized player. This adversarial learning allows agents to learn more robustly in uncertain and adversarial environments[5]. Specifically, Minimax Q-learning uses a Q-value function to represent the strategy for each agent. At each learning step, minimize the player's optimal strategy by updating its Q function to reflect its opponent's maximizing player. At the same time, the maximized player also adapts to the strategy of minimizing the player in an adversarial environment by updating its Q function.

Minimax Q-learning provides a powerful framework for dealing with cooperation and competition in multi-agent systems, especially when it comes to adversarial situations and incomplete information. Its algorithmic structure enables agents to effectively model uncertainties in the environment and adversary strategies to achieve a more robust and intelligent decision-making process.

2.1.2 Hybrid relationship

Nash Q-learning is a multi-agent reinforcement learning algorithm, which is commonly used in two-person zero-sum games between two agents and extends to more general multi-person general and game situations, and is committed to solving the Nash equilibrium problem in game theory. The algorithm coordinates the agent's strategy so that each agent cannot change its own strategy to increase its expected reward given the opponent's strategy. A Nash equilibrium is a combination of strategies in which each agent adopts a strategy that optimally responds to its opponent, forming a state of equilibrium that does not change from one another[6]. In Nash Q-learning, the learning goal of each agent is to find an equilibrium state, that is, a Nash equilibrium, through the evolution process of the game. By updating the Q function, each agent iteratively adjusts its strategy to approximate the Nash equilibrium of the game. This involves adversary modeling, which guides the adjustment of one's own strategy through the estimation of the adversary's strategy to achieve convergence to the equilibrium state.

Nash Q-learning provides an effective framework for coordinating cooperation and competition in multi-agent systems. The focus is on the application of game theory to enable the agent to gradually reach a stable equilibrium state in the game process. This method aims to deal with the policy interaction in the multi-agent system and ensure that each agent makes the optimal strategy choice under the Nash equilibrium, so as to form the cooperative behavior of the whole system.

2.1.3 Cooperation relationship

When multiple agents are fully cooperative in the environment, different agents need to cooperate with each other to achieve better overall performance. In dealing with the problem of mutual negotiation between agents to achieve optimal joint action, the mutual modeling between individuals can provide a potential coordination mechanism for the decision-making of agents. In the Joint Action Learner (JAL)[7] approach, agent i makes decisions based on the observed historical actions of other agents j and the modeling of their strategies. The Frequency Maximum Q-value (FMQ)[8] method introduces the frequency at which individual actions achieve the best return in joint actions to define individual Q values. In the learning process, the agent is guided to choose to maximize the probability of its own action in the joint action that obtains the best return.

Both JAL and FMQ methods are based on equilibrium solving, but these methods are often limited to dealing with small-scale (i.e., small number of agents) multi-agent problems. In practical problems, a large number of agents will be involved in the interaction and mutual influence between agents, and the traditional equilibrium solution method is limited by the computational efficiency and computational complexity, and it is difficult to cope with complex scenarios. In the problem of large-scale multi-agent learning, considering the effect of group joint actions, including the influence of the current agent and the role it plays in the group, is of great help to agent strategy learning.

2.2 Multi-Agent Deep Reinforcement Learning

The rise of deep reinforcement learning has also had a profound impact on MARL. The introduction of deep neural networks has enabled agents to learn more complex representations and strategies, improving the performance of MARL in real-world applications. However, deep MARL also introduces new challenges, such as training instability, sample efficiency, and generalization issues.

With the development of deep learning, the powerful expressive power of neural networks is used to build value approximation models and policy models (commonly found in policy-based DRL methods). Deep reinforcement learning methods can be divided into value-based and policy-based, when considering the multi-agent problem, the main way is to introduce multi-agent related factors into the definition of value function or strategy, and design the corresponding network structure as a value function model and strategy model, and finally the trained model can adapt (directly or potentially learn the complex relationship between agents). Get good results on specific tasks.

2.2.1 Value-based method

The value function-based approach can be said to be the first attempt of multi-agent reinforcement learning algorithms (e.g., IQL algorithm). However, for more complex environments, IQL is not able to handle the problems caused by non-stationary environments. The centralized method, that is, the method of merging the state space and action space of all agents as an agent, can better deal with the problem of environmental non-stationarity, but there are also problems such as poor algorithm scalability in a large-scale multi-agent environment, and the strategies made by agents with slower progress will hinder agents who have learned some strategies, thus reducing the global debriefing. Therefore, the researchers proposed a VDN (Value-Decomposition Networks) method[4]. The basic idea is that a federated Q network is centrally trained, but this federated network is obtained by the sum of the local Q networks of all agents, so that not only can the problems caused by the non-stationary environment be dealt with through centralized training, but also the complex interrelationships between agents are decoupled because they are actually learning the local model of each agent. Finally, since each agent has a Q network based only on its own local observations after training, decentralized execution can be realized.

VDNs make strong assumptions about the relationship between agents; however, such assumptions are not applicable to all cooperative multi-agent problems. In order to overcome this limitation, the researchers proposed an improved method, QMIX (Q-Mixing). In the QMIX framework, each agent is given its own Q-value function, and these individual Q-values are combined to form a global Q-value. QMIX uses a neural network known as a "hybrid network" whose task is to learn how to effectively integrate the individual Q values of individual agents into a global Q value, thereby motivating the agents to cooperate efficiently when performing actions. QMIX achieves two key improvements over VDN: first, global information is introduced during training to provide assistance; Secondly, the hybrid network is used to fuse the local value function of a single agent instead of simple linear addition to further improve the performance of the model. QMIX is designed so that agents can make collaborative decisions by maximizing global rewards without direct communication.

2.2.2 Policy-based method

When scaling reinforcement learning algorithms from a single agent to a multi-agent environment, the most straightforward approach is to adopt an independent Q learning (IQL) class approach. However, in complex environments, there are some difficulties in dealing with such methods due to the non-stationary nature of the environment. Again, while a centralized approach is able to cope with these issues, it sacrifices scalability to a certain extent relative to IQL. Therefore, the researchers propose an Actor-critic based approach[9]. The basic idea of this algorithm is to decompose the learning problem into two main components: the actor and the critic. The actor is responsible for performing the action, and the critic is responsible for evaluating how good or bad the action chosen by the actor is. There is a synergistic relationship between the actor and the critic, with the actor rewarding the improvement strategy by maximizing expectations, while the critic directs the actor's improvement by providing an evaluation of the actor's movements. This decoupled architecture enables actor-critic algorithms to deal more efficiently with complex environments and high-dimensional state spaces.

Multi-Agent Deep Deterministic Policy Gradient (MADDPG) is a reinforcement learning method for solving cooperative and competitive multi-agent problems. MADDPG is a multi-agent extension of Deep Deterministic Policy Gradient (DDPG) designed to address the challenges of inter-agent interaction and collaborative decision-making between agents. The goal of MADDPG is to enable agents to maximize cumulative rewards in a multi-agent environment by learning appropriate strategies. This approach excels in multi-agent scenarios involving collaborative decision-making or competing tasks, enabling agents to learn effective collaboration strategies. MADDPG establishes a centralized critic for each agent, who is able to obtain global information, including the global state and the actions of all agents, to provide the corresponding value function. To a certain extent, this design helps to alleviate the problem of environmental instability of multi-agent systems. At the same time, the actors of each agent only need to make decisions based on their local observations, so as to achieve distributed control of the multi-agent system.

3 APPLICATION OF META-REINFORCEMENT LEARNING MULTI-AGENT REINFORCEMENT LEARNING

As an important branch of reinforcement learning, multi-agent reinforcement learning(Multi-Agent Reinforcement Learning，MARL) is in the stage of continuous evolution and improvement. With the growing demand for modeling and decision-making in complex systems, researchers are faced with the challenge of generalizing the unknown environment. To address this challenge, they began to consider introducing a mindset of meta-learning. Meta-learning,

as a learning mode of learning how to learn, provides a new idea for solving the generalization problem in multi-agent reinforcement learning. Researchers try to combine meta-reinforcement learning with multi-agent reinforcement learning to solve the generalization difficulties and nonstationary problems that arise in multi-agent environments. This integration effort aims to make the system more adaptable, enabling efficient decision-making in unknown environments.

In traditional multi-agent reinforcement learning, the generalization problem has become particularly prominent due to the interaction of multiple agents and complex game strategies. The introduction of meta-learning provides a way for researchers to improve the performance of systems in new domains by learning the ability to adapt quickly in different environments. However, generalization difficulties in multi-agent reinforcement learning are not the only challenges. The issue of non-stationarity is also an important aspect to be addressed. The dynamics and interaction complexity of the multi-agent environment make traditional learning algorithms unable to cope with nonstationary. The introduction of meta-reinforcement learning provides a new way to deal with this problem, so that the system can better adapt to the changes in the environment through learning adaptability and flexibility. The integration of meta-reinforcement learning and multi-agent reinforcement learning aims to overcome the generalization and non-stationarity challenges brought about by the multi-agent environment. This research direction provides new theories and methods for building more intelligent and adaptive systems.

Meta-learning has been widely used in the field of multi-agent reinforcement learning to deal with diverse and complex problems. On the one hand, meta-learning solves the problem of information transfer and cooperation in multi-agent systems by learning which agents to communicate with1[10]. This learning mechanism enables the agent to adaptively select the agent it communicates with in the case of environmental changes or uncertainties, so as to maximize the performance of the whole system. On the other hand, meta-learning provides a mechanism for multi-agent systems to adjust and improve autonomously by learning agent-specific reward functions to automatically design mechanisms[11]. This approach allows the agent to better adapt to changing external conditions by optimizing its behavior through dynamic responses to the environment. A similar example is the ability to effectively deal with leader-follower dynamics in multi-agent systems[12] by performing agent learning to compute the Stackelberg equilibrium. This approach enables the system to quickly provide an adaptive, optimal response strategy when training a fixed leader strategy, resulting in an overall performance improvement in the system. This series of applications demonstrates the broad and far-reaching impact that meta-learning offers in multi-agent systems. The application of meta-learning in multi-agent reinforcement learning is not only limited to solving specific problems, but also provides a more flexible and intelligent learning paradigm for the system. This research direction not only promotes the development of multi-agent system theory, but also provides strong support for the design of more intelligent and adaptive systems in practical applications.

3.1 Problems Solved by Meta-Reinforcement Learning Methods in Multi-Agent Reinforcement Learning

This section focuses on two main problems to be solved by meta-reinforcement learning in a multi-agent environment. Firstly, the generalization problem of unseen agents and unstable agents is introduced, and how meta-reinforcement learning can solve these problems in general is discussed. Secondly, the types of meta-reinforcement learning methods used to solve each problem are discussed, and the PPG method that proposes additional mechanisms for each problem is elaborated.

We first consider the generalization of introducing new agents in a multi-agent environment. In multi-agent reinforcement learning, many agents act in a shared environment. In general, there may be large differences between the strategies of different agents, which creates the problem of generalization of unknown agents. This generalization can occur between opponents [13], or between teammates[14], or for specific tasks[15].The complexity of the generalization problem lies in the fact that the identities of other agents may be highly variable, either through learned strategies or actual human decision-makers.

In the context of meta-reinforcement learning, researchers consider the existence of other agents as part of the task and assume that the distribution of these agents is known and available for training. This assumption and perspective make meta-reinforcement learning methods effective in dealing with generalization problems in multi-agent systems. By considering the variability of other agents and incorporating them into the learning framework, meta-reinforcement learning provides a potential solution to improve the agent's ability to generalize to other agents in an unknown environment.

In multi-agent reinforcement learning, the problem of unsteady state is also an important and complex challenge. From the point of view of any one agent, all other agents are constantly learning, causing the environment of the problem to change. This makes it difficult for traditional learning algorithms to effectively cope with this unsteady state. The meta-reinforcement learning method considers the unsteady state as a part of the task by including other learning agents in the definition of the task, which enables the meta-learning algorithm to better adapt to the changes introduced by other agents in the learning process, so as to improve the adaptability of the system to environmental unsteady. By repeatedly resetting other learning agents during meta-training, we can meta-learn how to handle changes introduced by other agents. From the perspective of meta-learning agents, the distribution to other agents remains the same. This effectively solves the problem of unsteady state of multi-agent reinforcement learning.

3.2 Meta-Reinforcement Learning Methods Applied in Multi-Agent Reinforcement Learning

Various types of meta-reinforcement learning methods can be applied in the process of multiagent reinforcement learning, among which the most typical ones are PPG (Proximal Policy Gradients) method[16], black-box method[17] and task inference methods[14], etc. If another agent is also learning, that agent can even use a non-adaptive strategy such as Markov[18]. Most of these methods can be directly applied to the underlying meta-reinforcement learning problem to solve the generalization and unsteady problem of multiple agents.

The PPG method is a strategy gradient optimization method in reinforcement learning, which aims to solve the decision-making problem in the continuous action space. The core idea of the PPG method is to stabilize and accelerate the policy optimization process by controlling the magnitude of policy updates and maintaining the "proximal invariance" of the policy distribution. PPG's goal is to maximize cumulative returns while ensuring that the difference between the new strategy and the old strategy is bounded. This mechanism for controlling for differences helps to prevent excessive policy updates from being introduced in training, thereby improving the stability of training. This approximate invariance makes the PPG method an excellent performer in the face of highly variable environments. It can be applied to collaboration, adversarial scenarios, and other complex multi-agent systems. Furthermore, some scholars have studied additional mechanisms based on the idea of PPG to further deal with the generalization and unsteady problems in multi-agent reinforcement learning.

3.3 For Generalization Problems in Multi-Agent Reinforcement Learning

Some of the existing work is dedicated to improving the distribution of other agents through meta-gradients to improve the generalization ability of new agents. In 2021, Abhinav et al.[19] proposed a meta-learning method based on dynamic populations for multi-agent communication with natural language. In this way, populations are built dynamically in an iterative manner and diversity is introduced over time. In this way, an agent can be trained using population-based meta-learning algorithms that allow it to generalize among known and unknown partners and humans, and ultimately to obtain an agent that can cooperate with known, unknown, and humans in a multi-agent communication environment. This work iterates between PPG meta-learning and fixed adversary distributions, and adds the optimal response of meta-learning agents back to the population, leveraging the distribution of agents to create a robust agent capable of generalizing among many other agents.

3.4 For Unsteady State Problems in Multi-Agent Reinforcement Learning

Other works introduce additional mechanisms to deal with unsteady-state. In order to account for astability, all adaptive or non-adaptive agents must eventually be repeatedly reset to their initial policy. However, PPG-based approaches tend to allow other agents to continue learning [17] or even meta-learning cite{A policy gradient algorithm for learning to learn in multiagent reinforcement learning} without resetting.In 2021, Kim et al.[16] proposed a meta-multiagent policy gradient theorem Meta-MAPG (meta-multiagent policy gradient theorem).

Due to the presence of multiple agents in the environment, the overall environment is unsteady due to the change of strategies of other agents when each agent perceives the environment, and the distribution of experiences encountered by each agent itself is also astable. In order to solve this steady-state problem, the algorithm proposed in this work directly considers the inherent unsteady policy dynamics in the multi-agent learning environment, and models the gradient update to consider both the agent's own unsteady policy dynamics and the unsteady policy dynamics of other agents in the environment, so it can quickly adapt to the unsteady dynamics of other agent strategies in the shared environment. At the same time, in the process of interacting with other learning agents, the future strategies of other agents will also be affected to a certain extent, and this influence will also help to improve the performance of the meta-agents themselves to a certain extent.

4 CONCLUSION

Meta-reinforcement learning, a transformative approach that equips agents with the ability to learn how to learn, holds immense promise for addressing the challenges of generalization and non-stationarity in multi-agent reinforcement learning. By enabling agents to adapt their strategies to new agents and changing environments, meta-reinforcement learning empowers multi-agent systems to navigate complex and dynamic scenarios effectively. The Proximal Policy Gradients (PPG) algorithm, along with its extensions, has demonstrated its effectiveness in tackling both generalization and non-stationarity challenges. However, further research is needed to explore alternative meta-reinforcement learning algorithms, address scalability issues, and integrate this approach with other machine learning techniques. By pushing the boundaries of meta-reinforcement learning and its applications, we can unlock the full potential of multi-agent systems and pave the way for intelligent and adaptable solutions in various domains.

COMPETING INTERESTS

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THE EMBODIMENT, INFLUENCE AND SUGGESTIONS OF CHINESE TRADITIONAL CULTURAL VALUES IN THE RURAL REVITALIZATION LEGAL SYSTEM

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Abstract: In 2020, with the in-depth implementation of the targeted poverty alleviation policy, China successfully eradicated absolute poverty. Since then, the country's focus has shifted from poverty alleviation to rural revitalization. The formation and development of China's legal system for rural revitalization is not isolated from traditional culture but is deeply influenced by the values of Chinese traditional culture. The values represented by Confucianism, Daoism, Legalism, and other schools of thought in traditional Chinese culture are reflected to varying degrees in the laws related to rural revitalization. These traditional cultural values have played an important supporting role in China's rural revitalization strategy.
Keywords: China's legal system for rural revitalization; Traditional cultural values; Confucian thought; Taoist thought; Legalist thought

1 INTRODUCTION

Over the past few decades, China has undergone a profound transformation from a planned economy to a market economy, achieving remarkable economic and social development. In addressing the long-standing issue of poverty, the Chinese government implemented a series of powerful poverty alleviation measures. These measures not only accurately identified impoverished populations and regions but also effectively allocated and utilized resources through targeted policies and assistance. This greatly promoted economic development and social progress in poverty-stricken areas. With the deep implementation of precise poverty alleviation policies, China has successfully eradicated absolute poverty, marking a great miracle in the history of human poverty reduction.

However, eliminating absolute poverty is only the first step. Consolidating the achievements of poverty alleviation and preventing people from falling back into poverty has become an important task for the Chinese government in the present and future. On December 26, 2020, China issued an important document titled "Opinions on Effectively Aligning the Consolidation and Expansion of Poverty Alleviation Achievements with Rural Revitalization¨, which pointed out that ¨after winning the battle against poverty and achieving the goal of building a moderately prosperous society in all respects, we must, on the basis of consolidating and expanding the results of poverty alleviation, advance rural revitalization in a comprehensive way, continuing to promote the development of formerly impoverished areas and the improvement of people's lives."

Since then, China's focus has shifted from poverty alleviation to rural revitalization. As the rural revitalization strategy continues to be implemented, China has introduced a series of laws and policies aimed at promoting the comprehensive development of the rural economy and society. Compared with past poverty alleviation efforts, rural revitalization is not limited to economic support and assistance to rural areas; it also calls for comprehensive improvements in cultural, social, and other aspects of rural life. The formation and development of China's rural revitalization legal framework is not isolated from traditional culture but is deeply influenced and shaped by the values of Chinese traditional culture. The values represented by Confucianism, Daoism, Legalism, and other schools of thought have been reflected to varying degrees in the rural revitalization laws, becoming important guiding principles in the construction of rural legal governance.

The significance of this study lies in the following aspects: First, an in-depth analysis of China's current rural revitalization legal system and the embodiment and influence of traditional Chinese cultural values within this system helps us better understand the local and distinctive characteristics of rural governance, providing valuable insights for improving the rural legal framework. Second, based on summarizing the impact of traditional cultural values on the rural revitalization legal system, this study will explore how to further leverage the positive role of traditional culture to promote the organic integration of legal governance, moral governance, and self-governance in rural areas, thereby achieving comprehensive rural revitalization. Third, China's rural revitalization practices and the construction of its legal framework offer a model that can be referenced by other countries, particularly developing nations. By analyzing the positive role of traditional cultural values in rural revitalization, this research can help other countries understand and incorporate cultural elements suitable to their own national conditions, promoting the implementation of their own rural revitalization strategies.

2 OVERVIEW OF TRADITIONAL CHINESE CULTURAL VALUES

2.1 Definition of Traditional Chinese Cultural Values

Traditional Chinese culture refers to the unique cultural heritage of China, formed through thousands of years of continuous evolution and development. It encompasses various aspects of the Chinese people's way of thinking, value systems, ethics, customs, traditional literature, clothing, and more. It represents the collective manifestation of various philosophical, cultural, and conceptual systems throughout Chinese history. Traditional culture, as a product of daily life practices, has played an important role in China's development process and holds significant importance for rural revitalization [1].

Traditional Chinese cultural values refer to the standards and perspectives that the Chinese people have developed over time to evaluate the significance of objective phenomena, including people, events, and objects. These values are deeply rooted in traditional Chinese culture, shaped by long-term accumulation and inheritance, and carry distinct national characteristics and profound historical and cultural significance. They cover a wide range of areas, such as the spirit of self-reliance and perseverance, the unity of knowledge and action, emphasis on the spiritual life of individuals, patriotism, the pursuit of truth and dedication, and ethical norms like solidarity, mutual assistance, respect for the elderly, and care for the young. These values not only reflect the spiritual aspirations and moral principles of the Chinese people but also have had a profound impact on the development and progress of Chinese society.

2.2 Intellectual Origins of Traditional Chinese Cultural Values

The origins of traditional Chinese cultural values are deep and broad, extending to various aspects of ancient society, including religious beliefs, philosophical thought, social institutions, and customs. These elements continuously merged and evolved throughout history, eventually forming the unique set of traditional Chinese cultural values. These values, embodying the spiritual aspirations and moral standards of the Chinese people, have significantly influenced China's societal development and progress.

Among these intellectual origins, the philosophies of Confucianism, Daoism, and Legalism, which are key components of ancient Chinese thought systems, have profoundly influenced traditional Chinese cultural values. Over time, these schools of thought became integral parts of Chinese cultural values.

2.2.1 Traditional Chinese Cultural Values Reflected in Confucian Thought

The Confucian school of thought was founded during the Spring and Autumn period, with Confucius (551 BCE – 479 BCE) as its founder. The core of Confucius' philosophy revolves around moral ideals such as "ren" (benevolence), "yi" (righteousness), "li" (propriety), and "zhi" (wisdom). Confucius emphasized the individual's responsibility to cultivate themselves, manage their family, govern the state, and bring peace to the world. His teachings provided future generations with a rich set of moral guidelines and social behavior standards. Confucianism gradually developed into a complete system during the Spring and Autumn and Warring States periods, with disciples like Mencius and Xunzi further expanding its scope. During the Han Dynasty, Confucian thought received strong state support, and during the reign of Emperor Wu, Confucianism was promoted as the sole dominant ideology, marking its establishment as the official state ideology of ancient China.

The values emphasized by Confucianism, such as morality, benevolence, and social order, formed one of the most influential philosophical systems in ancient China. These values deeply influenced the Chinese people's way of thinking, behavioral norms, and cultural identity. The key traditional cultural values reflected in Confucianism include:

Benevolence (Ren'ai): Benevolence is one of the core values of Confucian thought, emphasizing care, compassion, and sympathy for others. Confucians believed that everyone should possess a heart of benevolence, extending kindness to others by putting oneself in their shoes. The Confucian principle of "the benevolent love others" advocates treating everyone with kindness and fostering a sense of empathy. In social interactions, this benevolence promotes love and warmth, contributing to social harmony. Some Chinese scholars have also pointed out that Confucian "benevolence" (ren'ai) is not limited to love and compassion for people but extends to caring for the environment as well [2].

Fairness and Justice (Gongping yu Zhengyi): Confucianism teaches that each person should fulfill their roles and responsibilities according to their position, thus ensuring the proper functioning of society. Confucians believed that the pursuit of personal interests must align with moral principles and should not harm others. This spirit of fairness and justice promoted societal equity and the maintenance of social order.

Propriety (Li):The construction of the ancient Chinese state was different from that of Western states, as it was built on the foundation of familial blood relationships, using "li" (ritual propriety) as a tool for patriarchal reinforcement of family governance. Initially, "li" referred only to the rituals and ceremonies in religious worship, but due to the influence of the family-based governance in ancient China, "li" permeated all aspects of people's daily lives [3]. Confucianism holds that "li" (propriety) is a key means of maintaining social order and harmony, as well as a standard for daily behavior. Confucians required individuals to restrain their desires and impulses, consistently aligning their actions with social norms and moral standards. Proper behavior according to "li" fosters respect and ensures orderly relationships in both public and private life.

Wisdom and Knowledge (Zhihui yu Zhishi): Confucianism advocates the pursuit of wisdom, knowledge, and rational thinking as essential tools for improving personal character and conduct. Confucians encouraged continuous learning and the pursuit of truth to enhance one’s cognitive abilities and problem-solving skills. Education and wisdom were seen as vital in fostering virtuous individuals and capable leaders.

Sincerity and Integrity (Chengxin): Confucianism views sincerity and integrity as fundamental to establishing positive interpersonal relationships. Sincerity requires that people act with honesty and that their words and deeds align, avoiding falsehoods. A sincere and trustworthy attitude towards others and society fosters social cohesion and builds mutual respect.

Loyalty and Filial Piety (Zhongxiao): Confucianism considers loyalty and filial piety as the foundation of social stability and family harmony. Loyalty refers to the devotion of subjects to their rulers, while filial piety is the respect and care children owe their parents. Confucians advocated "loyalty to the state" and "filial piety to parents," viewing these as essential responsibilities and obligations toward the nation and family. Starting from the Han Dynasty, filial piety (xiao) was incorporated as a governing strategy and became the main theoretical foundation for ruling and stabilizing the country. The idea of filial piety began to infiltrate various aspects of society and political life during the Han period, establishing a system of social governance with filial piety at its core [4].

In summary, Confucian thought, with its emphasis on moral integrity, benevolence, social responsibility, and respect for hierarchical relationships, has profoundly shaped Chinese society, fostering values that continue to influence China's cultural and legal development.

2.2.2 The traditional Chinese values embodied in Taoist thought

Taoism, also known as Daoism, is a philosophical tradition rooted deeply in Chinese culture. It emphasizes harmony with nature, the pursuit of spiritual cultivation, and the cultivation of inner peace and tranquility. Taoism advocates living in accordance with the natural laws, known as the Tao, which governs the universe.

Taoism originated in ancient China, with its roots tracing back to the pre-Qin period philosophers such as Lao Tzu and Zhuangzi. However, the formal establishment of Taoism as a religious movement is attributed to Zhang Daoling in the late Eastern Han Dynasty (around 2nd century CE). Over time, Taoism developed into various sects and schools, each with its unique practices and beliefs.

Taoism played a significant role in shaping the ancient Chinese thought system and value system. It emphasized the harmony between man and nature, the importance of inner cultivation, and the pursuit of spiritual enlightenment. Taoist ideas influenced not only philosophy but also politics, art, literature, medicine, and many other aspects of Chinese culture.

The traditional Chinese cultural values embodied in Taoism are mainly as follows:

Harmony with Nature: The harmonious relationship between humans and nature can be said to be a constant pursuit of the Chinese people for thousands of years. Whether emperors, philosophers, or ordinary citizens, none have ever fundamentally positioned themselves in opposition to nature [5]. The core value of Taoism is the harmony with nature, embodied in the concept of "Tao Te Ch'ing". It advocates living in accordance with the natural laws, respecting and preserving the environment, and achieving a harmonious coexistence between humanity and nature. Some scholars have pointed out that as early as the Spring and Autumn period, Chinese environmental legislation already reflected the idea of following natural laws and achieving sustainable resource use [6].

Non-action and Spontaneous Order(wu wei) : Taoism promotes the idea of "wu wei", which means non-interference and allowing things to take their natural course. In governance, it suggests that the best way to rule is to let people govern themselves, minimizing artificial interventions and fostering a state of spontaneous order. Some scholars have pointed out that Daoist "wu wei" does not mean doing nothing, but rather avoiding unnecessary or impulsive actions, and emphasizing respect for the natural order [7].

Simplicity and Inner Cultivation: Emphasizing simplicity in lifestyle and inner cultivation, Taoism encourages people to abandon material desires, reduce ego and ambition, and cultivate a peaceful and tranquil mind. This promotes mental clarity and wisdom, enabling individuals to make sound judgments and decisions.

Morality and Ethics: Taoism places great importance on morality and ethics, viewing them as the highest standards of human behavior. It incorporates virtues such as benevolence, righteousness, propriety, wisdom, and trustworthiness, and emphasizes the importance of these qualities in maintaining social harmony and stability.

These values together constitute the core of Taoist thought, reflecting the profound insight and unique understanding of nature, society, personal cultivation and the meaning of life in traditional Chinese culture.

2.3 Chinese traditional values embodied in Legalist thought

The Legalists, a prominent school of thought during the pre-Qin period, emerged and flourished during the Warring States era (475-221 BCE) in China. Originating from the tumultuous social changes brought about by the decline of the Western Zhou Dynasty, the Legalists advocated the supremacy of law and strict enforcement as the foundation for national governance. Their ideology centered on the belief that law, rather than ritual or morality, was the most effective means of maintaining social order and promoting national prosperity.

The Legalist school arose in response to the disintegration of the feudal system and the rise of new landed aristocracy during the Spring and Autumn period (770-476 BCE). Key figures such as Guan Zhong, Li Kui, and Shang Yang laid the groundwork for the Legalist philosophy, emphasizing the need for reforms aimed at strengthening central authority and enhancing agricultural productivity. By the late Warring States period, Han Fei, a prominent Legalist thinker, consolidated and refined the school's ideas, advocating a comprehensive legal system backed by a powerful centralized monarchy.

Within the diverse intellectual landscape of ancient China, the Legalists occupied a unique and influential position. While Confucianism focused on moral cultivation and ritual, and Daoism emphasized harmony with nature and non-action, the Legalists prioritized pragmatic governance through law and order. Their ideology was instrumental in shaping the political landscape of the Qin Dynasty, which unified China under a strict legalist regime. Although Legalism later declined in official favor, its principles continued to influence Chinese legal thought and governance throughout history.

The Legalist school in ancient China embodied several key values that are fundamental to traditional Chinese culture. These values are not only reflected in the Legalists' political philosophy but also deeply ingrained in the societal mindset and moral constructs of the time. Here are the primary values:

Emphasis on Rule of Law and Order: The Legalists placed the utmost importance on the rule of law, believing that a strict and well-enforced legal system was crucial for maintaining social stability and justice. They emphasized the supremacy of law over arbitrary authority or personal preferences, a cornerstone of their political ideology.

Pragmatism and Utility: The Legalists were known for their pragmatic approach to governance, valuing practical results and efficiency over abstract moral principles. They believed that policies and reforms should be judged by their tangible benefits to society, promoting a culture of pragmatism and realism. Although they approach the issue from different perspectives, like Confucianism and Daoism, Legalism also advocates against exhausting natural resources, emphasizing that nature should continuously provide material sustenance for the state and its people [8].

Centralization of Power: The Legalists advocated for a strong, centralized monarchy as the basis for effective governance. They believed that only a powerful central authority could maintain unity, order, and security within the state, rejecting decentralized systems and promoting the concentration of power.

Promotion of Agriculture and Military Strength: The Legalists emphasized the importance of agriculture as the foundation of the nation's economy and advocated policies that encouraged agricultural production. Additionally, they placed great value on military strength, believing that a powerful military was necessary to defend the state's interests and ensure its survival.

Belief in Strict Punishment and Rewards: The Legalists were known for their belief in strict punishment for transgressions and rewards for meritorious deeds. They saw these measures as essential for enforcing discipline, deterring crime, and motivating citizens to contribute to the state's prosperity.

These values, as embodied by the Legalist school, not only shaped the political landscape of ancient China but also left a profound impact on traditional Chinese culture and societal values. They continue to resonate in contemporary Chinese society, informing debates on issues such as governance, social order, and economic development.

3 OVERVIEW OF CHINA'S RURAL REVITALIZATION LEGAL SYSTEM

The legal framework for rural revitalization in China is a multi-layered and multi-dimensional system aimed at promoting comprehensive rural development through legislative means. This framework encompasses several key laws, including but not limited to the Rural Revitalization Promotion Law, the Land Administration Law, the Urban and Rural Planning Law, the Rural Land Contract Law, the Environmental Protection Law, and the Criminal Law of the People's Republic of China. These laws provide legal safeguards at various levels to support the rural revitalization effort.

3.1 Rural Revitalization Promotion Law

The Rural Revitalization Promotion Law, enacted by the Standing Committee of the National People's Congress in 2021, outlines the overall principles, goals, and measures for implementing the rural revitalization strategy. It covers aspects such as industrial revitalization, talent revitalization, cultural revitalization, ecological revitalization, and organizational revitalization, as well as promoting urban-rural integration.The specific contents are as follows:

Industrial Development: Supports the integration of rural primary, secondary, and tertiary industries, fostering new industries, business models, and agricultural entities, bridging small farmers with modern agriculture.

Talent Support: Encourages talent development and attraction to rural areas, promoting education, training, and entrepreneurship support.

Cultural Prosperity: Enhances rural spiritual civilization, promotes ethical practices, and builds civilized villages.

Ecological Protection: Implements ecosystem protection and restoration projects, greening and beautifying rural environments.

Organizational Construction: Strengthens rural governance structures.

Urban-Rural Integration: Coordinates rural revitalization with new urbanization, optimizing industrial, infrastructural, and public service layouts.

Supportive Measures: Establishes a comprehensive agricultural support and protection system, ensuring financial investment for rural revitalization.

Supervision and Inspection: Implements a target responsibility and evaluation system for rural revitalization implementation.

In short, the "Law of the People's Republic of China on Promoting Rural Revitalization" is a fundamental and comprehensive legal framework in the "three rural" sector, underpinning stability, predictability, and long-term

development. It holds significant milestone value in fostering rural industrial revitalization, talent revitalization, cultural revitalization, ecological revitalization, organizational revitalization, and advancing integrated urban-rural development.

3.2 Land Administration Law

The "Land Administration Law of the People's Republic of China" (hereinafter referred to as the "Land Law") serves as the fundamental legal framework guiding land management and utilization in China, with provisions that significantly contribute to rural revitalization efforts. Key aspects relevant to rural revitalization include:

Protection of Rural Land and Collective Ownership: The Land Law emphasizes the socialist public ownership of land in China, which comprises both state ownership and collective ownership by working people. Rural land, except for those designated as state-owned, belongs to farmers' collectives, safeguarding their rights over land use and management. This foundation supports stable land relationships in rural areas, fostering conditions conducive to rural revitalization.

Compensation and Resettlement for Land Acquisition: When collective land is acquired for public purposes, the Land Law stipulates that timely, adequate compensation must be paid to landowners and users, including compensation for land, resettlement, and any attached structures or crops. This ensures that farmers' livelihoods are protected during land acquisitions, facilitating their participation in rural revitalization initiatives.

Support for Rural Development: The law, in conjunction with other regulations like the "Rural Revitalization Promotion Law," encourages the efficient use of land resources in rural areas. It supports policies aimed at revitalizing rural economies, such as the allocation of construction land indicators to rural development and the activation of rural land resources, thereby promoting agricultural modernization, rural tourism, and other economic activities.

Protection of Agricultural Land: The law emphasizes the strict protection of farmland, particularly permanent basic farmland, which is vital for ensuring food security and agricultural sustainability. This is crucial for rural revitalization as it safeguards the economic foundation of rural communities.

Collective Rural Business Land: Recent amendments to the law have facilitated the entry of collectively-owned rural business land into the market. This allows for more flexible land use, attracts investments, and promotes rural economic diversification, thereby boosting rural development and incomes.

Rural Homestead Management: The law regulates the management and use of rural homesteads, including their allocation, transfer, and utilization. This ensures that rural residents have secure housing rights while also promoting efficient land use and the improvement of rural living environments.

In short, the Land Administration Law regulates land use and management, emphasizing the protection of agricultural land and ensuring its sustainable use for rural development. It also addresses issues related to land ownership, use rights, and land conversion, which are crucial for promoting rural revitalization.

3.3 Urban and Rural Planning Law

The Urban and Rural Planning Law governs the formulation and implementation of urban and rural plans, ensuring that development activities in rural areas are in line with overall planning objectives and contribute to rural revitalization. It emphasizes coordination between urban and rural spaces and sustainable development.

The Urban and Rural Planning Law of the People's Republic of China, enacted and amended over the years, plays a pivotal role in facilitating rural revitalization by providing a legal framework for the coordinated development of urban and rural areas. Key provisions within the law that are particularly relevant to or supportive of rural revitalization include:

Comprehensive Planning and Coordinated Development: The law emphasizes the importance of comprehensive planning and coordinated development between urban and rural areas. It mandates that urban and rural planning should be formulated and implemented in a manner that promotes overall balance and sustainability. This approach ensures that rural areas are not neglected in the process of urbanization, but rather integrated into a holistic development strategy.

Rural Planning and Implementation: The law specifically addresses the need for rural planning, encouraging local governments to formulate and implement plans for villages and townships based on local economic and social development levels. This includes detailed planning for rural infrastructure, public services, and environmental protection, all of which are crucial for rural revitalization.

Respect for Local Characteristics and Community Involvement: The law emphasizes the need to respect local characteristics and involve communities in the planning process. For rural areas, this means incorporating traditional customs, cultural heritage, and the wishes of villagers into planning decisions. This approach fosters a sense of ownership and participation among rural residents, which is essential for the success of rural revitalization efforts.

Environmental Protection and Sustainability: The law places significant emphasis on environmental protection and sustainable development. Rural revitalization must be achieved in a manner that does not compromise the natural environment. The law requires that planning decisions take into account the protection of natural resources, historical and cultural heritage, and the prevention of pollution and other hazards.

Promotion of Infrastructure and Public Services: The law encourages the development of infrastructure and public services in rural areas, which are essential for rural revitalization. This includes improvements to roads, water supply, sanitation, education, and healthcare facilities. By providing these services, rural residents are empowered to improve their living standards and participate more fully in economic and social activities.

In summary, the Urban and Rural Planning Law of the People's Republic of China provides a solid legal foundation for promoting rural revitalization through comprehensive planning, respect for local characteristics, environmental protection, and the development of infrastructure and public services. By adhering to the principles and provisions of this law, China can achieve sustainable and inclusive growth in both urban and rural areas.

3.4 Rural Land Contracting Law

The Rural Land Contracting Law safeguards the long-term and stable contracting rights of farmers over rural land, enabling them to fully utilize and benefit from their land resources. It promotes the transfer of land contracting rights and facilitates the consolidation and efficient use of rural land, thereby supporting rural revitalization efforts.

The Rural Land Contracting Law of the People's Republic of China plays a pivotal role in promoting rural revitalization by ensuring the stability and security of land rights for farmers, thereby fostering agricultural modernization and rural economic development. Key provisions relevant to rural revitalization include:

Stabilizing and Securing Land Rights for Farmers: The Law aims to stabilize and improve the dual-tiered management system based on household contract management, granting farmers long-term and secure land use rights. This secures farmers' legitimate rights and interests in land contracting, thereby promoting agricultural, rural economic development, and social stability.

Three Rights Separation Policy: The Law implements the policy of "separating rural land ownership, contracting rights, and management rights" (known as the "three rights separation"), as outlined in the 2014 Central Document No. 1. This policy facilitates the transfer of land management rights, encouraging the development of moderate-scale farming and agricultural productivity.

Voluntary Return of Contracted Land: The Law allows farmers to voluntarily return their contracted land, including farmland, grassland, and forestland, during the contract period. This is intended to facilitate the transfer of rural surplus labor to secondary and tertiary industries and urban areas, accelerating urbanization and industrialization.

Protection of Land Contracting Rights: The Law emphasizes the protection of farmers' land contracting rights, ensuring their stability and security. This includes measures to prevent the infringement of farmers' interests during land transfers and promoting the organic integration of land and capital elements to attract urban capital into agricultural production.

Support for Agricultural Modernization: By stabilizing land contracting relationships and enabling the transfer of land management rights, the Law lays the foundation for agricultural modernization. It also encourages reforms in agricultural support and protection policies, shifting towards "green box" measures to comply with international trade rules while supporting sustainable agricultural growth.

In summary, the Rural Land Contracting Law of the People's Republic of China plays a crucial role in promoting rural revitalization by securing land rights for farmers, facilitating land transfers, and supporting agricultural modernization. These provisions aim to unlock the potential of rural economies, foster sustainable growth, and improve the livelihoods of rural populations.

3.5 Environmental Protection Law

Although not specifically targeted at rural revitalization, the Environmental Protection Law plays a vital role in ensuring that rural development activities adhere to environmental protection principles. It promotes eco-friendly practices and safeguards the natural environment, which are essential for sustainable rural revitalization.

The Environmental Protection Law of the People's Republic of China contains several key provisions that are instrumental in supporting and fostering Rural Revitalization in China. Here are the main aspects:

Environmental Protection as a Basic National Policy : The protection of the environment is a basic national policy of China, and the state adopts economic and technological policies and measures conducive to conservation and the circular use of resources, protection and improvement of the environment, and harmony between humans and nature.

Prevention and Control of Pollution: Activities related to environmental protection adhere to the principles of giving priority to protection, emphasizing prevention, integrated governance, public participation, and liability for damages.

Public Participation and Environmental Awareness: All units and individuals have the obligation to protect the environment, and citizens are encouraged to enhance their environmental protection awareness, adopt low-carbon and energy-saving lifestyles, and conscientiously fulfill their environmental protection obligations.

Support for Environmental Science and Technology: The state supports scientific and technological research, development, and application in environmental protection, encouraging the development of the environmental protection industry and promoting information technology for environmental protection.

From the aforementioned provisions, it can be seen that the Environmental Protection Law of the People's Republic of China provides a solid legal foundation and a powerful driving force for rural revitalization by establishing environmental protection as a fundamental national policy, clarifying the importance of rural environmental elements, strengthening pollution prevention and control, advocating public participation and awareness in environmental protection, and supporting innovation in environmental protection technologies. Additionally, the law's measures to prevent environmental pollution not only safeguard public health but also preserve the natural beauty and recreational value of rural areas, attracting tourism and investment, thereby promoting the process of rural revitalization.

3.6 Criminal Law

The Criminal Law, while not directly related to rural revitalization policies, provides a legal framework for punishing crimes that hinder or damage rural development, such as corruption in rural governance, illegal land conversions, and environmental pollution. By deterring such crimes, it indirectly supports the smooth implementation of rural revitalization initiatives.

The Criminal Law of the People's Republic of China contains several provisions aimed at safeguarding natural resources, which form an essential part of the country's legal framework for environmental protection. These provisions primarily reside in Chapter Six, Section Six, titled "Crimes of Damaging Environmental Resources Protection," as well as scattered throughout other relevant sections. Key Provisions and Main Contents:

Illegal Occupation of Agricultural Land (Article 342): This article was amended to include the illegal occupation of not only farmland but also forestland and other agricultural lands, with significant penalties for those who violate land management regulations, occupy such lands in large quantities, and cause substantial destruction. This amendment underscores the importance of protecting both farmland and forestland, vital for food security and ecological balance.

Crimes Related to Forestry Resources (Articles 344-345): The Criminal Law also criminalizes acts such as illegally cutting down or destroying precious trees, stealing timber, and abusing forestry permits. These provisions aim to prevent the depletion of forestry resources and maintain the ecological integrity of forests.

Environmental Pollution (Article 338): This article specifically targets those who discharge, dump, or dispose of radioactive waste, waste containing pathogens, toxic substances, or other hazardous materials in violation of national regulations, resulting in severe environmental pollution. Penalties range from imprisonment and fines to more severe punishments for aggravated offenses, including those committed in protected areas or causing significant harm to public health or agricultural land.

Therefore, the protection of natural resources, as stipulated in the Criminal Law, is intricately linked to the goals of rural revitalization in China. Rural revitalization emphasizes sustainable development, ecological conservation, and the harmonious coexistence of humans and nature. By criminalizing activities that harm natural resources, the Criminal Law serves as a deterrent, ensuring that economic development in rural areas does not come at the expense of the environment.

The preservation of farmland and forestland, for instance, is crucial for maintaining agricultural productivity and biodiversity, both of which are essential for rural economies and communities. By punishing those who illegally occupy or destroy these resources, the law promotes sustainable land use practices and safeguards the long-term viability of rural livelihoods.

Furthermore, protecting the environment from pollution not only safeguards public health but also preserves the natural beauty and recreational value of rural areas, attracting tourism and investment, thereby contributing to rural revitalization efforts.

4 THE EMBODIMENT OF TRADITIONAL CULTURAL VALUES IN THE LEGAL SYSTEM OF RURAL REVITALIZATION

4.1 The Reflection of Confucian Values in the Legal Framework of China's Rural Revitalization

The values reflected in Confucian thought, such as benevolence, justice and fairness, propriety, wisdom and knowledge, integrity, and loyalty and filial piety, are embodied in various aspects of rural revitalization laws and policies.

Articles 55 and 56 of the Rural Revitalization Promotion Law encourage social capital to develop projects that are linked to the interests of farmers in rural areas, ensuring the dominant position and income rights of farmers in the process of rural revitalization, reflecting the law's concern for farmers' welfare. The Land Management Law and the Rural Land Contracting Law also have a large number of clauses to protect farmers' land rights and interests, allowing farmers to transfer land management rights by leasing, investing, etc., increasing farmers' income, and reflecting care for farmers' survival and development. These are all manifestations of the Confucian value of "benevolence".

The Rural Revitalization Promotion Law emphasizes that in advancing rural revitalization, the legitimate rights and interests of farmers and rural collective economic organizations must be safeguarded, and their interests must not be harmed. The Environmental Protection Law stresses the importance of strictly adhering to environmental regulations during the process of rural revitalization to prevent pollution and ecological damage, ensuring fairness in resource allocation and environmental protection. These principles reflect the Confucian values of "fairness and justice."

Although laws related to rural revitalization do not directly mention the term "etiquette," they indirectly reflect respect for rural etiquette and traditions through the protection of rural culture and landscape. For example, local governments are required to strengthen the preservation of historically and culturally significant cities, towns, villages, traditional villages, and rural landscapes. Additionally, in rural governance, the government promotes civilized practices, organizes moral education classes, and fosters socialist core values and outstanding traditional culture. These efforts guide villagers to observe social ethics and family virtues, all of which fall within the realm of etiquette culture. These actions reflect Confucian values of "etiquette."

Articles 18 and 53 of the ¨Rural Revitalization Promotion Law¨ encourage the development of agricultural informatization, promoting the digitization of agricultural production and management, and enhancing the digital and intelligent level of public services in rural areas. Additionally, in the practice of rural revitalization, the government has increased investment in rural education, improved the quality of rural education, and cultivated more knowledgeable

and skilled rural talents, providing intellectual support for rural revitalization. These measures reflect China's emphasis on wisdom and knowledge, which is a manifestation of the Confucian values of "wisdom and knowledge."

Although laws related to rural revitalization do not explicitly mention the word "integrity," the principle of good faith is a fundamental principle in Chinese law. In projects where social capital is linked to the interests of farmers, in the transfer of rural land, and in the requisition and compensation of rural collective land, all parties are required to act with honesty and fulfill their contractual obligations. At the same time, in the practice of rural governance, the Chinese government has vigorously promoted the development of a culture of integrity, using credit system development and mechanisms to penalize dishonest behavior. This guides villagers to be honest individuals and conduct affairs with integrity, fostering a favorable social environment for rural revitalization. These efforts embody the Confucian value of "integrity."

Although the ¨Rural Revitalization Promotion Law¨ does not directly refer to "loyalty and filial piety," the spirit of the law emphasizes the foundational role of the family in rural society and the care for the elderly and vulnerable groups. Moreover, the government has established and improved the social security system in rural areas, providing pensions, medical insurance, and other services for the elderly, which reflects the cultural tradition of filial piety and care for the elderly. These actions embody the Confucian values of "loyalty and filial piety."

4.2 The Reflection of Daoist Values in the Legal Framework of China's Rural Revitalization

Harmony with Nature: The concept of "Tao Te Ch'ing" is reflected in various legal policies related to rural revitalization, particularly in environmental protection laws. For instance, the Environmental Protection Law of China emphasizes the protection of natural resources and ecosystems, promoting sustainable development and ecological balance in rural areas. This aligns with Taoism's advocacy of living in harmony with nature and respecting the laws of nature.

Non-action and Spontaneous Order ("wu wei"): While the direct term "wu wei" may not be explicitly stated in legal texts, the principle of minimal government intervention and fostering self-governance is embodied in policies such as the Rural Revitalization Promotion Law. This law encourages rural communities to take the initiative in their own development, promoting self-reliance and spontaneous order, in line with Taoist ideals of non-interference and allowing things to take their natural course.

Simplicity and Inner Cultivation:The promotion of simplicity and inner cultivation in Taoism is indirectly reflected in rural revitalization policies that emphasize sustainable lifestyles and cultural preservation. For example, the Rural Land Contracting Act encourages sustainable farming practices and the preservation of traditional agricultural knowledge, fostering a simpler and more harmonious way of life that resonates with Taoist values.

Morality and Ethics: The importance of morality and ethics in Taoism is reflected in rural revitalization policies that promote social harmony and ethical behavior. The Rural Revitalization Promotion Law, for instance, emphasizes the role of community leaders and role models in upholding moral standards and fostering a positive social environment. This aligns with Taoist teachings on the cultivation of virtues such as benevolence, righteousness, and trustworthiness.

Therefore, Daoist values are reflected to varying degrees in the laws and policies related to rural revitalization. Although certain concepts may not be explicitly stated, the spirit and objectives of these policies align with core Daoist principles. These policies demonstrate the application of Daoist wisdom in modern governance by promoting harmonious coexistence with nature, reducing government intervention, encouraging a simple lifestyle and moral cultivation, and focusing on sustainable development.

4.3 The embodiment of traditional Chinese cultural values rooted in Legalist thought within the rural revitalization legal system

The values emphasized by the Legalist school, such as the importance of the rule of law and order, pragmatism and utilitarianism, centralization of power, emphasis on agriculture, and strict systems of rewards and punishments, can be discerned in various legal policies and regulations related to rural revitalization in China.

Importance of the Rule of Law and Order: Rural Revitalization Promotion Law establishes a comprehensive legal framework for rural revitalization, outlining measures to promote rural economic, social, and ecological development. It emphasizes the rule of law in addressing issues related to land management, resource allocation, and environmental protection, ensuring that rural areas are governed by clear and enforceable laws. Land Administration Law and Rural Land Contracting Law govern land use and ownership in rural areas, ensuring that land rights are protected and disputes are resolved through legal channels. They reinforce the principle of law and order by providing clear guidelines for land allocation, leasing, and contracting, thereby reducing conflicts and fostering stability.

Pragmatism and Utilitarianism: Rural Revitalization Promotion Law is designed to be practical and effective, focusing on concrete measures that can directly benefit rural residents and enhance their quality of life. It prioritizes initiatives that are economically feasible, socially acceptable, and environmentally sustainable, reflecting a pragmatic approach to rural development. Environmental Protection Law and Related Regulations emphasize the need for practical solutions to environmental challenges in rural areas, promoting sustainable development practices that balance economic growth with environmental conservation. They encourage the adoption of cost-effective and efficient technologies and policies to address pollution, resource depletion, and other environmental issues.

Centralization of Power: While Rural Revitalization Promotion Law promotes decentralization and community participation in rural development, it also emphasizes the role of the central and local governments in setting policies, allocating resources, and overseeing implementation. This centralized approach ensures that rural revitalization efforts are coordinated and directed towards achieving national goals and priorities.
Emphasis on Agriculture: Rural Revitalization Promotion Law prioritizes the development of modern agriculture, encouraging technological innovation, land consolidation, and improved agricultural practices. It also supports agricultural cooperatives and other forms of collective economic organizations to enhance agricultural productivity and rural incomes. Various government policies and subsidies aimed at promoting agricultural development, such as providing incentives for farmers to adopt new technologies, improving irrigation systems, and supporting rural infrastructure projects, demonstrate the importance placed on agriculture in rural revitalization efforts.
Strict Systems of Rewards and Punishments: Rural Revitalization Promotion Law and Related Regulations often include provisions for incentives and rewards for individuals, organizations, and communities that excel in rural revitalization efforts. At the same time, they establish clear penalties for violations of laws and regulations, such as illegal land use, environmental degradation, and corruption.
In summary, the values of the Legalist school can be seen in various legal policies and regulations related to rural revitalization in China, particularly in the areas of rule of law, pragmatism, centralization of power, emphasis on agriculture, and strict systems of rewards and punishments. These values provide a guiding framework for ensuring that rural revitalization efforts are effective, just, and sustainable.

5 THE INFLUENCE OF TRADITIONAL CHINESE CULTURAL VALUES ON THE FORMULATION AND IMPLEMENTATION OF CURRENT RURAL REVITALIZATION LAWS IN CHINA

The traditional Chinese cultural values have exerted a profound influence on the formulation and implementation of China's current rural revitalization related laws. This influence is primarily reflected in several aspects.
Firstly, the harmonious coexistence and respect for nature emphasized in traditional Chinese culture provide valuable guidance for rural revitalization laws. This philosophy promotes a focus on the harmonious development of man with nature and the environment in legal formulation, aiming to achieve sustainable and green development goals. For instance, environmental protection regulations reflect the traditional emphasis on preserving nature.
Secondly, the community awareness, collective interest orientation, and family values in traditional Chinese culture are also reflected in relevant laws for rural revitalization. These values inform a greater emphasis on village community building and development, encouraging villagers' self-governance and participation, fostering harmonious and stable rural societies. Meanwhile, they also manifest the protection of farmers' rights and interests and the value of fair distribution, ensuring that farmers can fairly share in the fruits of development during rural revitalization.
Furthermore, the profound foundation of agricultural civilization and the tradition of emphasizing practical labor and experience accumulation in traditional Chinese culture have provided abundant ideological resources for the formulation of provisions related to agricultural production and farmers' lives in rural revitalization laws. This culture emphasizes the significance of agricultural production, respects the labor achievements of farmers, and encourages them to improve living conditions through diligent work. Consequently, in rural revitalization laws, we observe support for agricultural technological innovation, encouragement for the development of farmer cooperatives, and emphasis on the protection of farmers' rights and interests, all of which reflect the affirmation of the value of farmers' labor and the importance attached to the sustainable development of agricultural production.
Overall, traditional Chinese cultural values have played a significant role in the formulation and implementation of China's current rural revitalization related laws. This influence is not only reflected in the value orientation and goal setting of these laws but also permeates through their specific content and implementation methods. By incorporating traditional cultural elements, rural revitalization laws are more closely aligned with rural realities, making them easier for farmers to accept and understand, thereby effectively promoting the smooth progress of rural revitalization work.

6 SUGGESTION

To further harness the positive effects of traditional Chinese cultural values and promote their integration with the rural legal, moral, and autonomous governance systems, thereby achieving comprehensive revitalization of rural societies, we can delve into the following strategies:
Firstly, promote cultural education and awareness programs. Regular training and workshops for rural residents, leaders, and legal practitioners on traditional virtues and their relevance to contemporary rural development can strengthen the moral foundation of society. Such initiatives can inspire self-governance by encouraging villagers to resolve disputes amicably and maintain social order based on shared values.
Secondly, foster collaborative governance models. By establishing platforms that bring together government officials, village elders, and community leaders, we can develop decision-making processes that blend the formal legal system with informal, culturally rooted dispute resolution mechanisms. This promotes a hybrid governance model that is both legally sound and culturally sensitive.
Thirdly, leverage traditional cultural practices for sustainable development. Encouraging rural communities to adopt eco-friendly agricultural practices rooted in their cultural heritage, for instance, can contribute to both environmental

conservation and economic prosperity. Similarly, preserving and promoting local arts, crafts, and festivals can attract tourism, enhancing rural economies while preserving cultural identity.

7 CONCLUSION

Law is merely a special cultural phenomenon, and its creation, interpretation, and application are inseparable from culture. Law cannot develop independently of culture. Without the context of cultural traditions, the formulation, interpretation, and application of legal norms would be like a tree without roots or water without a source [9]. Through the introduction of China's rural revitalization legal system, traditional Chinese cultural values, and the role these values play within the legal framework of rural revitalization, we can see that traditional cultural values have played a crucial supporting role in China's rural revitalization strategy. Chinese traditional legal culture is a cultural system that is very different from Western legal culture. This cultural system is based on a natural environment and social life that are different from those in the West, and has a different conceptual foundation and composition [10]. Whether it is possible to promote the integration of Marxist legal theory with China's outstanding traditional culture, based on the practical foundation of Chinese-style legal modernization, directly determines the success of China's legal modernization [11]. Therefore, the formulation and implementation of Chinese laws cannot mechanically copy Western legal ideas and theories. Through the analysis and discussion in this paper, we hope that China's experience with rural revitalization can offer valuable insights and lessons for rural revitalization and the integration of culture and law on a global scale.

COMPETING INTERESTS

The author has no relevant financial or non-financial interests to disclose.

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RESEARCH ON THE RELATIONSHIP BETWEEN INTELLECTUAL CAPITAL, SUPPLY CHAIN KNOWLEDGE SHARING AND ENTERPRISE INNOVATION ABILITY

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Abstract: Taking supply chain knowledge sharing as the intermediate variable, this paper constructs a conceptual model of intellectual capital's influence on enterprise innovation ability and explores its mechanism. Based on 288 questionnaires and structural equation models, the theoretical hypotheses are tested. The results show that: Three dimensions of intellectual capital, namely human capital, relational capital and structural capital, have a direct impact on knowledge sharing in supply chain and firm innovation ability. Knowledge sharing in supply chain plays an intermediary role in the impact of intellectual capital on firm innovation ability. Finally, on this basis, this paper gives some suggestions on how enterprises in the supply chain should promote their innovation ability through intellectual capital and knowledge sharing.
Keywords: Intellectual capital; Supply chain knowledge sharing; Innovation ability; Relationship research

1 INTRODUCTION

The innovation ability of enterprises directly drives the development of enterprises, regions and even the whole country at all levels. Economic growth is based on strong innovation ability. It is pointed out in the report of the 20th National Congress that adhering to innovation holds the core position in the overall situation of China's modernization drive. Faced with the increasing complexity and variability of the market environment, enterprises can only maintain their competitiveness by maintaining sufficient innovation. How to improve the innovation ability of enterprises has become an important issue for the survival and development of enterprises. With the coming of the era of knowledge economy, the improvement of intellectual capital and knowledge sharing among supply chain enterprises are the key to improve the innovation ability of enterprises. Intellectual capital with knowledge as the core has become an important strategic resource for enterprises to create value, and is the key factor for enterprises to obtain performance and competitive advantage. The improvement of organizational intellectual capital can make it stand out in the increasingly competitive market environment. Knowledge is an extremely important intangible asset of an enterprise. An enterprise has a wealth of knowledge and can constantly update and expand it, which has become a necessary condition for its foothold and development in the market competition. The core of innovation is the process of an enterprise constantly realizing knowledge accumulation. Supply chain knowledge sharing has a significant role in promoting the innovation ability of enterprises. From the perspective of knowledge management, the essence of enterprise innovation is knowledge innovation, and the smooth progress of innovation activities is essentially determined by the existing knowledge stock of enterprises. Only the efficient integration, utilization, absorption and creation of knowledge required for innovation can drive the opening of innovation activities. Therefore, it is of great theoretical and practical significance to explore the mechanism of intellectual capital and supply chain knowledge sharing on enterprise innovation ability and grasp the relationship among them for improving the innovation ability of nodal enterprises in the supply chain.

More and more enterprises begin to pay attention to the role of intellectual capital, and realize that intellectual capital has surpassed the importance of production capital and financial capital to some extent[1]. The knowledge acquisition of an organization depends on a certain intellectual capital, so the improvement of intellectual capital is particularly important for enterprises. Based on the characteristics of knowledge creativity, Ghosha et al. empirically-studied the impact of intellectual capital on knowledge sharing among enterprises, and found that the flexibility of organizational structure and the richness of network relations can promote knowledge sharing and innovation among enterprises[2].

By investigating the American medical equipment industry, Cheng et al. found that intellectual capital can promote enterprise innovation to a certain extent, but the correlation between them is not high[3]. Craighead et al. found through their research that organizational intellectual capital has a high degree of correlation with knowledge sharing, and the boundary between the two is fuzzy[4]. Knowledge enrichment guarantees the excellent performance of the supply chain, and the development degree of knowledge and intellectual capital level of the enterprise in the supply chain play a decisive role in the overall performance of the supply chain.

Enterprise innovation requires constant absorption of new knowledge, so only through the flow and sharing of knowledge can it exert its maximum utility and value. Knowledge sharing in supply chain belongs to the complex knowledge transfer process between organizations. Whether knowledge can flow smoothly in the supply chain plays a crucial role in promoting the improvement of organizational innovation ability. Almost all business activities of enterprises have to go through the process from knowledge acquisition, absorption, and then innovation[5]. Knowledge sharing in supply chain has become an important way for enterprises to obtain knowledge from outside. Through knowledge sharing activities, knowledge can flow among nodal enterprises in supply chain, connect knowledge islands

of member enterprises, optimize the allocation of knowledge resources, and promote the improvement of the overall competitiveness of supply chain[6]. Knowledge sharing can be divided into explicit knowledge sharing and invisible knowledge sharing. Explicit knowledge sharing can help enterprises obtain the technical rules and principles required for innovation, while invisible knowledge sharing can help enterprises obtain the technical know-how and professional experience required for innovation[7]. Hadaya believes that knowledge sharing among nodal enterprises in the supply chain can effectively reduce the learning time of repetitive knowledge, and play a significant role in speeding up the research and development process of new products and reducing research and development costs[8].

It can be seen that the research on the relationship between intellectual capital, supply chain knowledge sharing and enterprise innovation ability has become a hot topic of academic research at home and abroad, but there are still some problems worthy of further detailed research. For example, as an important intangible asset for enterprises to maintain competitive advantages, can organizational intellectual capital promote the improvement of enterprises' innovation ability? Supply chain knowledge sharing is an important channel for organizations to acquire external knowledge, can the improvement of intellectual capital promote the flow of knowledge in the supply chain? Whether intellectual capital indirectly affects the innovation ability of enterprises through the mediating role of knowledge sharing in supply chain? Through the above analysis, this paper mainly solves three research problems: first, build the relationship model among intellectual capital, supply chain knowledge sharing and enterprise innovation ability; Second, verify the relationship model between intellectual capital, supply chain knowledge sharing and enterprise innovation ability with the data obtained from the questionnaire; Third; Explore the mechanism of intellectual capital and supply chain knowledge sharing on enterprise innovation ability.

2 THEORETICAL REVIEW AND HYPOTHESIS

American economist John Kenneth Calbraith put forward the concept of intellectual capital for the first time in the 1960s. The reason for its emergence is that enterprises have explained the difference between market value and book value only by tangible assets. Therefore, intellectual capital is the sum of "intangible assets" owned by an enterprise, which can reflect the enterprise goal, reflect the enterprise competitive advantage and create the enterprise value. There are different ways to classify intellectual capital. Stewart et al. classified intellectual capital into three dimensions: Human capital, structural capital and relational capital, this classification method has been recognized by most scholars. This paper will also be based on this classification method, that is, intellectual capital includes human capital, relational capital and structural capital. Knowledge sharing in supply chain refers to the knowledge exchange among the supply chain member enterprises. It is the process of knowledge transfer from a single organization to multiple organizations. This process includes knowledge transfer, absorption, integration and application in the supply chain, which can improve the knowledge stock and quality of enterprises in the chain and build the knowledge advantage of the supply chain. The research of this paper will follow the above division of intellectual capital dimensions and the definition of supply chain knowledge sharing concept.

2.1 Relationship between Intellectual Capital and Knowledge Sharing in Supply Chain

Human capital generally refers to the knowledge or skills mastered by enterprise employees, including employees' educational background, work experience, business level and innovation ability. The prerequisite for efficient knowledge sharing among organizations is the ability, willingness and opportunity to share knowledge, which are closely related to the human capital within the organization. The process of knowledge sharing in supply chain cannot be completed without the cooperation of employees through their own knowledge, skills and experience. Therefore, Bontis et al. believe that human capital is an important asset for knowledge sharing among enterprises[9]. The improvement of human capital can lay a solid foundation for knowledge sharing among enterprises. The complexity of knowledge affects the effect of knowledge sharing, and the more complex the knowledge, the more difficult and costly the knowledge sharing will be. Hoopes and Zhang Zhenhong et al believe that the education level and work experience in human capital play a positive role in knowledge sharing among enterprises[10-11]. Liu and Chanvarasuth believe that employees' strong knowledge learning and absorption ability is conducive to promoting knowledge sharing among enterprises in the supply chain. [12-13] Hong et al proposed that the amount of professional knowledge of employees would affect their knowledge integration ability. The more professional knowledge of employees, the easier it is for enterprises to obtain knowledge from the outside, that is, the higher the efficiency of knowledge exchange between enterprises and the outside[14].

Relational capital refers to the interpersonal relationships formed by people's interaction and development over a period of time, such as trust, friendship, social support and recognition[15]. If an enterprise cannot establish good communication and exchanges with nodal enterprises in the supply chain, it is bound to be difficult to obtain effective knowledge shared by other enterprises. As a result, the internal knowledge of the enterprise cannot be updated in time, the competitive advantage of the enterprise is gradually lost, and the enterprise is abandoned by the supply chain. Trust among members of supply chain enterprises is an important embodiment of relational capital, and effective knowledge sharing in supply chain needs to be based on certain mutual trust. Lane believes that a good social interaction between enterprises is conducive to increasing the depth, breadth and effectiveness of the external knowledge acquired by enterprises[16]. Yeh and Cummings et al believe that long-term, stable and close cooperation relationship and effective communication can enable enterprises to obtain more effective knowledge and information resources[17-18]. Moreover,

a good relationship between enterprises can reduce the tendency of enterprises to protect knowledge in knowledge transfer to a certain extent, thus further improving the efficiency of knowledge sharing. It can be said that the higher the level of trust between enterprises, the higher the desire to cooperate with other enterprises, so that they are more willing to share knowledge with enterprises[19]. In addition, trust also helps reduce the psychological prevention in knowledge transfer and opportunism in enterprise cooperation. Kim believes that a long-term and stable cooperative relationship is the prerequisite for knowledge sharing among enterprises in the supply chain, and the attitude and behavior of nodal enterprises in the supply chain towards knowledge sharing determines whether knowledge can be exchanged from within enterprises to be shared outside enterprises [20].

The structural capital of an enterprise includes many factors such as organizational strategy, organizational culture, organizational structure, management system and information technology platform. For example, An Xiaofeng et al. found that media is very important for cross-enterprise knowledge sharing, and the establishment of sharing platform can provide technical support for knowledge sharing among supply chain enterprises[21]. Zhang Xumei, Feng Changli et al. believe that the unity between platforms will also affect the effect and cost of knowledge sharing among enterprises in the supply chain[22-23] . Similarly, the construction of information management system plays a positive role in promoting inter-organizational learning. Wang points out that a standardized organizational culture will promote knowledge sharing behavior, and an enterprise's internal culture will usually affect its external behavior. Enterprises with conservative culture tend to have low trust in other members of the supply chain, which will lead to the failure of knowledge transmission among enterprises in the supply chain nodes to improve the overall competitiveness of the supply chain[24]. In addition, the improvement of cooperation, supervision and incentive mechanism as well as the choice of communication channels can also promote knowledge sharing among enterprises in the supply chain. Based on the above analysis, this paper puts forward the following hypothesis:

H1a: Human capital has a positive impact on knowledge sharing in supply chain.

H1b: Relational capital has a positive and positive impact on knowledge sharing in supply chain.

H1c: Structural capital has a positive and positive impact on knowledge sharing in supply chain.

2.2 The Relationship between Intellectual Capital and Enterprise Innovation Ability

Human capital is the most difficult resource to be imitated by other enterprises, so human capital is the unique competitive advantage of enterprises. Lutz found through the investigation of German manufacturing enterprises that the educational background, work experience and work skills of employees directly determine the level of innovation performance of enterprises[25]. The more employees with high technical level of enterprises, the higher the number of employees, the higher the level of innovation performance of enterprises. The more employees, the higher the enthusiasm of the enterprise to carry out product innovation. Because human capital has the characteristics of creativity, skill and professionalism, it has become an important source of new ideas and new knowledge for organizations[26]. Galunic put forward that the realization of technological innovation needs the support of abundant human capital, which includes the knowledge level, skills and abilities of employees. Relationship capital mainly refers to the relationship of mutual trust and trust established between enterprises during long-term cooperation[27]. Wong et al. concluded that if an enterprise maintains a good relationship capital with its supply chain partners, the partners will take the initiative to improve product quality, thus promoting product innovation[28]. Through a survey of high-tech enterprises, Yli-Renko found that relationship capital can help enterprises obtain the desired external knowledge from key customers and promote enterprise innovation. Stable supplier partnership is conducive to improving the utilization rate of resources and promoting the innovation of production technology[29]. Good relationship capital can also promote the improvement of suppliers' innovation performance[30-31]. Good structural capital can realize the optimal allocation of enterprise resources through the coordination of corporate strategy, corporate culture and organizational structure, and promote the improvement of enterprise technological innovation and economic benefits[32]. Filieritakes Irish pharmaceutical enterprises as the research object, and finds that structural capital will positively promote the transfer and transformation of enterprise knowledge, thus promoting the development of enterprise innovation activities[33] . The leadership style in structural capital will also have an impact on the innovation ability of enterprises. Anderson found that inclusive leadership helps organizations maintain certain flexibility and stability, improve the operational efficiency of organizations, promote the reform of management methods and the optimization of organizational processes, and promote the innovation of enterprises[34].

Therefore, the intellectual capital of an enterprise has a positive correlation with the innovation ability of an enterprise, so the following hypothesis is proposed:

H2a: Human capital has a positive effect on firm innovation ability.

H2b: Relationship capital has a positive and positive impact on firm innovation capability.

H2c: Structural capital has a positive and positive impact on enterprise innovation ability.

2.3 Relationship between Supply Chain Knowledge Sharing and Enterprise Innovation Capability

Knowledge is an important resource for enterprises to develop and maintain competitive advantage. The key for enterprises to realize innovation lies in continuous acquisition and successful application of knowledge, and knowledge sharing enables enterprises to continuously acquire knowledge from outside enterprises, so that more resources can be invested in innovation. Jaff believes that innovation requires the process of knowledge learning and accumulation, and

the transfer of knowledge between enterprises is exactly in line with this feature. Therefore, the basis of innovation is the accumulation of knowledge in time[35]. Heide pointed out that an enterprise cannot possess all the knowledge needed for innovation, so it needs to continuously absorb and acquire knowledge from the outside of the enterprise to meet the needs of innovation activities. Knowledge sharing can help reduce R&D costs and improve the speed of product innovation[36]. Zhou and Subramaniam et al. found that timely exchange of knowledge and information between enterprises in the supply chain and their upstream and downstream enterprises is conducive to acquiring external knowledge and integrating it with the existing knowledge structure, thus improving the innovation capability of enterprises[37-38]. Only through knowledge sharing can static knowledge staying in various organizations flow dynamically between organizations, which is more conducive to knowledge integration and utilization and organizational innovation. Facts have proved that those enterprises with strong innovation ability are often the ones that can quickly absorb and utilize the external knowledge for innovation. Tsai's research found that knowledge sharing and transfer among organizations won more learning and cooperation opportunities for organization members, which helped organizations create new knowledge and enhance innovation ability[39]. In conclusion, knowledge sharing among enterprises in the supply chain can effectively promote the integration of external knowledge resources between enterprises and upstream and downstream enterprises in the supply chain, stimulate the inspiration of knowledge innovation of enterprises, and thus enhance the innovation ability of enterprises.

Therefore, the following hypotheses are proposed in this paper:

H3: Supply chain knowledge sharing has a positive impact on the innovation ability of enterprises.

2.4 The Mediating Effect of Knowledge Sharing in Supply Chain

For a long time, scholars have paid much attention to the direct effect of intellectual capital on enterprise innovation ability, but the mediating effect of knowledge sharing in supply chain between intellectual capital and enterprise innovation ability has not been paid enough attention. In fact, according to the above analysis, the improvement of organizational intellectual capital can promote knowledge sharing among enterprises in the supply chain, and knowledge sharing can promote the improvement of enterprises' innovation ability. Therefore, it can be inferred that intellectual capital can indirectly affect enterprises' innovation ability through knowledge sharing in the supply chain.

Studies have shown that inter-organizational learning ability plays an intermediary role in the effect of intellectual capital on the innovation performance of enterprises[40]. Moreover, the three dimensions of intellectual capital will also affect the innovation of an organization through knowledge management. Enterprises can realize knowledge innovation and shorten the innovation cycle by attaching importance to the investment of human capital, such as strengthening employees' learning and absorbing ability to the heterogeneous knowledge outside the organization. Meagher et al. found that close cooperative relationship in enterprise alliance is conducive to the occurrence of knowledge spillover effect, and promotes the knowledge absorption and innovation success of enterprises[41]. Baum et al. concluded that in the cooperation between enterprises, with the increase of the frequency of contacts between enterprises, that is, the improvement of relationship capital will significantly enhance the effect of knowledge sharing among enterprises, which will indirectly have a positive impact on the knowledge integration and innovation of enterprises, and improve the core competence of enterprises[42]. Mueller et al. found that a reasonable organizational culture can stimulate employees' creativity and passion for work, and make employees more willing to participate in knowledge sharing and innovation activities, thus improving organizational innovation performance[43].

Based on the above analysis, this paper holds that the improvement of intellectual capital within an organization can accelerate the flow of knowledge among enterprises in the supply chain, that is, promote knowledge sharing in the supply chain. At the same time, the strengthening of knowledge sharing among enterprises in the supply chain is also conducive to the continuous accumulation of knowledge needed for innovation, which has a positive impact on the improvement of innovation ability of enterprises. Therefore, the following hypothesis is proposed:

H4a: Knowledge sharing in supply chain plays an intermediary role between human capital and firm innovation ability.

H4b: Knowledge sharing in supply chain plays an intermediary role between structural capital and firm innovation capability.

H4c: Knowledge sharing in supply chain plays an intermediary role between relational capital and firm innovation capability.

Through the above analysis, we find that the three dimensions of intellectual capital, namely human capital, structural capital and relational capital, directly affect the innovation ability of enterprises. Moreover, the improvement of intellectual capital can effectively promote the knowledge sharing between upstream and downstream enterprises in the supply chain, and then through the flow of knowledge in the supply chain, improve the innovation ability of enterprises in the chain and promote the cooperation and win-win situation among enterprises in the supply chain. Therefore, according to the above logical relationship, this paper constructs the relationship model as shown in Figure 1, in which human capital, structural capital and relationship capital in intellectual capital are the dependent variables, knowledge sharing in supply chain is the intermediary variable, and enterprise innovation ability is the dependent variable.

Human capital, structural capital and relational capital are the dependent variables, knowledge sharing in supply chain is the intermediary variable, and innovation ability of enterprises is the dependent variable.

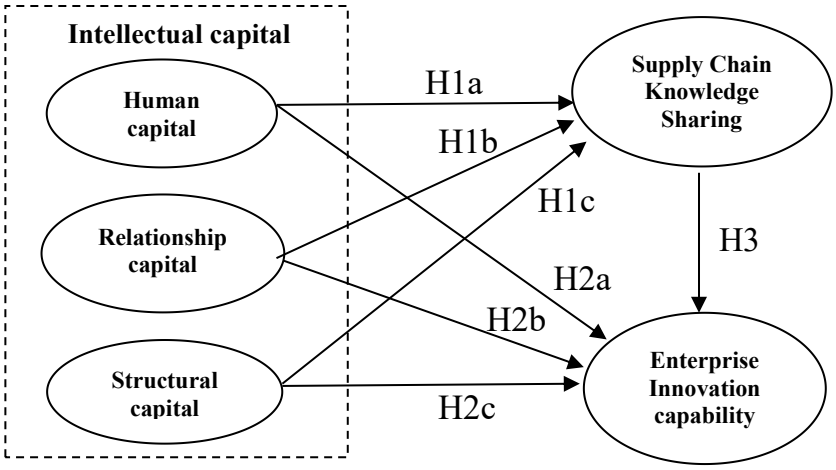

Figure 1: The Relationship Model between Intellectual Capital, Supply Chain Knowledge Sharing, and Enterprise Innovation Capability

3 DATA COLLECTION AND QUESTIONNAIRE DESIGN

3.1 Data Collection

In this study, part of the sample enterprises were randomly selected from the high-tech development zones in Yunnan, Guangdong and Anhui provinces, and the investigation was mainly conducted by telephone, E-mail, mail and door-to-door visits. A total of 500 questionnaires were sent out and 365 questionnaires were collected, accounting for 73% of the total. And 288 valid questionnaires, 78.9% of which were valid. The industries involved in the samples mainly included IT industry, new material industry, biomedicine industry, energy saving and environmental protection industry, electronic and electrical equipment industry and other industries. In order to ensure that the data obtained by the survey can truly reflect the actual situation of the enterprise, the respondents of this questionnaire are the business supervisor or department manager or above of the enterprise.

3.2 Questionnaire Design

The questionnaire measurement items in this study used a five-level Likert scale, with scores from 1 to 5 indicating "strongly disagree", "disagree", "uncertain", "agree" and "strongly agree". In order to ensure the reliability and validity of the model scale, the scales in this paper are selected from and refer to the mature scales in domestic and foreign literatures, and the scales are only adjusted appropriately according to the needs of actual research. Human capital mainly refers to the research of Youndt and Han et al., which includes five items[44-45]: Enterprise employees have received good education; Enterprise employees have rich working experience; The employees of the company have received good training; Employees are experts in their specific jobs and functions; Employees are constantly developing new knowledge and ideas. The relationship capital mainly refers to the research of Lv Feibao and Yang, including five items[46-47]: enterprises trust supply chain partners very much; Supply chain partners will try their best to help enterprises when they encounter difficulties; Supply chain partners will consider each other's interests when they act; Supply chain partners will not divulge each other's secrets; Reciprocity often occurs between companies and supply chain partners. Structural capital mainly refers to the research of Wang and Kamukama, which includes five questions[48-49]: the organizational structure of an enterprise is reasonable; The enterprise's overall business process is very efficient; The culture and atmosphere of the company is very flexible and comfortable; The company has easy access to information systems; The company's systems and processes support the development of R&D and innovation activities; The supply chain knowledge sharing mainly refers to the research of Feng Changli, which has 6 items[50]: enterprises and supply chain partners exchange a lot of knowledge related to product technology; Enterprises and supply chain partners to exchange a lot of knowledge related to production processes; Enterprises and supply chain partners to exchange a lot of management experience; Companies share a lot of marketing knowledge with supply chain partners; Companies and supply chain partners to exchange a lot of information about the latest development of the industry; Companies and supply chain partners share a lot of other aspects of knowledge needed by each other; The innovation ability of enterprises mainly refers to Song Zhihong's research, which has five items[51]: enterprises can launch new products or services faster than competitors; Enterprises can open up new markets faster than competitors; A firm can better control the source of supply of raw materials or semi-finished products than its competitors. They pay more attention to research and development than their competitors.

4 Research results

4.1 Reliability and Validity Analysis

After analyzing the questionnaire data with SPSS19.0, it was found that Cronbach's α value of each latent variable item was greater than 0.7, so the questionnaire had good reliability. At the same time, the measurement items used in this study were all selected from the mature research results of previous studies, so they had good content validity. KMO and Barttle sphere tests were performed on the collected sample data, and it was found that the overall KMO value of the model was 0.927, and the significance probability was 0.000 < 0.001, indicating that the data was suitable for factor analysis. Most of the factor load coefficients of the latent variables of the whole scale are above 0.7, the average variance extraction values AVE among latent variables are all greater than 0.5, and the square root of AVE is greater than the absolute value of Pearson correlation coefficients among latent variables. Therefore, it can be judged that all variables have good discriminant validity and are suitable for structural equation model analysis. The specific analysis results are shown in Table 1 and Table 2.

Table 1: Descriptive Statistics, Pearson Correlation Coefficient, and AVE Values

Latent Variables	Item	Standard factor load	Cronbach's alpha	Composite reliability	AVE
Human Capital (HC)	HC1	0.735	0.874	0.889	0.617
	HC2	0.746	0.871		
	HC3	0.805	0.861		
	HC4	0.827	0.854		
	HC5	0.809	0.859		
Relational capital (RC)	RC1	0.808	0.827	0.867	0.567
	RC2	0.763	0.836		
	RC3	0.728	0.844		
	RC4	0.739	0.843		
	RC5	0.725	0.844		
Structural capital (SC)	SC1	0.754	0.834	0.866	0.563
	SC2	0.744	0.839		
	SC3	0.727	0.841		
	SC4	0.755	0.837		
	SC5	0.77	0.835		
Supply Chain Knowledge Sharing (KS)	KS1	0.795	0.864	0.891	0.578
	KS2	0.732	0.875		
	KS3	0.83	0.860		
	KS4	0.736	0.875		
	KS5	0.739	0.873		
	KS6	0.723	0.877		
Enterprise Innovation capability(IA)	IA1	0.804	0.836	0.873	0.579
	IA2	0.732	0.851		
	IA3	0.764	0.844		
	IA4	0.759	0.847		
	IA5	0.742	0.849		

Table 2: Descriptive Statistics, Pearson Correlation Coefficient, and AVE Values

Research variables	M	SD	1	2	3	4	5
Human capital	3.0972	1.17429	0.785				
Relationship capital	2.6014	1.08625	0.255**	0.753			
structural capital	3.0931	1.09530	0.258**	0.349**	0.750		
Supply Chain Knowledge sharing	3.2037	1.11815	0.436**	0.393**	0.491 **	0.760	
Enterprise innovation ability	3.5514	1.00805	0.483 **	0.507**	0.517 **	0.541 **	0.761

Note: The square root of AVE on the diagonal and the correlation coefficient of each latent variable below the diagonal, ** indicates a significant correlation at the 0.01 level (bilateral)

4.2 Model Fitting Analysis

In this paper, AMOS 22.0 software was used to build a structural equation model, and the relevant hypotheses were empiratically tested and the main fitting indexes of the model were analyzed, as shown in Table 3. It can be seen that the

fitting index values are less than 3, GFI, AGFI, CFI are all greater than 0.9, RMSEA is less than 0.05, and all fitting index values are analyzed within a reasonable range. χ^2/df It indicates that the overall fitting degree of the model is good.

Table 3: Model Fitting Index

Indicators	χ^2/df	GFI	AGFI	NFI	CFI	RMSEA
Model values	1.167	0.920	0.903	0.920	0.988	0.024

4.3 Hypothesis testing and Path Analysis

The path analysis results of the model are shown in Table 4. The analysis results of the structural equation model show that all the ten hypotheses proposed in this paper pass the test. Among the direct influences of intellectual capital on supply chain knowledge sharing, structural capital has the largest influence on supply chain knowledge sharing path coefficient, followed by human capital, and relational capital has the least influence on supply chain knowledge sharing. Among the three dimensions of intellectual capital, relational capital has the largest path coefficient, followed by structural capital, and human capital has the smallest.

Table 5: Shows the Path Coefficient of the Modely

Assumptions	Paths	Coefficient	T-value	P	Hypothesis test result
H1a	Human Capital → Supply Chain knowledge sharing	0.340	5.126	***	Acceptance
H1b	Relationship Capital → Supply chain knowledge sharing	0.235	3.190	**	Acceptance
H1c	Structural Capital → Supply chain knowledge sharing	0.425	5.876	***	Acceptance
H2a	Human Capital → Enterprise innovation capability	0.273	4.797	***	Acceptance
H2b	Relationship capital → Corporate innovation capability	0.304	4.858	***	Acceptance
H2c	Structural capital → Corporate innovation capability	0.284	4.524	***	Acceptance

Note: *** means p < 0.001, ** means p < 0.01, and * means p < 0.05

The total influence coefficient of intellectual capital on enterprise innovation ability is shown in Table 5. The analysis shows that among the three dimensions of intellectual capital's influence on enterprise innovation ability, structural capital has the largest influence on enterprise innovation ability, followed by relational capital, and finally human capital.

Table 5: The Total Influence Coefficient of Intellectual Capital on Enterprise Innovation Ability

Paths	Direct impact	Indirect effects	Total effect
Human capital → Enterprise innovation ability	0.273	0.056	0.329
Relational capital → Enterprise innovation ability	0.304	0.036	0.340
Structural capital → Enterprise innovation ability	0.284	0.070	0.354

5 CONCLUSIONS AND SUGGESTIONS

5.1 Research Conclusion

Based on the intellectual capital theory, supply chain knowledge sharing theory and enterprise innovation ability theory, this paper constructs relevant research models and corresponding measurement scales from the perspective of knowledge interaction among enterprises in the supply chain and according to the research framework of "intellectual capital -- supply chain knowledge sharing -- enterprise innovation ability". Using 288 questionnaire data of supply

chain enterprises as samples, the structural equation model method is used to conduct hypothetical tests, and the influence of three dimensions of intellectual capital, human capital, relationship capital and structural capital on supply chain knowledge sharing and enterprise innovation ability is discussed, respectively. And the influence of these three dimensions on firms' innovation ability under the adjustment of the intermediary variable of knowledge sharing in supply chain. The results show that human capital, relational capital and structural capital in intellectual capital have significant positive effects on knowledge sharing in supply chain and firm innovation ability. Knowledge sharing in supply chain also has a significant positive impact on firms' innovation ability, and knowledge sharing in supply chain plays an important intermediary role between intellectual capital and firms' innovation ability.

5.2 Countermeasures and Suggestions

First, we should pay more attention to the promotion of enterprise intellectual capital. Through the research of this paper, it is found that the improvement of intellectual capital of the member enterprises in the supply chain is very beneficial to promote the knowledge sharing among the supply chain enterprises and the innovation ability of the member enterprises. Enterprises should strengthen intellectual capital from three aspects: human capital, relational capital and structural capital. In terms of human capital, enterprises should adapt to the changes of The Times, transform the former human resource concept into the current human capital concept, attach importance to the concept of human capital, and make human capital play a repeated role in the supply chain knowledge sharing and the improvement of enterprise innovation ability. Specifically, human capital can be improved by improving the education level of employees, paying attention to on-the-job training of employees, strengthening their competency and experience on the post, and cultivating their innovation consciousness. In terms of relationship capital, enterprises should establish mutual trust, respect and coordination interest relationship with suppliers, manufacturers, distributors and customers in the supply chain network in the long-term cooperation and exchanges, and form the unique relationship capital of supply chain enterprises, so as to bring advantages for knowledge sharing and enterprise innovation among enterprises. Specifically, the relationship capital with the supply chain partner enterprises can be maintained by strengthening mutual trust, taking the interests of the other side into consideration when acting, and reciprocal behavior. In terms of structural capital, enterprises should fully understand the importance of structural characteristics, and give full play to the social interaction and connection with external enterprises in the supply chain through various channels, which can be realized by strengthening the construction of organizational culture, improving the construction of information system, optimizing business process and promoting the rationalization of organizational structure.

Second, we should pay more attention to the knowledge sharing of supply chain. In China's implementation of innovation-driven development strategy and in the era of knowledge economy, the importance of knowledge has become increasingly prominent. With the increasingly fierce market competition, enterprises need to constantly obtain and absorb new knowledge from the outside to consolidate their advantages. Knowledge sharing among supply chain enterprises has become an important way to improve the innovation ability of enterprises in the chain and the overall competitiveness of the supply chain. The enterprises in the supply chain are closely connected, which is more convenient for knowledge dissemination and sharing. Through mutual exchange and learning, member enterprises in the supply chain can effectively integrate complementary knowledge, optimize their own knowledge structure, and realize the improvement of enterprise innovation ability. The emphasis on knowledge sharing among enterprises in the supply chain should be started from the following three aspects: one is to strengthen knowledge sharing between individuals in the supply chain, the other is to strengthen knowledge sharing within the organization in the supply chain, and the third is to promote knowledge sharing between enterprises in the supply chain. Enterprises in the supply chain can formulate corresponding incentive measures to actively encourage their employees to participate in knowledge sharing.

6 RESEARCH LIMITATIONS AND PROSPECTS

This paper collects variable data through questionnaire survey, which is largely influenced by the subjective factors of the respondents. Moreover, the sample size is limited and has strong regional characteristics, which will affect the final research results to some extent. In the follow-up research, it is planned to increase the number of samples and expand the regional scope of the survey in order to increase the credibility and representativeness of the data. In addition, it takes a long time to realize the formation of intellectual capital and knowledge sharing among enterprises in the supply chain, and the innovation ability of enterprises is unlikely to change significantly in a short period of time. The data obtained from the questionnaire is cross-section data with no time lag, which makes the research results have certain limitations. In future studies, we should try our best to solve the problem of time lag of variables, and we plan to use intertemporal time series data to make the research conclusions more reliable.

COMPETING INTERESTS

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THE IMPACT OF MINIMUM WAGE REGULATIONS ON INDUSTRIAL PRODUCTIVITY IN CHINA

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Abstract: Based on the dynamic OP method, this paper examines the impact of Minimum wage regulations on the productivity of China's manufacturing industry from two aspects: resource allocation and production incentive. It is found that the implementation of the policy improves the compliance of enterprises, Narrows the labor price distortion gap, and improves the static configuration. At the same time, the policy will also dredge the exit channel of the market and improve the dynamic allocation of resources between the exiting enterprises and the surviving enterprises. Policy benefits also exist in the productivity incentive of enterprises under the forced mechanism. Using the data of Chinese industrial enterprises and the minimum wage data of prefecture-level cities, the empirical test is carried out. Therefore, the Chinese government should speed up the improvement of the minimum wage system supervision system, "grasp the small and magnify", and pay attention to the incentive effect of such systems on the market mechanism and production efficiency.
Keywords: Minimum wage regulation; Industry productivity; Enterprise productivity; Static resource allocation; Dynamic resource allocation

1 THEORETICAL ANALYSIS

The introduction of Minimum Wage Regulations explicitly prohibits violations disguised as overtime pay, piecework wages or commission wages. It also clarifies the supervision responsibility of labor and security administration while increasing penalties for violations, thereby raising the cost for non-compliant enterprises. This will negatively impact labor costs for small-scale businesses by elevating their low labor price and reducing labor price distortion compared to market equilibrium prices. On the other hand, although Minimum Wage regulations also affect labor costs for large enterprises through spillover effects[1], this impact is relatively minor compared to that on small enterprises. Consequently, it reduces the degree of differentiation in labor price distortion between large and small firms, promotes income productivity equality among businesses, and minimizes deviations from optimal resource allocation. These findings indicate a flow of resources from low-productivity small firms to high-productivity large firms while enhancing static allocation efficiency among surviving entities. Theoretical hypothesis 1: The implementation of the Minimum Wage Regulations is expected to mitigate labor price differentiation among enterprises and enhance the static allocation efficiency of resources.

According to recent studies[2], the critical level of entering market is influenced by factors such as industry-wide material productivity, enterprise compliance levels, and average wage levels within the industry. Specifically, a higher average wage paid to workers in an industry corresponds to a higher threshold for firms entering into production.After the implementation of Minimum Wage Regulations, enterprises face strict constraints in implementing minimum wage standards. This not only increases the wages of low-skilled workers but also generates a spillover effect on high-skilled workers, leading to an overall increase in wages. However, this rise will further elevate the market threshold and hinder new entrants from joining the market. As a result, enterprises with high productivity that do not exceed the critical level fail to enter while those with low productivity continue to occupy resources, resulting in a decline in resource allocation efficiency between surviving enterprises and potential entrants. Theoretical hypothesis 2: minimum wage regulations promote wage growth, raise the critical productivity level for entering markets, impede potential entrants from joining markets and ultimately reduce resource allocation efficiency between surviving enterprises and potential entrants.

In addition, from the perspective of market exit, small enterprises with wages lower than the minimum wage standard will bear the brunt of the impact, as they face an increased cost burden in terms of wages and salaries. These enterprises often lack sufficient capital, technology, and operational capacity to internalize labor costs, exacerbating their business difficulties and leading to their withdrawal from the market. While large businesses are also affected by spillover effects of the minimum wage policy, they are relatively less impacted by labor costs compared to small businesses. Moreover, due to fewer borrowing or capital constraints, large enterprises possess a stronger ability to withstand shocks and sustain their presence in the market. Consequently, heterogeneous labor costs generate a selection effect among enterprises[2]. As a result of this effect, low-productivity small enterprises are eliminated while high-productivity large enterprises remain in the market. This process releases resources previously occupied by low-productivity small enterprises and enhances dynamic allocative efficiency between surviving and exiting firms. Theoretical hypothesis 3: minimum wage regulations facilitate the market exit of low-productivity enterprises, thereby enhancing resource allocation efficiency between surviving and exiting firms.

Faced with costly labor resources, enterprises are likely to opt for machinery and equipment as a rational choice to replace low-skilled workers, thereby increasing the input of material capital in the production process[2,3]. According to the theory of capital-skill complementarity, advanced machinery and equipment require a highly skilled workforce. In response to this demand, enterprises may enhance employee training programs aiming at improving human capital levels[4], resulting in alterations in both labor employment structure and production factor composition.

Influenced by labor costs, managers will pay more attention to performance gaps among peers and strive towards enhancing enterprise profitability[5]. Alternatively, they may improve management practices by implementing measures such as inventory reduction to cope with shocks[3]. The backward forcing mechanism involving factor substitution and management promotion effects contributes positively towards enhancing enterprise productivity. Theoretical hypothesis 4: Following the implementation of minimum wage regulations, enterprises will be compelled to engage in factor replacement and managerial improvement processes that ultimately drive their own productivity enhancement.

On the aforementioned assumptions, it is evident that the implementation of minimum wage regulations has the potential to foster industry productivity progress. This can be achieved by stimulating enterprise productivity growth and enhancing both static resource allocation efficiency among surviving enterprises and dynamic resource allocation efficiency between surviving and exiting enterprises. However, it is this policy may also result in market blockage, thereby reducing dynamic resource allocation efficiency between surviving and entering enterprises, consequently impeding industry productivity progress. Consequently, Competitive Hypothesis 5 posits that the implementation of minimum wage regulations may facilitate industry productivity improvement. Additionally, Competitive thesis 6 suggests that such implementation may hinder industry productivity progress.

2 MODEL SETTING, VARIABLE SELECTION AND DATA DESCRIPTION

2.1 Model Construction and Variable Selection

This paper constructs the following DID model to evaluate the effect of Minimum wage regulation on manufacturing industry productivity. Where, the variable $Exposed_{ci03}$ indicates the susceptibility of city c industry i to policy influence prior to its implementation. $Change_t$ serves as a determinant for whether the policy has been implemented or not. Additionally, ΔTFP_{cit} represents the productivity change value of industry i in city c from year t-1 to t. CV_{cit} acts as a control variable at the city-industry level. The model also accounts for city-industry fixed effects μ_{ci} and time fixed effects ν_t. Lastly, ε_{cit} refers to the random error term.

$$\Delta TFP_{cit} = \chi + \beta Exposed_{ci03} \times Change_t + CV_{cit} + \mu_{ci} + \nu_t + \varepsilon_{cit} \quad (1)$$

Dependent Variable. Melitz and Polanec method[6] (referred to as DOP method) is used to calculate the change value of industry productivity. Core Independent Variables: If the proportion of industry i of city c in 2003, whose monthly average wage is below the local minimum wage standard, exceeds the national median level, it indicates that this industry is susceptible to the impact of Minimum Wage regulation, $Exposed_{ci03} = 1$. Since the implementation of Minimum Wage regulations in 2004, subsequent years including 2004 are considered as occurring at which time, $Change_t = 1$. To assess the sensitivity of grouping variables, we define wage density as the average ratio between average monthly wage and minimum wage in industry i of city c in year t. Industries with a wage density lower than the national median level in 2003 are classified as being susceptible to policy impact.Control Variables:Net assets; Export ratio; State capital; Number of employed persons; Per capita real capital; Degree of monopoly; Proportion of labor dispute case settlements;Logarithmic GDP; Population; Average wage; Number of employees.

2.2 The Source of Data and the Processing of Data

The enterprise data in this paper primarily originate from the National Bureau of Statistics' "Database of non-state-owned industrial enterprises". Given that this study focuses on manufacturing enterprises, only samples within this category are retained. Additionally, the minimum wage standards across different regions are included as supplementary data. For empirical analysis purposes, this paper selects prefecture-level cities as research scope. Additionally, to reflect the proportion of concluded labor dispute cases and the level of economic development in each city, we also cross-referenced data from China Statistics Yearbook and China City Statistics Yearbook for the respective years.

3 FINDINGS AND ANALYSIS BASED ON EMPIRICAL RESULTS

3.1 The Analysis of Benchmark Results

After employing formula (1) as the benchmark model and clustering parameters to the city level based on standard error, the regression results are presented in column (1) of Table 1. It is evident that the coefficient of the secondary interaction term exhibits significant positive association at a significance level of 1%. This finding confirms, initially, the competitive hypothesis5 by demonstrating a substantial increase in productivity growth rate for low-wage industries following the implementation of Minimum Wage Regulations. In column (2), we present estimated results after further

controlling for variables at both city and industry levels; notably, even with this additional control, the coefficient of the interaction term remains significantly positive at a significance level of 1%, indicating that Minimum Wage Regulations continue to exert their promoting effect on low-wage industries' productivity regardless of city-industry characteristics. To mitigate any influence from contemporaneous policies, we employ labor dispute cases closed as a proxy $dispute_{pt}$ for assessing the impact degree of Labor Security Supervision Regulations within each province. The results after incorporating this variable are displayed in column (3). Although there is some decrease in significance observed for the coefficient associated with interaction terms, it still retains positive statistical significance at a level of 5%. This suggests that while of Labor Security Supervision Regulations may amplify to some extent the promotion effect exerted by Minimum Wage Regulations on industrial productivity, removal of corresponding policy influences does not diminish Minimum Wage Regulations' ability to significantly enhance industrial productivity growth rates. Considering the impact of urban economic development on minimum wage levels, as well as its influence on enterprises and industry productivity through various channels, we have controlled variables in column (4) at this level. The significant interaction coefficient at the 5% level suggests that the city-level economic development does not significantly alter the industry's promotion effect on minimum wage regulation, thus further confirming competitive hypothesis 5.

Table 1 Results of Baseline Regression

	(1) ΔLP_{cit}	(2) ΔLP_{cit}	(3) ΔLP_{cit}	(4) ΔLP_{cit}
$Exposed_{ci03} \times Change_t$	0.0053***	0.0061***	0.0053**	0.0051**
	(3.38)	(3.86)	(2.58)	(2.47)
City-Ind,Year	Yes	Yes	Yes	Yes
N	32545	32544	28849	28257

3.2 Mechanism Verification

(1)Static Resource Allocation. Using the OP, LP, and ACF methods, calculate the enterprise productivity and its annual city industry level OP covariance, and then use the annual change value of this covariance as the dependent variable of equation (1). The regression results are shown in columns (1) to (3) of Table 2. It can be seen that the interaction coefficient is significantly positive at the level of at least 10%, indicating that the implementation of the Minimum Wage Regulations has significantly promoted the growth of static resource allocation efficiency in the industry, confirming the judgment on static resource allocation in theoretical hypothesis 1.

Table 2 Mechanism Verification - Static Resource Configuration

	(1) $\Delta Op\,\mathrm{cov}\_LP$	(2) $\Delta Op\,\mathrm{cov}\_OP$	(3) $\Delta Op\,\mathrm{cov}\_ACF$	(4) $Exit\_lp$	(5) $Entry\_lp$
$Exposed_{ci03} \times Change_t$	0.0027***	0.0023**	0.0017*	0.0431**	-0.0077
	(2.71)	(2.44)	(1.84)	(2.06)	(-0.38)
City-Ind,Year	Yes	Yes	Yes	Yes	Yes
N	28140	28140	28140	4853	7535

(2) Dynamic Resource Allocation. We use the proportion of exiting enterprises with productivity lower than the average productivity of incumbent enterprises in the total exiting enterprises as the dependent variable of equation (1) for regression. Columns (4) of Table 2 show the regression results. It can be seen that the Minimum Wage Regulations significantly promote the exit of low-productivity enterprises from the market, confirming theoretical hypothesis 3. Columns (5) show the regression results after using the proportion of incoming enterprises with productivity higher than the average productivity of incumbent enterprises as the dependent variable. From this perspective, the Minimum Wage Regulations have not significantly hindered the proportion of high productivity enterprises entering the market, proving that theoretical hypothesis 2 is not valid.

(3) Enterprise Productivity Mechanism. Referring to the practice of Mayneris et al.[3], enterprises whose average monthly wage in the previous year was lower than the local minimum wage standard in the current year were defined as enterprises affected by policies ($Exposed_{ft}=1$), and the rest were not affected by policies ($Exposed_{ft}=0$). Using this policy variable, the control variable at the firm level and a series of fixed effects, a DID model is constructed as shown in formula (2).

$$\Delta TFP_{ft} = \chi + \alpha Exposed_{ft} + \beta Exposed_{ft} \times Change_t + CV_{ft} + \mu_{ci} + \nu_{it} + \kappa_f + \varepsilon_{ft} \quad (2)$$

ΔTFP_{ft} is the productivity change value of the surviving enterprise f during the period t-1 to t; CV_{ft} is a series of control variables at the enterprise level, including logarithmic employment $labor_{ft}$, logarithmic capital per capita $cap\_intense_{ft}$, asset-liability ratio lev_{ft} , state holding soe_hold_{ft} , export proportion $\exp_{ft}$ and foreign capital proportion $foreign_{ft}$. μ_{ci} is the fixed effect of city-industry level. ν_{it} is the fixed effect of industry-year and κ_f is the fixed effect of individual enterprises. ε_{ft} is a random error term. The regression results are shown in columns (1)

of Table 3. It can be found that, consistent with the expectation, the greater the impact of policies, the greater the productivity growth of enterprises, which confirms the judgment of enterprise productivity in theoretical hypothesis 4.
This productivity promotion effect may come from the management improvement, factor substitution and innovation incentive effect under the "backforcing mechanism". Consistent with Mayneris et al.[3], we used the proportion of finished products in inventory in sales revenue $Inven_{ft}$ to reflect the inventory situation of enterprises. The capital input of enterprises is reflected by fixed assets per capita of production and operation $Fact_{ft}$, and the influence of policy on factor substitution of enterprises is verified. This paper estimates the educational level of employees in enterprises from 2001 to 2007, and reflects the human capital level of enterprises with the proportion of employees with college degree or above Edu_{ft} . At the same time, productivity improvement may also come from innovation incentives. We also use the logarithmic value of the number of total patents $Paten_{ft}$ to reflect the innovation behavior of enterprises. After replacing the explained variable in equation (2) with this series of variables and conducting regression, the results are shown in columns (2) to (5) of Table 3.
According to the regression results, consistent with expectations, after the introduction of the Minimum Wage Regulations, the inventory of enterprises is indeed reduced, the substitution of capital for labor and the level of human capital of enterprises is improved, which is conducive to the productivity growth of enterprises, and confirms the judgment on the productivity improvement mechanism of enterprises in theoretical hypothesis 4. However, the effect of rising labor costs brought about by the minimum wage regulations has also squeezed out the innovation expenditure of enterprises and reduced the number of patent applications of enterprises.

Table 3 Mechanism Test - Firm Productivity

	(1)	(2)	(3)	(4)	(5)
	ΔLP_{ft}	$Inven_{ft}$	$Fact_{ft}$	Edu_{ft}	$Paten_{ft}$
$Exposed_{ft}$	0.0092***	-0.003***	1.9002***	0.0073***	-0.0043**
$\times Change_t$					
	(3.30)	(-3.50)	(3.37)	(4.56)	(-2.17)
City-Ind,Year	Yes	Yes	Yes	Yes	Yes
N	818330	818330	818330	502824	605968

4 CONCLUSIONS

Based on dynamic OP method and HK method, this paper explores the mechanism of minimum wage Regulation on industry productivity from two aspects of resource allocation and enterprise productivity. The results show that: (1) the minimum wage regulation not only protects the compensation rights of workers, but also creates policy benefits for the productivity of the manufacturing industry, and truly realizes the dual goals of "ensuring safety" and "increasing efficiency". This policy benefit not only comes from the improvement of configuration, but also from the production incentive. (2) The reason for the improvement of static allocation is that after the introduction of the Minimum Wage Regulations, the distortion of labor price caused by the increase of corporate policy compliance is weakened and the marginal benefit of factors is equalized. (3) This policy also triggers the market competition mechanism, forcing enterprises to adopt measures such as factor substitution, changing employment structure, and improving management level to improve their own productivity, so as to achieve dual incentives for workers and enterprises. The market competition caused by the system also dredged the market exit channel, cleaned up the inefficient enterprises in time, released the resources occupied by them, and improved the dynamic allocation efficiency.

COMPETING INTERESTS

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

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AIGC ENABLES THE CONSTRUCTION OF ACADEMIC EVALUATION SYSTEM FOR UNDERGRADUATE COLLEGE STUDENTS

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Abstract: A series of policies of the Ministry of Education of China guide universities to change the traditional evaluation orientation and optimize the academic evaluation system. At the same time, the wide application of artificial intelligence generated content (AIGC) technology has brought new opportunities and challenges to the academic evaluation of colleges and universities. This paper focuses on the application of AIGC technology in the academic evaluation system of undergraduate universities, and puts forward four key application scenarios: automatic data collection and processing, comprehensive learning situation analysis, diversified evaluation model construction and personalized learning support. Based on this, this paper discusses the direction of academic evaluation reform under the power of AIGC from three dimensions of students, teachers and schools, and analyzes how to stimulate students' learning motivation, improve teaching accuracy and optimize resource allocation. Finally, the paper points out that the application of AIGC in the field of education not only provides an innovative path, but also faces challenges such as data privacy and technical reliability, which provides theoretical support and practical inspiration for the future construction of academic evaluation system.
Keywords: AIGC technology; Students' academic evaluation; System construction

1 INTRODUCTION

The academic evaluation system is a set of methods and standards used to systematically and scientifically evaluate students' learning results in the educational process. It covers the evaluation of examinations, homework, classroom performance and practical ability, aiming to promote the all-round development of students. As early as in 2018, China's Ministry of Education issued "about speed up the construction of high level undergraduate education comprehensively improve personnel training ability of opinions", clearly put forward to build diversified academic evaluation system, the integrated use of written, oral and standard answer test, comprehensive evaluation students to master knowledge and use ability, to improve students' comprehensive quality, enhance their communication, team cooperation and practice innovation ability [1]. In recent years, a number of policy documents further emphasize the need to change the unscientific evaluation orientation, improve the academic evaluation system, and promote the reform of the university evaluation system.

At the same time, the rapid development of generative artificial intelligence (AIGC, Artificial Intelligence Generated Content) technology has brought new possibilities for the academic evaluation system. AIGC technology, through algorithm and big data analysis, can automatically generate text, images, audio and video content, which has great application potential in the field of education [2]. Its application in academic evaluation not only enriches the content of the evaluation system, but also significantly improves the efficiency and accuracy of data collection, processing and analysis. Therefore, this paper will discuss how AIGC technology can empower the university academic evaluation system, the whole process from data collection, cleaning, analysis to the construction of diversified evaluation model, and reflect on its potential risks, and put forward corresponding reform suggestions.

2 APPLICATION SCENARIO OF AIGC TECHNOLOGY IN THE ACADEMIC EVALUATION SYSTEM

With its advantages in data processing, deep learning, intelligent analysis and other aspects, AIGC technology has brought innovative ideas and reform impetus to the academic evaluation system. It can not only improve the efficiency and accuracy of the evaluation process, but also deeply explore students' learning behavior and academic performance from multiple dimensions, helping to build a more scientific, diversified and personalized academic evaluation system. Next, the specific application scenarios of AIGC technology in the undergraduate academic evaluation system will be discussed from four aspects: automatic data collection and processing, stereoscopic chemical performance analysis, diversified evaluation model construction and personalized learning strategy support.

2.1 Automatic Data Collection and Processing

The AI system adopts a series of efficient and accurate technical means to automatically collect students' academic data. Through the education platform and learning management system used by students, monitor and record students 'learning activities in real time; analyze the students' learning and learning behavior data, such as the frequency of browsing course content, stay time, search keywords, etc., to infer students 'learning interest and understanding degree;

obtain the intelligent question bank and online test system, and then evaluate the students' knowledge mastery.
The role of artificial intelligence in data cleaning, integration and standardization is deeply reflected in the efficiency and accuracy in the data processing steps. First, in the process of data cleaning, AI technology can automatically identify and correct errors, inconsistencies and missing values in the data set. Through machine learning algorithms, you can learn the patterns of normal data to identify outliers and take appropriate measures to process them, such as filling in missing data or removing abnormal observations. Furthermore, duplicate records in the data can be identified and resolved, ensuring the purity and uniqueness of the dataset. Second, when it comes to data integration, AI is able to process data from multiple sources and seamlessly merge it together. Including data transformations and fusions in different formats, structures, and types. By understanding the internal correlation between the data, intelligently matching the merged data records, eliminating the problem of data silos, and creating a unified and integrated data view. Thirdly, in the process of data standardization, AI algorithms can automatically scale the data to a specific range, or convert it to a specific distribution, ensuring the comparability between different datasets or data features. This is crucial for subsequent data analysis and modeling, because the standardized data can more accurately reflect the real-world rules, thus improving the predictive ability and explanatory power of the model.

2.2 Analysis of Stereochemical Situation Performance

Through advanced algorithms and big data technology, artificial intelligence conducts in-depth mining and analysis of students' learning data. By analyzing data such as students' test scores, homework completion and class performance, Identify the difficulties and problems that students encounter in the learning process; By analyzing the students' learning behaviors and habits, Predict their future academic performance; By analyzing the students' interests and preferences, Recommend suitable learning resources and courses for them; Through the deep-learning algorithms, Processing and analyzing large amounts of academic data, Such as class performance, homework completion, test scores, participation in extracurricular activities, Identify potential factors and risk points that may affect academic performance; By analyzing students' interactions, online forum posts, and so on, Indirect assessment of the students' emotional status. In practice, these predictions and analysis provided by AI can be used to formulate more accurate education policies, adjust teaching methods, and provide customized student support services, so as to reduce academic risks and improve students' overall academic performance. This use of AI technology for academic risk identification and performance prediction not only enhances the personalization of education, but also improves the quality and efficiency of education.

2.3 Construction of Diversified Evaluation Model

Artificial intelligence technology is integrated into the construction of diversified evaluation models, and the accuracy, efficiency and comprehensiveness of the evaluation process are improved through advanced algorithms and machine learning methods. Deep analysis of multi-dimensional data to realize comprehensive and accurate evaluation of individuals or systems, including: algorithms adapted to different evaluation scenarios, such as feature extraction and pattern recognition techniques; intelligent evaluation rules and standards to adapt to complex and changeable environment and requirements; intelligent models including neural network to process and analyze large-scale evaluation data sets, and mine potential information and rules; and automatic feedback and continuous optimization of evaluation results through deep learning.

2.4 Personalized Learning Strategy Support

Artificial intelligence can play a role in providing personalized learning strategies, optimizing and improving learning effects. First of all, artificial intelligence can analyze a large amount of data to understand students' learning habits, learning interests and difficulties in learning, so as to make personalized learning plans for students. This personalized learning plan can improve students' learning efficiency and enable students to master more knowledge in a short time. Secondly, AI can provide students with intelligent learning guidance. Through real-time monitoring of students 'learning situation, students' learning problems can be found in time, and targeted guidance suggestions can be provided. In this way, students can get timely help when they encounter difficulties to improve their learning effect. Thirdly, artificial intelligence can provide students with intelligent learning resource recommendation. Through the analysis of students' learning needs, suitable learning resources are recommended for them, so that students can make more effective use of learning resources and improve the learning effect. Finally, AI can realize intelligent educational evaluation. Through the analysis and evaluation of students' learning outcomes, we can provide students with detailed feedback on their learning outcomes, helping them to understand their learning situation, so as to find ways to improve their learning effects.

3 REFLECTION ON THE REFORM OF THE ACADEMIC EVALUATION SYSTEM BASED ON AIGC

3.1 Students' Point of View: Let Learning Happen and Stimulate Internal Motivation

From the perspective of constructivism, learners themselves are the best subject of evaluation. Compared with evaluating the learning results obtained by students, it is more important to evaluate the process of how students construct knowledge. At present, in the academic evaluation system of college students in China, the evaluation subject

is relatively single, and schools, colleges or teachers have absolute authority on the students' academic evaluation, while students have fewer opportunities to participate in the evaluation, the participation platform is limited, and the enthusiasm is not high. Even if there are opportunities for students to participate, the weight of the results is very limited, which seriously weakens the motivation of students to actively explore and learn, and has a negative impact on the objectivity and fairness of the evaluation results. By introducing an academic evaluation system based on artificial intelligence-generated content (AIGC), we can fundamentally change this situation. AIGC technology can provide personalized learning resources and tasks according to students 'learning progress and interests, so as to stimulate students' internal motivation to learn. Students are no longer single knowledge recipients, but become active knowledge explorers and creators. In this way, students can experience a sense of achievement and satisfaction in the learning process, and further enhance their interest in learning and self-directed learning ability.

3.2 Teacher's Point of View: Make Teaching Accurate and Improve Teaching Quality

In the traditional academic evaluation system, teachers mainly rely on the manual recording and analysis of students 'learning data, which often leads to the intermittent and incomplete recording of students' learning process. In the process of formative evaluation, this evaluation system often has one-sidedness and standardized evaluation standards, which is difficult to meet the personalized needs of each student. In the teaching process, teachers often feel powerless, and it is difficult to fully understand the learning situation of each student. In contrast, the educational evaluation system with AI participation can have a more comprehensive understanding of students' learning process and effects by collecting and analyzing large amounts of learning data. The artificial intelligence system can monitor students' learning behavior in real time, and analyze their learning habits, knowledge mastery and thinking patterns. Through machine learning algorithms, artificial intelligence can identify students' learning disabilities and provide personalized learning advice and guidance, which greatly helps teachers to refine the education of each student in real time, thus improving the accuracy of teaching. By analyzing the students' learning data, teachers can understand the learning situation of each student in real time and develop personalized teaching plans. This kind of precise teaching can not only help students to better master the knowledge, but also enable teachers to carry out teaching activities more efficiently. Teachers can make use of the rich teaching resources generated by artificial intelligence to give targeted guidance and explanation, so as to improve the teaching quality and maximize the teaching effect. In addition, AI technology can also help teachers design their courses and optimize their teaching content. By analyzing the students' learning data, teachers can find out which teaching contents are not well mastered, so as to adjust the teaching strategies and optimize the course content. AI can also help teachers automatically correct homework and exams, reducing their workload and giving them more time and energy into instructional design and student tutoring.

3.3 School Angle: to Make the Management Orderly and Optimize the Allocation of Educational Resources

Students' academic achievement, as the key indicator to measure the overall education level, teaching quality and education effectiveness of the school, is always the core content of evaluating the effectiveness of the school education. The implementation of academic quality evaluation is a complex and continuous process, and the evaluation index system is not an unchanging template. It needs to make timely adjustments according to the changes of spatial and temporal background and objective conditions to ensure the accuracy and effectiveness of the evaluation. As the administrator of education, schools shoulder the responsibility of efficiently allocating educational resources and improving the quality of education. Although the traditional academic evaluation system has begun to take shape of formative evaluation, it often exists between teachers and various departments in a scattered state, and the lack of systematic data center, which leads to the inability of schools to fully grasp students 'learning and teachers' teaching information. Therefore, it is impossible to build a higher-level, scientific and effective academic evaluation system. Faced with this challenge, the application of AIGC technology has provided strong support for school management. Through intelligent data analysis and processing, schools can formulate educational policies and management strategies more scientifically. For example, the school can reasonably plan the curriculum and teaching resources according to the students' learning data, optimize the allocation of teachers, and ensure that every student can receive the most suitable education for himself. In addition, AIGC technology can also help schools to realize the intelligent examination and evaluation system, reduce the interference of human factors, and ensure the fairness and accuracy of the evaluation results. Through these measures, the school can achieve more orderly and efficient management, and provide a better education environment for students and teachers, so as to improve the overall quality of education.

4 CONCLUSIONS AND REVELATION

The application of artificial intelligence technology in the construction of academic evaluation system is a field full of both challenges and opportunities. From the perspective of the development trend, the application of artificial intelligence in the academic evaluation system is gradually deepening. The application of artificial intelligence can evaluate students more accurately and comprehensively based on big data analysis, which can improve the efficiency of academic evaluation and reduce labor cost and time cost; promote the fairness of academic evaluation, avoid the influence of artificial subjective judgment on the evaluation results, and make the evaluation results more objective and fair.

However, the application of AI in the academic evaluation system also faces many challenges. First, in terms of

theoretical research, it is still necessary to further explore how to more effectively integrate advanced technologies such as deep learning and natural language processing into academic evaluation models, so as to improve the accuracy and comprehensiveness of evaluation, especially in a complex and diverse educational environment. Second, in terms of practical application, how to use artificial intelligence technology to achieve dynamic and process evaluation is still an important topic, and it is urgent to explore its specific implementation methods in the monitoring and optimization of the learning process. Third, in terms of educational equity, although artificial intelligence helps to narrow the educational gap, it may also lead to new inequalities due to the algorithm bias. Therefore, it is very important to ensure the fairness and applicability of the algorithm. Fourth, in terms of ethics and privacy protection, the academic evaluation system must strictly abide by ethical norms, especially in the process of the collection, processing and storage of student data, to ensure that information is transparent and systematically interpreted, students' privacy is strictly protected, and the relevant legal and moral standards are followed to avoid potential risks of abuse.

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INTERPLAY OF PROACTIVE PERSONALITY, SELF-EFFICACY, AND WORK ENGAGEMENT: A MEDIATING ROLE OF JOB SATISFACTION

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Abstract: Employees' work engagement is essential for an organisation's success. Past studies showed a declining trend in work engagement among administrative staff compared to academic staff in public universities in China. Yet, limited studies have been found on the work engagement of administrative staff affiliated with public universities. Hence, this study aims to investigate the impacts of self-efficacy and proactive personality on university administrative staff's work engagement, notably job satisfaction, which was included as a mediator. Responses from 420 administrative staff from 30 public universities were collected using an online survey. Descriptive analysis was conducted using SPSS. PLS-SEM was used to test the hypotheses and the model's predictive power. The findings show that proactive personality and self-efficacy are positively correlated with job satisfaction and work engagement. Also, job satisfaction was found to significantly mediate the relationship between proactive personality and self-efficacy in terms of work engagement. As a whole, self-efficacy has a greater effect on job satisfaction and work engagement. This study expands the existing knowledge by testifying to the mediating role of job satisfaction and providing insight concerning administrative staff member work engagement. Lastly, implications of the study findings are discussed, along with limitations and future research directions.
Keywords: Proactive personality; Self-efficacy; Job satisfaction; Work engagement; Administrative staff

1 INTRODUCTION

The work engagement from the employees is essential for the organisation's success and the achievement of the organisational goals [1]. Studies showed that work engagement can reduce turnover intention, making it important to examine work engagement to prevent employee's turnover [2]. In the context of education, past studies showed that the issue of work engagement among the administrative staff members has become more serious where the work engagement among these employees has declined tremendously over the last three years, in spite of government incentives and supports given to the public universities. Based on the findings from Hayes et al. [3], the work engagement level among the university administrative staff has declined from 19% in 2015 to only 6% in 2018, mainly due to the work nature of administrative staff, which is always burdened by operating procedures and policies, making it difficult to effectively perform their tasks. Boring and tedious duties are common issues that characterise both administrative and managerial jobs. In addition, China in particular is a collectivist society where "guanxi" is widely used in corporate management and possesses an important cultural role [4]. University administrative staff members place a greater value on building "guanxi" with their superiors instead of engaging with their work, to obtain better promotion opportunities than academic staff members do [5]. In fact, academic staff at public universities enjoy more advantages, such as better promotion prospects, higher salaries, and a more flexible work schedule. They are mostly engaged with their work, specifically student engagement, teaching, and research, thus avoiding certain interpersonal challenges encountered by administrative staff.

According to Ojo et al. [6], numerous studies in the field of human resources management were conducted to discover strategies to encourage the employees' work engagement so that the employees are not "wandering around at work," particularly in the "command and control blind area," and thus improve the organisation's overall effectiveness. Yet, the work engagement of administrative staff affiliated with the university has been ignored. To address this issue, it is critical to identify and cultivate positive psychological resources to mitigate the adverse effects. The positive characteristics of a proactive personality are the focus of an empirical investigation that are expected to boost self-efficacy, which would, in turn, provide more favourable outcomes [7, 8]. This study emphasizes proactive personality and self-efficacy as the significant factors influencing job satisfaction, thereby fostering greater employee work engagement in the workplace.

Previous studies [9-11] found that engagement in work exerts a favourable impact on one's level of satisfaction. However, there have been relatively few studies focusing on whether job satisfaction can serve as a precursor to working engagement [12-15]. Thus, this study aims to gain further insight into the relationship between job satisfaction and work engagement, in particular how proactive personality and self-efficacy among university administrative staff

affect work engagement and how job satisfaction intervenes with or interacts with these effects. The current study explores these relationships and their underlying mechanisms in more detail.

2 LITERATURE REVIEW

The Social Exchange Theory (SET) and the Job Demands-Resources (JD-R) paradigm serve as the foundation for this research. SET emphasised the reciprocity process that affects work engagement. Employees are more likely to get involved in their work for the organisation in return if they feel encouraged by it [16]. The JD-R model emphasises job characteristics, and Xanthopoulou et al. [17] introduce an additional dimension known as "personal resources" into the model. Self-efficacy, initiative, hope, and resilience are characteristics of personal resources. This study, which integrated the SET and JD-R models, suggests that an employee's work engagement may be influenced by their job satisfaction, while the impacts of personal resources (i.e, self-efficacy and proactive personality) on work engagement may intervene (or mediate) job satisfaction.

2.1 Proactive Personality and Work Engagement

The term "proactive personality," initially coined by Bateman and Crant [18], describes proactive personality as a consistent tendency that causes individuals to adopt proactive strategies that influence their immediate environment. A comparative study from Seibert et al. [19] among employees with proactive personalities and those with non-proactive dispositions found that proactive employees are more inclined to adapt themselves and more engaged in their work in the organisation. Proactive employees tend to take a series of actions and measures to impact those who are around them, actively seek opportunities, act, and adjust to their surroundings to pursue their career goals [8,20]. Conversely, passive employees typically adapt to changes and adverse outcomes in a passive way and never change or engage to improve their current circumstances.

The JD-R model of work engagement provides the basis for the theoretical framework, suggesting that proactive employees would utilise their personal resources to forecast future workplace engagement and boost productivity at work [21,22]. Consistent with other studies [23,24], they also found that proactive personality played a critical role in fostering work engagement since proactive individuals will actively seek out opportunities, exercise creativity, and be persistent in changing to achieve the desired outcome. Thus, proactive individuals are likely to be enthusiastic, engaged with, and receptive to new ideas in their jobs in order to improve the quality of their work life [25,26](. Similarly, Syara and Rahmat Shah [23] claimed that having a proactive personality enhances employees' workplace engagement by acting as an internal asset that generates extra capabilities and value. The research by Bakker et al. [27], who investigated 190 Dutch workers with a proactive mindset, found that proactive employees are more likely to engage with work and always make efforts to achieve their goals at work. In addition, Bergeron et al. [28] found that employees with a proactive personality tend to work longer on a weekly basis and show higher work engagement, which in turn leads to better performance. Based on the above review of literature, the authors hypothesised:

H1: Proactive personality is positively related to work engagement among administrative staff members at a public university in China.

2.2. Self-Efficacy and Work Engagement

Albert Bandura [29] initially coined the term "self-efficacy," which refers to individuals who have faith in their ability to successfully complete a task or reach a certain objective. Fundamentally, self-efficacy is a psychological construct that indicates an individual's confidence in their capacity to achieve success under all possible conditions. Self-efficacy is closely related to the concept of self-confidence but differs in that it specifically relates to one's belief in their ability to perform a particular task rather than a more general sense of self-assurance. Self-efficacy is considered a crucial predictor of achievement and performance in different areas, including academic, athletic, and professional settings [30]. Indeed, self-efficacy and work engagement have been disclosed to be positively connected in previous investigations [31-34]. This implies that individuals are more likely to feel engaged in their work when they have confidence in it. In a study by Buric and Macuka [35], it was found that Croatian teachers with high self-efficacy reported greater work engagement with their students and their institution. The findings suggest that having confidence in their abilities makes teachers feel more positive about their work. The relationship between self-efficacy and work engagement was also explained in social cognitive theory, which states that employees who believe they have a high level of self-efficacy are more likely to engage in their employment and professional lives by seeking opportunities for growth or support. Accordingly, this study hypothesised:

H2: Self-efficacy is positively related to work engagement among administrative staff members at a public university in China.

2.3 The Mediating Role of Job Satisfaction

Job satisfaction and work engagement are two different but related concepts. According to Yalabik et al. [36], job satisfaction and work engagement are distinct concepts that must coexist for employees to become inspired, dedicated, and absorbed in their work. Weiss [37] explains that job satisfaction is the result of a positive evaluation that individuals make regarding their jobs, while work engagement is related to the content of the work. Although numerous past studies

have shown that work engagement and job satisfaction are strongly linked to each other in work [38], there is a debate on whether job satisfaction is an antecedent or an outcome of work engagement, with some studies supporting both perspectives. As stated by Saks [10], work engagement should contribute to job satisfaction; employees who are enthusiastic and invested in their work might feel more satisfied with their jobs. However, other researchers claim that job satisfaction precedes work engagement [13-15,39]. Employees who are happy with their work typically exhibit greater vigour, commitment, and concentration [40]. As far as social exchange is concerned, this validates the reciprocity rule. Hence, in this study, we hypothesise that:

H3: Job satisfaction is positively related to work engagement among administrative staff members at a public university in China.

As mentioned above, proactive personality is one of the main predictors of individual behaviour. Wang and Lei [41] stated that proactive individuals who receive greater social support are more likely to feel appreciated and satisfied with their profession, which in turn leads to a higher level of work engagement. Tee et al. [48] and Uy et al. [42] stated that proactive individuals are resourceful and self-directed in managing their careers. For proactive employees, work is the centre of their life activity, and with more challenges and resources in managing their work, they are more likely to derive a greater sense of job satisfaction [43]. Such satisfaction leads to greater engagement with work in order for them to achieve their career goals [14,44]. Yet, some of the past studies [15,45,46] discovered that work engagement instead of job satisfaction played a significant mediating role in the relationship between proactive personality and job outcomes (i.e, job satisfaction). Thus, in this study, the authors would like to further investigate and verify the role of job satisfaction as a predictor as well as a mediator instead of an outcome variable in affecting work engagement among the university's administrative staff in China.

A review of past studies indicated a significant positive relationship between self-efficacy and job satisfaction [20,39,47,48]. In fact, a large number of theoretical models integrate multiple factors into the job satisfaction literature. As stated by Lipscomb et al. [49], general self-efficacy would affect job satisfaction; individuals with high self-efficacy are more likely to deal with difficulties effectively and attain valued outcomes (i.e, job satisfaction). Research has confirmed that self-efficacy is associated with job satisfaction (e.g, Corry & Stella, 2018[50]; Lent & Brown, 2006[51]; Li et al, 2023[52]), and thus satisfied employees are energetically and effectively connected (e.g, engagement) with their work. Consistent with previous studies, a positive correlation between self-efficacy and job satisfaction was found among Chinese university teachers [53-56]. The results suggest that teachers with higher levels of self-efficacy are more confident in their work and able to complete their work effectively, resulting in increased job satisfaction and more engagement with their work. Thus, this study includes job satisfaction as a mediator along the link between self-efficacy and work engagement. The following hypotheses were proposed:

H4: Job satisfaction mediates the relationship between proactive personality and work engagement among the administrative staff members at a public university in China.

H5: Job satisfaction mediates the relationship between self-efficacy and work engagement among the administrative staff members at a public university in China.

Accordingly, the research framework for this study is illustrates in Figure 1:

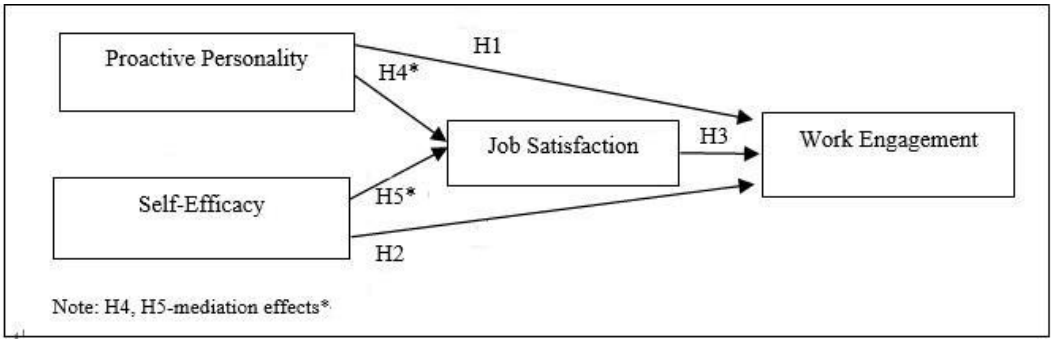

Figure 1 Research Framework

3 METHODOLOGY

3.1 Sampling

The researchers employed a two-stage stratified random sampling procedure to obtain the sampling units for this study. First, only non-academic staff from government (i.e, public) universities in Shaanxi, China, were selected, followed by convenient sampling in distributing the questionnaire online. The "Wenjuanxing" professional platform was utilized to conduct the online surveys. A total of 838 questionnaires were sent to administrative staff who work at 30 government universities. 450 responses were recovered, resulting in a response rate of 53.7%. Out of the 450 responses, 420 were considered valid after eliminating invalid ones based on criteria such as missing data, irregular response patterns, and contradictory responses.

3.2 Instruments

All the instruments in this study are adapted from past studies. The proactive personality scale [18], with ten items, was used to measure proactive personality. The instrument pertaining to self-efficacy was adapted from Schwarzer and Jerusalem's [57] general self-efficacy scale, which consisted of 10 items. The instrument to measure work engagement was adapted from Schaufeli and Bakker [58] and comprised of three items to reflect absorption, vigour, and dedication. Lastly, Judge et al.'s [59] job satisfaction scale was used to measure job satisfaction. All the items are rated using a five-point Likert scale, with "1 = strongly disagree and 5 = strongly agree.".

3.3 Data Analysis Methods

SPSS v28 was used to analyse common method bias and the respondent's profile, while SmartPLS 3.0 was used to execute partial least squares structural equation modelling (PLS-SEM) analysis, which included validation of the measurement model, estimation of the structure model, and mediating effects as well as justifying the hypotheses presented in this study.

4 RESULTS

4.1 Respondent's Profile

With respect to the respondents' profile, most participants were female (51.5%) and aged between 34 and 43 years (53.6%). The majority of the respondents had obtained a bachelor's degree (58.9%), followed by a master's (37.5%) and a doctorate's degree (3.6%). In addition, most of the respondents (96.4%) worked with the university for less than five years, whereas only 3.6 percent had been working at the university for five years and above. Regarding job positions, most of the participants (85.7%) are executives, 11% are middle-level administrative managers, and the rest (3.3%) hold positions at higher-level management, respectively.

4.2 Common Method Bias

Harman's single-factor test was conducted to detect common method bias before data analysis [60]. The first factor captures only 39.6% (<50%) of the total variance in the entire dataset. Since the first factor did not account for most of the variance, the study concludes that the common method bias was not an issue in this study.

4.3 Measurement Model Assessment

In this study, the four variables have been modelled with reflective constructs. Therefore, assessments of internal consistency reliability, convergent validity, and discriminant validity were conducted [61]. The results presented in Table 1 show that all loadings are greater than 0.8, indicating the indicators' reliability. The composite reliability for all constructs ranges from 0.918–0.952 (> 0.70), supporting the internal reliability for all constructs [61]. In addition, average variance extracted (AVE) for all constructs achieved a threshold value >0.50, indicating high convergent validity.

Table 1 Results for Measurement Model Assessment

Constructs	Item	Loading	Cronbach's alpha	Composite reliability	AVE
Work Engagement	WE1	0.954	0.947	0.950	0.904
	WE2	0.945			
	WE3	0.953			
Job Satisfaction	JS1	0.918	0.917	0,918	0.751
	JS2	0.866			
	JS3	0.857			
	JS4	0.844			
	JS5	0.846			
Proactive Personality	PP1	0.831	0.951	0.952	0.695
	PP2	0.812			
	PP3	0.843			

	PP4	0.822			
	PP5	0.833			
	PP6	0.828			
	PP7	0.816			
	PP8	0.805			
	PP9	0.818			
	PP10	0.920			
	SE1	0.830			
	SE2	0.830			
	SE3	0.827			
	SE4	0.824			
Self-Efficacy	SE5	0.842	0.951	0.952	0.696
	SE6	0.927			
	SE7	0.803			
	SE8	0.809			
	SE9	0.820			
	SE10	0.824			

In addition, the present study adopts the Heterotrait-Monotrait (HTMT) criterion for assessing discriminant validity. A cut-off value lower than 0.85 indicates no issue with discriminant validity [62]. As shown in Table 2, all HTMT values were lower than 0.85, supporting discriminant validity.

Table 2 Heterotrait-Monotrait (HTMT) Ratio

	Job Satisfaction	Proactive personality	Self-efficacy	Work Engagement
Proactive personality	0.490			
Self-efficacy	0.518	0.523		
Work Engagement	0.511	0.491	0.534	

Based on the above results for the measurement model assessment, all evaluation criteria were met, establishing the measurement model's reliability and validity. The model was thus fit for structural model estimation.

4.4 Structural Model Assessment

The results confirm that proactive personality, self-efficacy, and job satisfaction have significant (positive) direct effects on work engagement (Table 3). Self-efficacy has the highest impact ($\beta = 0.282$, $p < 0.05$, $t > 1.645$) on work engagement, followed by job satisfaction ($\beta = 0.243$, $p < 0.05$, $t > 1.645$), and proactive personality ($\beta = 0.139$, $p < 0.05$, $t > 1.645$). In addition, proactive personality ($\beta = 0.290$, $p < 0.05$, $t > 1.645$) and self-efficacy ($\beta = 0.346$, $p < 0.05$, $t > 1.645$) also significantly affect job satisfaction. Among all the variables, the findings confirm that self-efficacy is the most important variable affecting the administrative staffs' job satisfaction and work engagement. In terms of the model's predictive value (R^2), the model explained 36.2% of the variance in work engagement and 30.4% of job satisfaction. The results of the study testify that all the hypotheses for direct paths H1, H2, and H3 are accepted. Table 3 summarises all the results of the bootstrapping routine for direct paths.

Table 3 Result for Structural Model Assessment

Paths	Hypothesis.	Std. Beta	St. Error	t-value	p-value	R^2

Proactive Personality -> Work Engagement	H1	0.215	0.047	4.585	0.000	0.362
Self-Efficacy -> Work Engagement	H2	0.282	0.048	5.823	0.000	
Job Satisfaction ->Work Engagement	H3	0.243	0.045	5.412	0.000	
Proactive Personality->Job satisfaction	H4	0.296	0.045	6.473	0.000	0.304
Self-efficacy->Job satisfaction	H5	0.346	0.043	8.071	0.000	

4.5 Mediation Model Assessment

Table 4 shows the results of the mediation analysis. The indirect (mediation) effect of job satisfaction was tested and found to be significant (β = 0.070, t > 1.96) along the link between proactive personality and work engagement. The bias-corrected (BC) confidence interval (LL = 0.041, UL = 0.106) does not include 0, justifying the significant indirect effect of job satisfaction. Since the direct path of proactive personality to work engagement was also found to be significant (β = 0.215, t > 1.96), it can be concluded that partial-complementary mediation exists for job satisfaction. Hence, the hypothesis for mediation (i.e, H4) is supported. Similarly, the result for the indirect path between self-efficacy and engagement via job satisfaction was also found to be significant (β = 0.084, t > 1.96), and the bias-corrected (BC) confidence interval does not straddle from 0 (LL = 0.050, UL = 0.123). Since the direct path of self-efficacy to work engagement was also found to be significant (β = 0.282, t > 1.96), it is concluded that partial-complementary mediation exists for job satisfaction. Accordingly, the hypothesis for mediation (i.e, H5) is supported.

Table 4 Results for Mediation Model Assessment

Hypothesis	Paths	Std. Beta	Std. error	t-value	95% CI (LL; UL)	Type of mediation
H6a	Proactive Personality ->Job Satisfaction ->Work Engagement	0.070	0.017	4.243	(0.041; 0.106)	*Partial Mediation (Complimentary)
H6b	Self-Efficacy ->Job Satisfaction ->Work Engagement	0.084	0.019	4.481	(0.050; 0.123)	*Partial Mediation (Complimentary)

Note. *Significant at p<0.05, t>1.96, two-tailed

5 DISCUSSION AND CONCLUSION

The purpose of this study is to investigate the relationships between proactive personality, self-efficacy, job satisfaction, and work engagement among administrative staff members at a public university in China. The results show that proactive personality increases the employee's likelihood to engage with their work, which is consistent with the findings of previous studies [23,46,63]. The administrators in higher education who possess proactive personalities were found to be proactively addressing work-related issues in the university and also willing to offer individual assistance to solve the problems for institutional effectiveness [64]. Indeed, the administrators diligently attempt to build a sense of belonging, actively seek validation and acceptance from others in the group, and actively seek institutional recognition of their works. Further, Soomro et al. [65] discovered that employees who possess greater autonomy in their work seem to have a proactive mentality, which in turn strengthens the relationship between proactive personality and work engagement. These employees constantly strive for greater autonomy and independence because it makes them feel excited and invested in their profession [65].

In a similar vein, the findings also reveal that employees who have greater self-efficacy are more likely to be engaged with their work. According to earlier studies [49,54,66] gage with their work and the organisation. This study's findings showed that proactive personality and self-efficacy had a direct and noticeable effect on work engagement, which is in line with the claims in the JD-R model that work engagement is more likely to endure when employees are proactively and self-directed and have possession of their own assets that enable them to tackle challenging tasks [67].

Furthermore, this study revealed that self-efficacy and proactive personality simultaneously played a significant role in shaping job satisfaction. This finding corroborates earlier research that has identified a positive impact of these factors

on job satisfaction [68]. The finding in this study indicates that work engagement is significantly impacted by job satisfaction, and this result is in line with the well-established theory of job satisfaction, which contends that higher levels of job satisfaction might favourably affect an employee's behaviour at work [69]. Notably, this study verified the contribution of job satisfaction along the direct path between proactive personality and self-efficacy in heightening work engagement. The study's findings offer empirical evidence of the mediating role of job satisfaction. When the administrative staff exhibits a proactive trait and has a sense of self-efficacy, it establishes a strong and positive link with their overall job satisfaction; when job satisfaction improves, it helps maintain and boost work engagement [70,71]. In fact, the inclusion of job satisfaction as a mediator in this study advances the theoretical understanding of the widespread belief that job satisfaction is an outcome rather than an intervening variable.

Theoretically, this study expands the existing knowledge by first addressing a noticeable gap in prior studies by examining the mediating role of job satisfaction within complicated relationships involving self-efficacy, proactive personality, and work engagement. To the best of our current knowledge, this marks the first attempt to examine the mediating role of job satisfaction across these two independent variables and their connection to work engagement, particularly within the educational setting. Indeed, most of the past studies included and tested work engagement instead of job satisfaction as a mediator in testing employment outcomes [15,46]. Secondly, this study provides an empirical justification by extending work engagement research in the context of university administrative staff in China. A review of the past literature in the Chinese context found limited studies on work engagement among administrative staff members in public universities. Specifically, the predictive roles of self-efficacy and proactive personality concerning work engagement have not received much attention in the literature variable.

This study has few practical implications. First, the university management team should acknowledge the contribution of the administrative staff and provide appropriate support to enhance their work engagement to reduce burnout or attrition among administrative staff at the university. In fact, this issue has existed for a long time but has been ignored by the management as well as the policymakers. Second, this study reveals the impact of proactive personality and self-efficacy on job satisfaction and work engagement. Consequently, the human resource practitioner should pay more attention to recruiting employees who are naturally proactive while providing them with supports and training to enhance their work efficacy in order to improve the employees' job satisfaction and work engagement [72]. In addition, the administrative staff themselves need to be mindful of the importance of self-efficacy, as self-efficacious employees have more confidence in problem solving and performing their work, which in turn leads to higher satisfaction and work engagement.

A number of limitations pertaining to the current study should be noted. To begin with, this study is cross-sectional in nature, in which data were gathered at a single moment in time rather than reflecting the impact of cumulative work experiences across time [73]. In order to offer a thorough grasp of the phenomenon under investigation, the researcher needs to think about gathering longitudinal data in subsequent studies. Second, this study is confined to the specific region of Shaanxi province in China, and the sample is mainly Chinese government administrative staff, which might make it challenging to generalise the findings to China as well as the international context. Future research should consider widening its geographical scope to obtain a more representative sample and should include administrative staff from private universities. Finally, there are a number of undiscovered aspects that have not yet been taken into consideration, including the cultural factor, style of management, work features, and guanxi between supervisors and subordinates. These factors may also influence employee work engagement. Therefore, in the future, research can be expanded to the organizational level to further consider the boundary conditions that affect employee work engagement.

As a conclusion, the findings in this study validated the mediating role of job satisfaction along the direct path of proactive personality and self-efficacy toward work engagement and demonstrated the direct influence of these characteristics on work engagement. The results add valuable insights to the body of research, particularly with regard to the job satisfaction and work engagement of Chinese administrative staff members in higher education institutions.

COMPETING INTERESTS

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

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RESEARCH ON STRATEGIES FOR THE HIGH-QUALITY TRANSFORMATION OF SCIENTIFIC AND TECHNOLOGICAL ACHIEVEMENTS IN UNIVERSITIES AND RESEARCH INSTITUTES IN DALIAN

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Abstract: The transformation of scientific and technological achievements plays a crucial role in driving economic development through innovation, as well as in promoting the advancement of regional economy and industrial upgrades. Exploring the high-quality transformation of scientific and technological achievements in universities and research institutes in Dalian can significantly contribute to the cultivation and development of new productive forces, thus driving economic growth in the region. However, the current state of transformation of scientific and technological achievements in Dalian's universities and research institutes is characterized by a low local transformation rate, subpar transformation quality, and insufficient service level. This paper proposes four suggestions to enhance the transformation of scientific and technological achievements in Dalian: improving the source supply mechanism, strengthening collaboration between universities, research institutes, and enterprises, establishing a high-level scientific and technological intermediary service system, and enhancing the level of technological maturity in achieving successful transformation of scientific and technological achievements.
Keywords: Dalian; Universities and Research Institutes; Transformation of scientific and technological achievements

1 INTRODUCTION

Universities and research institutes play a vital role in driving technological revolutions and industrial transformations, serving as key contributors to fundamental research and major technological breakthroughs. Leveraging the leading position of universities and research institutes in scientific and technological innovation and promoting organized scientific research are essential for enhancing social innovation capability and fostering high-quality economic and social development. Dalian is home to universities and scientific research institutes that possess abundant resources and exceptional research capabilities. Enhancing the efficiency and quality of the transformation of scientific and technological achievements in these institutions will greatly contribute to the economic development of Dalian. Through an analysis of statistical data pertaining to the transformation of scientific and technological achievements in Dalian's universities and research institutes, this paper aims to explore the existing challenges and provides targeted suggestions to promote the high-quality transformation of scientific and technological achievements in Dalian.

2 ANALYSIS OF THE CURRENT STATUS OF THE TRANSFORMATION OF SCIENTIFIC AND TECHNOLOGICAL ACHIEVEMENTS IN DALIAN'S UNIVERSITIES AND RESEARCH INSTITUTES

2.1 Transformation of Technological Achievements in Universities and Research Institutes

The transformation of technological achievements in universities and research institutes exhibits an active and stable trend. In 2023, there was a significant increase in both the quantity and transaction amount of scientific and technological achievements transformed by universities and research institutes in Dalian, compared to 2022. Among the top three universities in Dalian in terms of technology export contract transaction amount for 2023 were the Dalian Institute of Chemical Physics of the Chinese Academy of Sciences, Dalian University of Technology, and Dalian Maritime University. Notably, the Dalian Institute of Chemical Physics of the Chinese Academy of Sciences ranked first with a transaction amount of 1.409 billion yuan (Table 1).

Table 1 Top 10 in Technology Turnover of Universities and Research Institutes in 2023

Name of universities and research institutes	2022		2023	
	Number of contracts (items)	Transaction amount (ten thousand yuan)	Number of contracts (items)	Transaction amount (ten thousand yuan)
Dalian Institute of Chemical Physics	198	22280.36	313	140949.01
Dalian University of Technology	371	40581.34	736	59864.82
Dalian Maritime University	49	2417.03	583	22759.37

Dalian Polytechnic University	161	5196.55	193	7486.22
Liaoning Ocean and Fisheries Science Research Institute	78	3345.87	92	4151.14
Dalian University	19	1508	48	2932
Dalian Jiaotong University	56	1801.76	69	2291.92
Dalian Ocean University	18	571.45	69	1680.69
Dalian Minzu University	17	349.51	52	1413.7
Dalian Neusoft Institute of Information	62	471.13	77	1227.18
Dalian Medical University	2	111	36	1182.8

Data source: Dalian National Technology Contract Management and Service System

2.2 Industrial Distribution of the Transformation of Scientific and Technological Achievements in Universities and Research Institutes

This section analyzes the composition of technical fields for technology contracts in Dalian's key technology transactions. Over the past three years, the majority of technology contracts have been concentrated in the advanced manufacturing sector, accounting for approximately 30% of the total transaction volume in Dalian and ranking first. This trend aligns with Dalian's economic development plan, which emphasizes the growth of the manufacturing industry. Furthermore, the development of strategic emerging industries, including electronic information, new energy and energy efficiency, and new materials and applications, also exhibits a consistent trajectory. The city's rapid growth in urban construction, social development, and modern transportation has provided substantial support for the expansion of Dalian's modern service industry. Notably, respective values have increased from 4.05 billion yuan and 140 million yuan in 2021 to 10.22 billion yuan and 8.27 billion yuan in 2023 (Table 2)

Table 2 Technology Composition of Dalian Technology Contract from 2021 to 2023

technical field	Contract number			turn volume			Transaction volume in 2023	
	2021	2022	2023	2021	2022	2023	proportion	increase
Advanced manufacturing	609	426	547	138.9	128.1	160.9	31.82%	25.63%
Urban construction and social development	245	228	378	40.5	104.6	102.2	20.22%	-2.25%
Modern traffic	219	149	761	1.4	45.5	82.7	16.35%	81.78%
electronic information	6244	4,685	5,661	57	62.5	70.7	13.97%	13.05%
New energy and high energy efficiency	256	285	422	56.8	30	54.2	10.72%	80.68%
New materials and their applications	208	202	359	3.4	8.5	10.2	2.02%	20.10%
aerospace	138	87	108	6.8	4.9	9.6	1.90%	95.88%
Environmental protection and comprehensive utilization of resources	354	489	553	15	40	9.4	1.87%	-76.38%
Biological, pharmaceutical, and medical devices	200	168	251	1.6	2.9	5.4	1.07%	86.59%
agriculture	34	32	103	0.2	0.1	0.3	0.07%	232.47%
Nuclear application	0	3	3	0	0.02	0.1	0.01%	206.70%
Total	8507	6754	9,146	336.2	427.3	505.8	100%	18.4%

Data source: Dalian National Technology Contract Management and Service System

2.3 Localization Rate of the Transformation of Scientific and Technological Achievements in Universities and Research Institutes

In terms of analyzing the number of projects for transforming scientific and technological achievements, the overall localization rate of universities and research institutes in Dalian increased from 41.6% in 2022 to 44.3% in 2023. The institutions with the top five highest localization rates in 2023 were Liaoning Normal University (73.1%), Neusoft Institute of Information (70.5%), Dalian Polytechnic University (68.9%), Dalian Medical University (67.2%), and Dalian Jiaotong University (60.9%).

Regarding the analysis of transaction amounts in the transformation of scientific and technological achievements, the overall localization rate of universities and research institutes in Dalian increased from 18.2% in 2022 to 35.7% in 2023. The institutions with the top five highest localization rates in 2023 were Neusoft Institute of Information (70.5%),

Liaoning Provincial Institute of Oceanography and Fisheries (63.6%), Dalian Minzu University (56.5%), Dalian Ocean University (54%), and Dalian Jiaotong University (51.7%)(table 3).

Table 3 Local Transformation of Scientific and Technological Achievements of Universities and Research Institutes in Dalian from 2022 to 2023

University research institutes	Number of scientific and technological chievements transformation projects in 2022 (one)			Transaction amount of transformation of scientific and technological achievements in 2022 (RMB 10,000)			Number of scientific and technological achievements transformation projects in 2023 (one)			Transaction amount of transformation of scientific and technological achievements in 2023 (RMB 10,000)		
	Total	Dalian	Conversion rate in Dalian	Total	Dalian	Conversion rate in Dalian	Total	Dalian	Conversion rate in Dalian	Total	Dalian	Conversion rate in Dalian
Dalian Institute of Chemical Physics	299	101	33.8%	64272.1	6918.8	10.8 %	348	131	37.6%	101753.0	42059.2	41.3%
Dalian University of Technology	78	28	35.9%	3345.9	885.7	26.5 %	92	36	39.1%	4151.1	2640.2	63.6%
Dalian Maritime University	541	184	34.0%	50204.8	6663.2	13.3 %	829	332	40.0%	74051.2	21552.0	29.1%
Dalian Polytechnic University	333	103	30.9%	13233.3	3882.3	29.3 %	509	137	26.9%	21185.8	2721.9	12.8%
Liaoning Ocean and Fisheries Science Research Institute	66	31	47.0%	1206.7	530.7	44.0 %	121	59	48.8%	2917.5	1648.6	56.5%
Dalian University	29	13	44.8%	407.4	176.0	43.2 %	61	41	67.2%	955.9	306.3	32.0%
Dalian Jiaotong University	112	59	52.7%	3473.4	852.1	24.5 %	92	56	60.9%	2122.7	1098.4	51.7%
Dalian Ocean University	42	24	57.1%	1296.4	506.6	39.1 %	52	38	73.1%	495.4	159.6	32.2%
Dalian Minzu University	185	124	67.0%	6375.1	3612.9	56.7 %	273	188	68.9%	8521.5	4155.6	48.8%
Dalian Neusoft Institute of Information	139	58	41.7%	2858.6	689.5	24.1 %	191	95	49.7%	2728.2	1473.5	54.0%
Dalian Medical University	52	34	65.4%	2712.9	2188.0	80.7 %	95	50	52.6%	1974.8	932.9	47.2%

Dalian Institute of Chemical Physics	76	54	71.1%	497.8	413.9	83.1 %	61	43	70.5%	402.6	296.4	73.6%
Total	1952	813	41.6%	149884.4	27319.7	18.2 %	2724	1206	44.3%	221259.8	79044.7	35.7%

Data source: Dalian Municipal Science and Technology Bureau

3 ISSUES IN THE TRANSFORMATION OF SCIENTIFIC AND TECHNOLOGICAL ACHIEVEMENTS IN DALIAN

3.1 Low Conversion Rate of Scientific and Technological Achievements in Dalian

In Dalian, the conversion rate of scientific and technological achievements in universities and research institutes is relatively low. In 2023, the proportion of local transactions of scientific and technological achievements from Dalian's universities and research institutes significantly increased to 35.7% (compared to 18.2% in 2022). However, the majority of transactions involved the transfer of technological achievements outside the region, accounting for as much as 64.3% (Table 4). Notably, Dalian Maritime University had the lowest proportion of local transactions, with only 12.8%, followed by Dalian Medical University at 32%.

Table 4 The Situation of the Transformation of Scientific and Technological Achievements in Dalian's Major Universities and Research Institutes in 2023

University research institutes	The number of achievement transformation projects is in the continuous proportion	Achievement transformation project transaction volume in the continuous proportion	University research institutes	The number of achievement transformation projects is in the continuous proportion	Achievement transformation project transaction volume in the continuous proportion
Dalian Institute of Chemical Physics	37.6%	41.3%	Dalian Jiaotong University	60.9%	51.7%
Liaoning Ocean and Fisheries Science Research Institute	39.1%	63.6%	Liaoning narmal University	73.1%	32.2%
Dalian University of Technology	40.0%	29.1%	Dalian Polytechnic University	68.9%	48.8%
Dalian Maritime University	26.9%	12.8%	Dalian Ocean University	49.7%	54.0%
Dalian Minzu University	48.8%	56.5%	Dalian University	52.6%	47.2%
Dalian Medical University	67.2%	32.0%	Dalian Neusoft Institute of Information	70.5%	73.6%
Total				44.3%	35.7%

Source: Dalian Science and Technology Bureau

3.2 Low Transaction Quality of Scientific and Technological Achievements in Dalian

In terms of profitability in the transformation of scientific and technological achievements, the overall profitability of universities and research institutes in Dalian is relatively low, with a low average contract amount for technology transfer. Table 5 shows that the nationwide average amount for each technology transfer contract in 2023 was 40.15 thousand RMB. However, several universities in Dalian, excluding Dalian University of Technology, Liaoning Oceanographic Academy, Institute of Chemistry of Chinese Academy of Sciences, and Dalian Maritime University, fell below this average. This indicates that Dalian's universities and research institutes face challenges in optimizing the value and quality of scientific and technological achievements.

Moreover, the technological content of scientific and technological achievements available for technology transfer in Dalian is relatively lower compared to achievements from other regions. The average contract amount for the

transformation of scientific and technological achievements in major universities and research institutes in Dalian is 81.2 thousand RMB, significantly higher than the average amount for local technology transactions at 65.5 thousand RMB.

Table 5 Situation of Contract Amounts for the Transformation of Scientific and Technological Achievements in Major Universities and Research Institutes in Dalian

University/Research Institute	Number of Transformation Projects	Number of Projects Transformed Locally	Total Transaction Amount (thousand RMB)	Transaction Amount Locally (thousand RMB)	Average Contract Amount (thousand RMB)	Average Contract Amount in Dalian (thousand RMB)
Dalian Institute of Chemical Physics	348	131	101753.0	42059.2	292.4	321.1
Liaoning Ocean and Fisheries Science Research Institute	92	36	4151.1	2640.2	45.1	73.3
Dalian University of Technology	829	332	74051.2	21552.0	89.3	64.9
Dalian Maritime University	509	137	21185.8	2721.9	41.6	19.9
Dalian Nationality University	121	59	2917.5	1648.6	24.1	27.9
Dalian Medical University	61	41	955.9	306.3	15.7	7.5
Dalian Jiaotong University	92	56	2122.7	1098.4	23.1	19.6
Liaoning Normal University	52	38	495.4	159.6	9.5	4.2
Dalian University of Technology	273	188	8521.5	4155.6	31.2	22.1
Dalian Ocean University	191	95	2728.2	1473.5	14.3	15.5
Dalian University	95	50	1974.8	932.9	20.8	18.7
Dalian Neusoft Institute of Information	61	43	402.6	296.4	6.6	6.9
Total	2724	1206	221259.8	79044.7	81.2	65.5

Source: Dalian Science and Technology Bureau

3.3 Insufficient Collaboration between Universities, Research Institutes, and Enterprises

Insufficient collaboration between major universities, research institutes, and enterprises in Dalian is evident. As depicted in Table 6, the average number of jointly established research and development institutions with enterprises per university and research institute nationwide was 3.6 in 2022. Similarly, the average number of newly established or invested enterprises was 0.9. While a few universities surpassed these averages, the majority fell short. Surprisingly, nearly half of the universities and research institutes did not engage in collaborations to establish research and development institutions or invest in new enterprises. Hence, the existing connections and collaborative efforts between Dalian's universities, research institutes, and enterprises appear insufficient and lack depth.

Table 6 Collaboration between Universities, Research Institutes, and Enterprises

Universities and research institutes	The number of r & d institutions jointly built with enterprises	Create and share in the number of new enterprises	Universities and research institutes	The number of r & d institutions jointly built with enterprises	Create and share in the number of new enterprises
Dalian Institute of Chemical Physics	6	0	Dalian Jiaotong University	7	0
Liaoning Ocean and Fisheries Science Research Institute	0	0	Liaoning narmal University	0	0

Dalian University of Technology	3	3	Dalian Polytechnic University	4	0
Dalian Maritime University	5	6	Dalian Ocean University	0	0
Dalian Minzu University	0	0	Dalian University	3	2
Dalian Medical University	0	0	Dalian Neusoft Institute of Information	0	0
National average of universities and research institutes				3.6	0.9

Source: Dalian Science and Technology Bureau

3.4 Lack of Concept Validation Centers and Low Project Maturity

Research projects at universities and research institutes in Dalian often revolve around theoretical innovations, prioritizing advancement and originality in research and development rather than market demand. Consequently, research results may lack transformation value, as projects may deviate from market needs[1]. Additionally, the promotion of concept validation centers in Dalian is insufficient. While cities like Beijing, Shanghai, Shenzhen, Hangzhou, and Guangzhou have established concept validation centers to facilitate joint validation activities among universities, research institutes, enterprises, and other innovative entities, Dalian has only established concept validation centers in Jinpu New Area and Dalian University of Technology, in collaboration with enterprises and incubation bases. These centers require further development, as their functions and roles are not entirely clear in society.

4 RECOMMENDATIONS FOR ENHANCING THE TRANSFORMATION RATE OF SCIENTIFIC AND TECHNOLOGICAL ACHIEVEMENTS IN DALIAN

4.1 Improve the Source Supply Mechanism and Strengthen Cooperation between Universities, Research Institutes, and Enterprises

First, refine the project approval mechanism to align with market demand. Optimize the process of forming scientific and technological projects to ensure continuous participation of enterprises in various stages such as project selection, guideline formulation, and R&D execution. Second, enhance the integration between industry, academia, and research in enterprises to enhance the quality of scientific and technological achievements. Promote a collaborative innovation model involving industry, academia, research, where market issues are addressed, enterprise needs are identified, university solutions are provided, and government support is offered. Third, support the establishment of joint R&D institutions by enterprises, universities, and research institutes. Utilize enterprises' understanding of industry trends and market demand to prioritize project approvals, making research outcomes more applicable to practical production. Fourth, establish a "use before transfer" model for scientific and technological achievements along with a risk compensation mechanism for failed technology transfer[2].

4.2 Develop a High-level Technology Intermediary Service System

First, encourage universities and research institutes to establish specialized technology intermediary organizations. This allows for the enhanced market development, promotion, and industrialization of technology outcomes. Combining the introduction of excellent technology service agencies from other regions with the cultivation of local technology service institutions can improve the professionalism of technology intermediaries. They will provide specialized services such as intellectual property rights, legal advice, asset assessment, and technological evaluation for technology transfer and outcome conversion. Second, promote the high-quality development of local technology intermediary organizations. Capitalize on provincial technology intermediary institutions by leveraging their demonstrative and radiating role to facilitate the transfer and conversion of regional scientific and technological achievements. Strengthen the construction of exemplary technology intermediary institutions in Dalian, coordinating technical selection, transaction matching, and intellectual property services for technology transfer. Exploration of a registration management system for technology intermediary institutions is recommended.[3] Third, cultivate and develop a team of technology managers. Utilize existing talent training bases for technology intermediaries to foster a strong team of technology transfer professionals in Dalian. Provide business training for these technical managers and support them in legal advice, financing, asset assessment, technological evaluation, intellectual property, and contract registration. Enhance the professional service capabilities of technology transfer professionals while encouraging their involvement in the entire technological achievement conversion process. Fourth, establish guidance management mechanisms for technology management firms along with certification and training mechanisms for technology managers. Clearly define promotion channels and

foster versatile technology intermediary talents who possess in-depth knowledge of technology, market, finance, and management.

4.3 Strengthen Technological Achievement Transformation and Improve Technological Maturity

First, enhance the promotion of concept validation centers to bridge the gap between basic research outcomes and commercialization. Establishing concept validation centers aids the effective integration of the "four chains" (talent, industry, innovation, and fund chains) to increase the rate and quality of technology transformation. Second, enhance the construction of scientific and technological achievement transformation platforms in universities and research institutes. Encourage these institutions to establish pilot platforms for technology transformation, utilizing new models of market operation and adopting a "test-first, incubate-later" approach[4]. By integrating existing resources and focusing on core services such as sample and prototype development and clinical verification, aim to further enhance technological achievement maturity, efficiency of technology transformation, and the number and value of transformation contracts for technological achievements.

4.4 Incentivize Local Transformation of Technological Achievements

To address the issue of low local transformation in universities and research institutes, comprehensive incentive measures can be implemented. First, assess and incentivize universities and research institutes in Dalian to ensure substantial progress in local transformation. Second, provide financial incentives to technology achievement owners to stimulate enthusiasm and innovation, thereby encouraging priority transformation into practical applications. Third, enhance incentives for local businesses engaged in technological achievement transformation, promoting active participation to achieve widespread local application of technological achievements. Fourth, improve financial support measures by providing funding and financial services to reduce risks and costs associated with local technological achievement transformation, further fostering transformation and application of technological achievements.

COMPETING INTERESTS

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FINTECH DISRUPTION IN TRADITIONAL BANKING: OPPORTUNITIES AND CHALLENGES FOR FINANCIAL INSTITUTIONS

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Abstract: This research explores the disruption caused by financial technology (FinTech) in traditional banking sectors, emphasizing the opportunities and challenges faced by financial institutions. The article analyses the evolution of FinTech, its impact on banking services, and the strategic responses of institutions. This highlights cases of successful adaptation and pitfalls encountered by banks in the face of rapid technological advancement. The paper concludes with recommendations for navigating the fintech landscape to ensure sustainable growth and relevance in the modern financial ecosystem.
Keywords: FinTech; Traditional banking; Disruption; Opportunities and challenges; Financial institutions

1 INTRODUCTION

The financial services landscape has undergone a significant transformation over the past two decades, driven primarily by technological advancements and the rise of financial technology (FinTech) companies. FinTech, characterized by the integration of technology into offerings by financial services companies, has disrupted traditional banking operations, introduced innovative business models, and challenged long-standing norms in financial transactions. This transformation is not merely a passing trend; it represents a profound shift in the way financial services are conceived, delivered, and consumed, fundamentally altering the competitive landscape of the industry.

The rise of fintech has been catalyzed by several key technological advancements, including the proliferation of mobile devices, the growth of internet connectivity, and the development of sophisticated data analytics capabilities. For example, the widespread adoption of smartphones has enabled consumers to access a plethora of financial services at their fingertips, leading to a growing preference for digital banking solutions [1]. As noted by Gomber et al. [2], the integration of advanced technologies such as artificial intelligence (AI), machine learning, and blockchain has not only increased operational efficiency but also enabled the creation of personalized financial products that cater to individual consumer need.

This disruption presents both opportunities and challenges for traditional banks, which must navigate a rapidly evolving landscape characterized by changing consumer expectations, regulatory complexities, and competitive pressures. Consumers today demand seamless, instantaneous, and personalized services, a shift that traditional banks often struggle to accommodate owing to their legacy systems and regulatory constraints [3]. According to a report by KPMG [4], the rise of FinTech has intensified competition in the banking sector, compelling traditional banks to innovate or risk losing market share to more agile and tech-savvy competitors.

The rapid pace of technological innovation has led to a reconsideration of strategic priorities within financial institutions, prompting a fundamental rethinking of how banking services are delivered to consumers. As highlighted by the World Economic Forum [5], traditional banks are increasingly recognizing the need to embrace digital transformation, not only to enhance customer experiences but also to improve operational efficiency and reduce costs. This shift requires banks to invest in new technologies, rethink their business models, and foster a culture of innovation that is often at odds with their historical practices.

Moreover, the regulatory environment surrounding FinTech is complex and continuously evolving, adding another layer of challenge for traditional banks. Regulatory bodies are grappling with how to effectively oversee a rapidly changing financial landscape while ensuring consumer protection and financial stability [6]. Traditional banks must adapt to these regulatory changes while navigating the risks associated with new technologies, such as cybersecurity threats and data privacy concerns.

This article aims to explore the complex dynamics at play in the fintech revolution, examining how traditional banks can harness the opportunities presented by technological change while effectively addressing the challenges that arise. By analysing the interplay between FinTech innovations and traditional banking practices, this study seeks to provide a comprehensive understanding of the current landscape and identify strategic pathways for traditional banks to thrive in this new environment.

Understanding the implications of fintech for traditional banking is crucial for several reasons. First, as consumer preferences shift toward digital-first experiences, banks must adapt their service offerings to meet these expectations. Research by Bain & Company [7] indicates that consumers are increasingly willing to switch banks for better digital experiences, underscoring the need for traditional banks to innovate and improve their digital capabilities.

Second, the competitive landscape is evolving rapidly, with new entrants leveraging technology to disrupt traditional

banking models. This challenge is particularly pronounced in areas such as payments, lending, and wealth management, where fintech firms are often able to offer more efficient and user-friendly solutions [2]. Traditional banks must not only recognize these threats but also identify opportunities for collaboration or integration with FinTech firms to enhance their service offerings and maintain relevance in the market.

Finally, this study aims to highlight the strategic responses that traditional banks can employ to manage the complexities of the fintech landscape. By assessing successful case studies and best practices, this research provides actionable insights for banking executives and policymakers, enabling them to make informed decisions that promote resilience and long-term growth in an increasingly competitive environment.

In summary, the intersection of FinTech and traditional banking represents a critical area of study that warrants attention from both academia and industry. As the financial services landscape continues to evolve, understanding the implications of this transformation is essential for ensuring the sustainability and competitiveness of traditional banks in the face of disruptive change.

2 THE EVOLUTION OF FINTECH

Fintech development can be traced through three primary stages: early innovations in financial technology, the rise of digital disruption, and current trends and developments. Each of these stages highlights the transformative impact of technology on financial services and the ongoing journey towards more integrated and consumer-friendly solutions.

2.1 Early Innovations in Financial Technology

The term "FinTech" originally referred to the back-end technologies that financial institutions used. The early 2000s marked a pivotal transition in the financial sector, with the emergence of online banking, electronic payment systems, and the initial wave of automated trading platforms. This era began to demonstrate how technology could streamline banking operations and enhance transactional efficiency. As Arner, Barberis, and Buckley [8] articulated, it was during this period that technological advancements laid the groundwork for future innovations by improving the effectiveness and speed of financial transactions.

For instance, the introduction of online banking allowed consumers to perform transactions without visiting a physical bank, drastically changing the usability and accessibility of financial services [9]. Electronic payment systems, such as credit and debit card processing services, facilitated quicker transactions and increased consumer trust in digital payments. Furthermore, automated trading platforms began to optimize stock and commodity transactions by reducing human error and leveraging advanced algorithms to make real-time trades, representing an early shift toward data-driven financial solutions [10]. These early innovations set the stage for a more integrated financial technology environment that prioritizes efficiency and cost reduction.

2.2 The Rise of Digital Disruption

The late 2000s and early 2010s saw the global financial crisis catalyze a significant shift toward more consumer-centric financial services. In the aftermath of the crisis, many traditional banks faced scrutiny over their practices, leading to a growing demand for transparency and accountability. This environment provided fertile ground for the emergence of fintech startups offering innovative solutions, fundamentally reshaping the landscape of financial services.

Startups began to diversify the financial offerings available to consumers, introducing services such as peer-to-peer lending, crowdfunding platforms, and mobile payment applications. Companies such as PayPal, Square, and LendingClub not only redefined consumer interaction with financial services but also prioritized speed, convenience, and accessibility [2]. Peer-to-peer lending platforms disrupted traditional lending channels by enabling individuals to borrow directly from other individuals, effectively democratizing access to capital for many who might have been overlooked by conventional banks [11]. Additionally, crowdfunding platforms such as Kickstarter and Indiegogo revolutionized fundraising by connecting creators directly with potential supporters, illustrating the power of digital connectivity [12].

The proliferation of mobile payment applications, exemplified by services such as Venmo and Apple Pay, further emphasized the shift towards a cashless society. These platforms not only simplified the payment process but also enhanced the overall customer experience, encouraging wider adoption of electronic payments [13]. This stage of fintech evolution highlighted the potential for technology to disrupt established financial practices and forge a new path for consumer engagement.

2.3 Current trends and developments

Today, the FinTech landscape is characterized by an amalgamation of technologies such as artificial intelligence (AI), blockchain, big data analytics, and the Internet of Things (IoT). These advancements have enabled the development of sophisticated financial products, such as robo-advisors and digital wallets, which have become mainstream among consumers. Robo-advisors, for example, utilize AI algorithms to provide personalized investment advice and portfolio management at a lower cost than traditional financial advisors do, appealing to a broader demographic of investors [14].

Blockchain technology has also emerged as a transformative force in fintech, offering decentralized and secure transaction solutions. Its applications extend beyond cryptocurrencies to include smart contracts and real-time

settlement systems, enhancing transparency and reducing transaction costs across various financial activities [15]. As noted by the World Economic Forum [16], global investment in fintech reached an impressive $105 billion in 2020, reflecting robust growth and increasing interest from institutional investors. This surge in investment underscores the recognition of fintech's potential to revolutionize financial services by making them more efficient, scalable, and accessible.

Moreover, big data analytics and the IoT have enabled financial institutions to enhance their risk management practices and personalize their service offerings. Through advanced data analytics, institutions can now predict consumer behavior, assess creditworthiness more accurately, and tailor financial products to meet individual preferences [17]. The integration of the IoT with financial services allows for more dynamic pricing models and real-time financial management, further aligning with consumer expectations.

In conclusion, the evolution of fintech illustrates a dynamic interplay between technological advancement and consumer demand, paving the way for a future where financial services are increasingly accessible, efficient, and tailored to individual needs. Traditional banking institutions must stay attuned to these developments to remain competitive and relevant in an ever-evolving financial landscape.

3 IMPACT OF FINTECH ON TRADITIONAL BANKING

The emergence of FinTech has brought profound changes to the landscape of traditional banking, shaping new dynamics and necessitating a shift in how traditional banks operate. This impact can be categorized into several key areas: the disruption of business models, enhanced customer experience, and increased financial inclusion.

3.1 Disruption of business models

The advent of FinTech has led to the emergence of alternative business models that actively challenge traditional banking operations. FinTech firms typically operate with lower overhead costs, leveraging technology to optimize efficiency and minimize traditional expenses such as branch maintenance and manual processing. This operational lean structure enables fintechs to offer more competitive pricing, faster services, and innovative products that often leave traditional banks struggling to keep pace.

As noted by PwC [18], more than 80% of financial service executives believe that the competitive landscape of financial services will change significantly within the next five years, indicating that this disruption is not only profound but also accelerated. FinTech companies such as Revolut and N26 have introduced neobanking services that bypass traditional banking infrastructures entirely, allowing customers to manage their finances through user-friendly apps. This shift is compelling traditional banks to rethink their pricing strategies and operational practices [19]. Traditional institutions are increasingly adopting strategies such as partnering with fintechs or even creating their own innovation hubs to integrate technology-driven solutions into their existing frameworks [20].

The transformation extends beyond mere pricing; it involves a fundamental reevaluation of how banking services are delivered. As fintechs prioritize streamlined, technology-driven experiences, traditional banks are pressured to innovate or risk losing their market share [21]. Ongoing shifts create a more competitive environment that mandates agility and responsiveness in product offerings, positioning FinTechs as formidable competitors.

3.2 Enhanced Customer Experience

One of the most significant impacts of FinTech on banking is the enhancement of customer experiences. FinTech startups have prioritized the user experience, focusing on intuitive interfaces, seamless interactions, and personalized services that resonate well with today's tech-savvy consumers. Traditional banks, constrained by legacy systems and bureaucratic structures, frequently struggle to match the agility and responsiveness of these newcomers.

According to research by Capgemini [22], 85% of consumers express a preference for digital banking options, indicating a clear demand for improved customer engagement. This preference drives traditional banks to adopt digital transformation strategies, which often include revamping their digital platforms and enhancing online customer support [23]. The focus on customer experience is underscored by the successful implementation of features such as round-the-clock access to banking services, mobile check deposits, and personalized financial advice through chatbots. Furthermore, the degree of personalization facilitated by data analytics allows fintechs to tailor services that meet individual customer needs, leading to higher customer satisfaction and loyalty [24].

Moreover, the pressure to enhance user experiences has led traditional banks to invest in technology and rethink their value propositions. This includes exploring collaborations with FinTech firms to incorporate automated services and utilizing AI and machine learning for better customer insights [25]. The resulting evolution reflects an industry that values the customer interface and empathy as core components of service delivery.

3.3 Increased Financial Inclusion

FinTech has tremendous potential to promote financial inclusion by providing access to banking services for underserved and unbanked populations. Digital lending platforms, mobile banking services, and cryptocurrency solutions can effectively reach individuals in remote areas who otherwise lack access to traditional banking infrastructure. The World Bank [26] estimates that approximately 1.7 billion adults remain unbanked, underscoring the

critical need for innovative solutions to bridge this gap.

The proliferation of mobile wallets and digital currencies has empowered many individuals without access to conventional banking systems to engage in financial services. Products such as microloans and peer-to-peer lending enable entrepreneurs in low-income regions to secure funding, fostering local economic growth and stability [27]. By leveraging technology, fintech firms can offer tailored financial products that consider the specific needs and constraints often faced by underserved demographics.

Additionally, the ease of access to credit through digital platforms has transformative implications for financial literacy and empowerment. According to research by the McKinsey Global Institute [28], providing access to financial services can lead to improved household savings rates and increased investment in education and healthcare, thereby enhancing overall quality of life. FinTech innovations not only bring financial services closer to the unbanked but also promote a more inclusive financial ecosystem that fosters participation from all societal segments.

In summary, the impact of fintech on traditional banking is multifaceted, driving changes in business models, enhancing customer experiences, and promoting financial inclusion. This ongoing evolution compels traditional banks to adapt, innovate, and rethink their strategies to thrive in a transformed financial landscape.

4 OPPORTUNITIES FOR TRADITIONAL BANKS

While the emergence of FinTech presents significant challenges to traditional banks, it simultaneously offers numerous opportunities for these institutions to grow, adapt, and redefine their business models. By leveraging collaborations, embracing innovation, and proactively engaging with regulators, traditional banks can not only maintain their competitiveness but also enhance their overall service offerings.

4.1 Collaboration and partnerships

One of the most promising opportunities for traditional banks lies in collaborating with fintech companies. These partnerships enable banks to gain access to innovative technologies and fresh perspectives that can augment their existing operations. By leveraging the agility and creativity of FinTech firms, banks can enhance their product offerings and accelerate their digital transformation journeys. According to a survey conducted by Deloitte [29], 55% of banking executives believe that partnerships with FinTech firms are critical to their business strategies and long-term success.

Such collaborations can take various forms, from strategic alliances to joint ventures and even mergers. For example, banks can benefit from FinTech's expertise in areas such as blockchain technology, artificial intelligence (AI), and big data analytics, which can facilitate the development of more efficient, secure, and customer-centric services [30]. Collaborative efforts not only allow traditional banks to stay relevant in a rapidly evolving financial landscape but also enable them to tap into new revenue streams by offering innovative solutions that cater to different customer segments.

Furthermore, established banks can leverage their brand reputation and regulatory experience when partnering with fintechs, thus providing them with a credibility boost while ensuring customer confidence in new offerings [31]. Ultimately, these partnerships can help banks differentiate themselves in a competitive market, retain customers, and attract new businesses.

4.2 Embracing Innovation

Embracing innovation is essential for traditional banks to remain competitive in the financial services industry. This involves investing in new technologies, adopting agile methodologies, and fostering a culture that encourages experimentation and adaptability. Many banks are establishing innovation hubs or accelerators designed to promote creative problem solving and the rapid development of digital solutions [32].

Investing in technologies such as artificial intelligence and data analytics can empower banks to provide hyperpersonalized services that significantly increase customer satisfaction and loyalty. AI can help analyse customer data to deliver tailored financial advice, customized product recommendations, and proactive customer engagement [33]. By using machine learning algorithms to understand customer behavior and preferences, banks can create a more engaging and relevant experience that meets the unique needs of individual consumers.

Moreover, the adoption of innovative technologies can streamline internal processes, reduce operational costs, and improve service delivery. For example, the automation of routine tasks through robotic process automation (RPA) can free up human resources to focus on more strategic and value-added activities [34]. By leveraging innovation effectively, traditional banks can create efficiencies that empower them to compete more effectively against agile fintech challengers.

4.3 Regulatory Adaptation

Regulatory adaptation is another crucial opportunity for traditional banks to navigate the changing landscape of the financial services industry. Proactively engaging with regulators can foster a more favourable environment that supports innovation while also ensuring consumer protection. By advocating for regulatory frameworks that facilitate the adoption of new technologies, banks can position themselves as industry leaders in compliance and innovation [35].

One effective approach to regulatory adaptation is the establishment of collaborative frameworks, such as regulatory sandboxes. These controlled environments allow banks and fintech firms to test new products and services with

regulatory oversight, enabling the identification and mitigation of potential risks before broader implementation [36]. Such initiatives not only create a safer testing ground for innovative ideas but also promote a culture of transparency and trust between financial institutions and regulatory bodies.

Additionally, by actively participating in discussions about regulatory reform, banks can help shape the rules governing the industry to better accommodate innovations and market demands. Engaging with regulators allows traditional banks to stay ahead of compliance requirements while ensuring that they can leverage new technologies to meet evolving customer expectations [37].

In conclusion, while fintech poses challenges to traditional banks, it also presents significant opportunities for growth and adaptation. By collaborating with fintech companies, embracing innovation, and engaging proactively with regulators, traditional banks can position themselves to thrive in an increasingly competitive and dynamic financial landscape.

5 CHALLENGES FACING FINANCIAL INSTITUTIONS

While traditional banks encounter numerous opportunities in the evolving fintech landscape, they also face significant challenges that can impede their ability to innovate and adapt effectively. Understanding these challenges is crucial for financial institutions looking to navigate the complexities of the modern banking environment. This section discusses three primary challenges: legacy systems and culture, cybersecurity risks, and competition from nontraditional players.

5.1 Legacy systems and culture

One of the most critical challenges facing traditional banks is their reliance on legacy systems and outdated technology. Many financial institutions have invested heavily in systems that have become ingrained in their operations for decades, making it difficult to adopt and integrate new technologies swiftly. A study by PwC [38] indicated that 62% of banks identified legacy technology as their greatest obstacle to transformation. These systems often lack interoperability and flexibility, creating silos that hinder the adoption of innovation.

Moreover, these technological constraints are compounded by entrenched corporate cultures that resist change. Traditional banks often have hierarchical structures and risk-averse mindsets, which can stifle creative ideas and impede agility [39]. Employees may be reluctant to challenge the status quo due to fear of failure or pushback from management. This cultural inertia can significantly slow banks' response to industry shifts and make realizing the potential benefits of digital transformation efforts challenging [40].

To overcome these challenges, banks must prioritize the modernization of their IT infrastructure and foster a culture that embraces innovation. This may involve not only investing in new technologies but also cultivating a workforce that is open to new ideas and methodologies, ensuring alignment between technological capabilities and organizational goals.

5.2 Cybersecurity Risks

The rise of digital banking and online financial services has led to a corresponding increase in cybersecurity risk. As transactions and customer data are increasingly managed online, financial institutions have become attractive targets for cybercriminals. Data breaches, ransomware attacks, and identity theft are prevailing threats that can severely damage customer trust and institutional integrity. Deloitte [41] emphasized that financial institutions must invest significantly in cybersecurity measures to protect sensitive customer information and maintain their reputation.

In response to these threats, banks need to adopt a multilayered cybersecurity strategy that includes advanced technologies such as artificial intelligence and machine learning for threat detection, enhanced encryption protocols, and continuous monitoring of digital systems. Additionally, establishing a robust cybersecurity culture within an organization, where employees are continuously trained to recognize vulnerabilities and respond effectively to incidents, is crucial [42]. Regulatory compliance is equally critical; as regulations around data protection tighten, banks must ensure that they adhere to standards such as the GDPR or CCPA, mitigating risk while protecting customer data.

5.3 Competition from Nontraditional Players

In recent years, the competitive landscape for financial services has shifted dramatically. Nontraditional players, particularly technology companies such as Google, Apple, and Amazon, are increasingly entering the financial sector, using their established customer bases and technological expertise to offer financial products and services. According to Capgemini [43], 84% of consumers would consider using financial products offered by these nonbanking technology companies. This emergence of tech giants as competitors has intensified the pressure on traditional banks to innovate and improve their offerings.

These companies leverage their strengths in user experience design, data analytics, and scalability, creating products that often exceed those of traditional financial institutions in terms of functionality and ease of use. For example, platforms such as Apple Pay and PayPal have simplified transactions such that they overshadow conventional banking services [44]. Consequently, traditional banks must not only improve their digital offerings but also reconsider their value propositions to remain relevant in this increasingly competitive landscape.

To compete effectively, traditional banks can explore partnerships or collaborations with fintech firms to harness their innovation capabilities. This strategy enables banks to integrate cutting-edge technology into their existing services

while maintaining their regulatory compliance. Additionally, enhancing customer experience, leveraging data analytics for personalized services, and offering competitive pricing can help banks retain and attract customers in an era of fierce competition.

In summary, while traditional banks can leverage numerous opportunities within the fintech landscape, they face substantial challenges, including the constraints of legacy systems and corporate culture, cybersecurity risks, and competition from nontraditional players. Addressing these challenges will be essential for banks to succeed in an ever-evolving market landscape.

6 CASE STUDIES

Understanding the varying trajectories taken by traditional banks in adapting to fintech is essential for drawing lessons into successful strategies and pitfalls. The cases of JPMorgan Chase and Deutsche Bank provide valuable insights into how institutions can either thrive or falter in the face of technological disruption.

6.1 Successful Adaptation: JPMorgan Chase

JPMorgan Chase stands out as a prime example of a traditional bank successfully navigating the challenges posed by fintech. Banks have strategically embraced technology through substantial investments in fintech initiatives, particularly in areas such as blockchain, artificial intelligence (AI), and digital payments. For example, JPMorgan has developed its own blockchain platform known as the interbank information network (IIN), which facilitates real-time cross-border payments and reduces the friction involved in traditional banking processes [45]. This move not only enhances efficiency but also positions the bank as a leader in financial innovation.

In addition to its blockchain efforts, JPMorgan Chase has launched its own digital payment platform, Chase Pay, to compete in the growing mobile payment market. This initiative allows customers to make secure payments through a user-friendly interface, integrating seamlessly with popular merchants [46]. Furthermore, the bank's partnerships with various FinTech firms have been instrumental in enriching its customer offerings. By collaborating with companies specializing in payments, lending, and investment management, JPMorgan has been able to incorporate cutting-edge technologies and services into its existing framework, thus enhancing customer experience and satisfaction [47].

This multifaceted approach has enabled JPMorgan Chase to not only maintain its market leadership but also adapt swiftly to changing consumer preferences. According to a report by The Economist [48], the bank's proactive investment in technology has significantly improved its operational capabilities and has positioned it as a frontrunner in the race toward digital banking. As a result, JPMorgan Chase highlights how embracing innovation can lead to sustained competitive advantage, reinforcing the importance of a forward-thinking strategy in a technology-driven environment.

6.2 Learning from Failure: Deutsche Bank

In contrast, Deutsche Bank presents a cautionary tale about the challenges of adapting to the FinTech disruption. Banks have faced significant hurdles in integrating technology effectively into their operations, primarily due to their reliance on legacy systems and the absence of a coherent digital strategy. The bank’s legacy infrastructure not only hindered its ability to innovate but also led to inefficiencies that were detrimental to its competitiveness in a rapidly changing financial landscape [49].

The lack of a well-defined digital strategy became evident as competitors began to capitalize on digital transformation opportunities. Deutsche Bank's failure to invest early in technology left it behind its peers, leading to financial difficulties and a notable loss of market share. Research by McKinsey & Company [50] highlights that banks that prioritize digital initiatives early and integrate them into their strategic framework tend to perform better in the long term. Unfortunately, Deutsche Bank’s inertia and slow response to digital trends have resulted in diminished customer trust and an eroded brand reputation.

Moreover, Deutsche Bank's attempts to remedy these shortcomings have often been hampered by organizational complexity and limited operational agility. A report by Accenture [51] noted that many traditional banks, including Deutsche Bank, face internal resistance to change due to entrenched corporate cultures that prioritize stability and risk aversion over innovation. This lack of urgency in addressing technological gaps further exacerbates banks’ vulnerability to external competition from agile fintech companies.

In summary, Deutsche Bank’s experience underscores the consequences of failing to adapt effectively to the FinTech landscape. The bank’s challenges serve as a crucial lesson for other financial institutions about the importance of a proactive digital strategy, the need to modernize legacy systems, and the value of cultivating a culture that embraces change and innovation.

7 FUTURE OUTLOOK

The FinTech revolution is reshaping the banking industry at an unprecedented pace, and traditional financial institutions are compelled to adapt to remain competitive. As the landscape continues to evolve, understanding the key trends that influence the future of banking is essential.

7.1 Continued Growth of Digital Banking

The shift towards digital banking is not just a passing trend; it reflects a fundamental change in consumer preferences. The rapid adoption of mobile banking apps and digital payment solutions has escalated, driven by the desire for convenience and a seamless user experience [52]. According to a survey by PwC [53], 59% of consumers stated that they prefer digital interactions over face-to-face banking services.

To meet these increasing demands, banks must invest in scalable digital infrastructure. This not only includes upgrading legacy systems but also enhances cybersecurity measures to protect customer data from increasing cyber threats. It is imperative to prioritize customer experience by implementing personalized banking solutions. The use of data analytics and AI can help banks tailor offerings to individual customer needs, thereby improving customer satisfaction and loyalty [54]. A focus on user-centric design in digital interfaces can further facilitate this personalization, creating intuitive experiences that retain existing customers while attracting new ones.

Moreover, the growth of digital banking entails an increase in competition, including from fintechs that offer agile, user-friendly solutions. Traditional banks' ability to innovate quickly and adapt their strategic priorities will determine their market position moving forward [55]. The future of banking will be characterized by a relentless focus on enhancing digital experiences, and those banks that effectively leverage technology and prioritize customer satisfaction will likely thrive in this environment.

7.2 Increased Regulatory Oversight

As fintech continues to disrupt traditional banking practices, regulatory bodies are increasingly tasked with creating frameworks that can accommodate innovation without compromising consumer protection. The emergence of new technologies such as cryptocurrencies, digital wallets, and AI-driven financial services compels regulators to evaluate existing policies continually and adapt to new realities [56].

Given this dynamic landscape, banks must ensure compliance with emerging regulations that may arise in response to technological developments. Engaging with regulators early in the development process has become a best practice—this proactive approach allows banks to shape regulatory discussions and build products that align with legal requirements while still fostering innovation. A collaborative relationship with regulators can facilitate the development of frameworks that promote a balance between protecting consumers and encouraging technological advancement [57].

Moreover, the recent Global Financial Stability Report [58] indicates a growing emphasis on regulatory compliance for cybersecurity, data privacy, and anti-money laundering measures in the fintech space. Therefore, banks should not only focus on compliance as a checkbox exercise but also view it as a strategic advantage. Properly adhering to regulatory standards can enhance a bank's reputation in the market and build trust among consumers, enabling a long-term competitive advantage against less compliant fintech entities.

7.3 Rise of Open Banking

Open banking, which involves the sharing of customer data with third-party providers through secure application programming interfaces (API), is gaining momentum as a transformative force in the banking sector. This initiative aims to increase transparency and competition within the financial services ecosystem, providing consumers with the opportunity to access a broader array of financial products and services [59].

The adoption of open banking not only promotes collaboration between banks and fintechs but also encourages innovation in product development. For example, third-party providers can leverage customer data to create tailored financial services that cater to consumers' unique needs, thereby enhancing customer choice and satisfaction [60]. Moreover, a report by Deloitte [61] suggests that open banking could lead to a significant increase in efficiency within the banking sector, as it allows for streamlined processes and reduced operational costs.

However, the successful implementation of open banking hinges on data security and privacy concerns. Banks must ensure that robust security measures are in place to protect consumer information while also providing transparency regarding how data are shared and used [62]. As these initiatives gain traction globally, successful banks effectively manage the complexities of open banking while ensuring regulatory compliance and consumer trust.

In conclusion, the future of banking will undoubtedly be significantly influenced by the continued growth of digital banking, increased regulatory oversight, and the rise of open banking. Banks that embrace these trends, cultivate strategic relationships with regulators, and prioritize customer-centric digital experiences will be well positioned to thrive in an increasingly competitive and technological landscape.

8 CONCLUSION

The disruption caused by fintech in the banking sector offers a dual-edged sword to traditional financial institutions, presenting them with both exciting opportunities and significant challenges. By adopting a forward-thinking approach and embracing technological innovation, traditional banks can collaborate with fintech companies to tap into the benefits of cutting-edge technologies. This proactive stance allows them to stay relevant and competitive in an increasingly digital marketplace. However, these institutions must also grapple with the complexities of their legacy systems, which may not be equipped to handle the speed and flexibility required in today's fast-paced financial environment. Additionally, they face the daunting task of fortifying their defenses against sophisticated cybersecurity

threats and fierce competition from agile nontraditional financial players that are unencumbered by the constraints of traditional banking models.

To not only survive but also thrive in this dynamic and ever-evolving financial landscape, banks must prioritize several key areas. Agility becomes crucial as they need to adapt quickly to changing market conditions and customer expectations. A customer-centric approach is essential, as it allows banks to better serve their clients by offering personalized and innovative financial solutions that meet their evolving needs. Collaboration with fintech firms and other stakeholders is also vital, as it enables banks to leverage external expertise and resources, fostering a culture of innovation and shared growth.

As the financial landscape continues to be reshaped by technological advancements, traditional financial institutions that can effectively navigate the complexities of fintech integration, manage the risks associated with legacy systems, and maintain a strong focus on customer satisfaction will be well positioned to succeed in the future. By doing so, they can transform potential threats into opportunities for growth and maintain their relevance in a rapidly changing industry.

COMPETING INTERESTS

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

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INFLUENCE OF POLITICAL DEBATES ON ELECTORAL OUTCOMES IN NIGERIA

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Abstract: Political debates during elections in Nigeria are a crucial component of the democratic process, serving as a platform for candidates to present their ideas, policies, and vision to the electorate. However, in recent years, political debates in Nigeria have been marred by controversy, bias, and lack of transparency, raising questions about their effectiveness in informing voters and promoting accountability among politicians. Hence the study examined influence of political debate on electoral outcome in Nigeria. The study examined scholarly opinions and concepts and reviewed two theories. The study concluded that it is important for stakeholders in Nigeria to critically assess and enhance the role of political debates in shaping electoral outcomes. This includes promoting transparent and inclusive debate formats, ensuring fair and impartial media coverage, and encouraging meaningful engagement between candidates and voters. By strengthening the quality and impact of political debates, Nigeria can foster a more informed electorate, encourage voter participation, and ultimately contribute to more credible and democratic electoral outcomes. The study recommended that to improve the influence of political debates on electoral outcomes in Nigeria, it is essential to enhance media coverage and promote transparency. Media outlets should provide fair and unbiased coverage of debates, ensuring that all candidates have equal opportunities to present their views. Transparency in media reporting can help voters make informed decisions and hold candidates accountable for their statements and positions.
Keywords: Politics; Election; Debate; Democracy; Political actors; Electoral reformation

1 INTRODUCTION

Over the years, politics has been a multifaceted field that encompasses the study of power, governance, public policy, and decision-making processes within societies. It involves the exercise of authority, the distribution of resources, and the resolution of conflicts among individuals, groups, and institutions. Politics influences various aspects of society, including social, economic, and cultural dynamics. Politics is essential for understanding how societies are governed, how decisions are made, and how resources are allocated. Political science, as an academic discipline, analyzes political behavior, institutions, systems, ideologies, and public policies to provide insights into the functioning of political systems and the impact of political actions on society[1].

Politics is characterized by competition for power, influence, and resources. Political actors, such as elected officials, political parties, interest groups engage in political activities to advance their interests, shape public opinion, and promote their policy agenda. Elections, campaigns, lobbying, advocacy, protests and political debates are some of the tools used in political processes to mobilize support, achieve objectives, and hold government officials accountable especially during election [2].

Nigeria has, unarguably, not fared well in her democratic journey even after many years of nationhood. This has given rise given rise to political instability[3]. Nwokeocha went on to assert that the electoral system in Nigeria has been described as among the worst in the world[3]. He further argued that this is largely because the media have not lived up to expectations bas the agenda setter and the Fourth Estate of the Realm.

However, political debates among politicians in Nigeria are often characterized by heated arguments, grandstanding, and deflection, rather than genuine discourse on policy issues. In recent years, the political landscape in Nigeria has been marked by a lack of civility and intellectual rigor in debates among politicians, as they prioritize personal attacks and mudslinging over substantive discussions about governance and public policy[4].

One of the key issues with political debates in Nigeria is the prevalence of ethnic and religious divisions, which often lead to polarized arguments and strawman attacks. Rather than engaging in constructive dialogue, politicians often resort to identity politics and tribalism to score cheap political points and appeal to their base of supporters. This not only detracts from the real issues at hand but also perpetuates a cycle of divisiveness and intolerance in Nigerian politics.

Furthermore, many politicians in Nigeria often lack the necessary knowledge and expertise on the issues they are debating, leading to superficial arguments and shallow analysis. Many politicians focus on rhetoric and empty promises rather than presenting concrete plans and solutions to address the country's challenges[5]. This results in a public discourse that is devoid of substance and fails to engage citizens in meaningful ways. In addition, the media play a significant role in shaping political debates in Nigeria, often amplifying sensationalist narratives and promoting conflict rather than fostering dialogue and understanding. Biased reporting and misinformation further contribute to the erosion of public trust in political institutions and exacerbate the polarization of society[6].

Political debates during elections in Nigeria are a crucial component of the democratic process, serving as a platform for candidates to present their ideas, policies, and vision to the electorate. However, in recent years, political debates in

Nigeria have been marred by controversy, bias, and lack of transparency, raising questions about their effectiveness in informing voters and promoting accountability among politicians. According to Ojo[7], one of the key issues with political debates during elections in Nigeria is the lack of equal representation and participation of all candidates. Oftentimes, debates are monopolized by major political parties and their candidates, while smaller parties and independent candidates are sidelined or excluded altogether. This limits the diversity of perspectives and inhibits voters from making informed decisions based on a comprehensive understanding of all available options.

Furthermore, political debates in Nigeria are often plagued by a lack of moderation and enforcement of rules, leading to chaotic and unruly discussions that do not foster meaningful dialogue. Candidates frequently resort to personal attacks, deflection, and evasion of questions, rather than engaging in significant and meaningful discussions on policy issues and governance. This undermines the credibility of debates and diminishes their potential to serve as a platform for genuine debate and accountability[8].

Very importantly, one of the biggest issues with political debates in Nigeria is that the electoral laws in the country, the latest being the 2022 Electoral Act, has not recognized it as a key component of the electoral process. The Nigerian electoral laws ought to make election debates compulsory for all political parties, stating clearly that any candidate who fails to participate in it becomes ineligible to contest in the election. This is one of the key ways of deepening democracy in Nigeria as it would make political and economic misfits to steer clear of the elections.

Again, Nigerian electorate should grow and go beyond biases, ethno-religious sentiments and shun greed and allow the support any candidate who shows clear understanding of the many developmental challenges plaguing the country and is clear on how to solve the problems if given the opportunity or mandate to serve.

Moreover, the influence of money and vested interests in political debates in Nigeria raises concerns about the integrity and independence of the process. Candidates with financial resources often use their wealth to influence the format, content, and tone of debates, shaping the narrative in their favor and distorting the public perception of their opponents. This not only undermines the fairness of the electoral process but also erodes public trust in the credibility of political debates as a tool for informed decision-making[9].

In order to enhance the effectiveness of political debates during elections in Nigeria, it is imperative to promote inclusivity, transparency, and accountability in the process. All candidates, regardless of party affiliation or financial resources, should be given equal opportunity to participate and present their views to the electorate. Moderators should enforce strict rules and guidelines to ensure civil debate and adherence to substantive issues, while the media should play a watchdog role in holding candidates accountable for their statements and promises.

2 RESEARCH METHODOLOGY

The qualitative descriptive research approach adopted in this study allows for an in-depth analysis of the phenomenon of political debates influence on electoral outcome in Nigeria. By examining reports from international, national observers, such as SMBintel, EU, the African Union, as well as scrutinizing accounts from reputable national newspapers, this study gains a comprehensive understanding of the scope and nature of electoral debates. Moreover, scholarly works pertaining to electoral outcomes and political debates in Nigeria offer valuable insights into the underlying causes and potential consequences of such incidents.

3 Literature Review

3.1 An Overview of Politics

Politics is a complex and multifaceted field that encompasses the exercise of power, governance, and decision-making within societies. It plays a crucial role in shaping the social, economic, and cultural landscape of a nation, and can have far-reaching implications for the wellbeing of its citizens. However, the practice of politics is often marked by power struggles, corruption, and lack of accountability, which can hinder the effective functioning of democratic systems and lead to governance failures. One of the key challenges in politics is the pervasiveness of corruption, which undermines trust in government institutions and erodes public confidence in the political system. According to Transparency International[10], corruption is a global phenomenon that plagues both developed and developing countries, and poses a significant threat to democracy and good governance. In Nigeria, for example, corruption is a pervasive issue that has hampered the country's development and led to widespread poverty and inequality.

Another challenge in politics is the abuse of power by those in positions of authority, who may prioritize their own interests over the needs of the population. This often results in a lack of accountability and transparency in government, as leaders evade scrutiny and fail to address the concerns of their constituents. In countries with weak democratic institutions, such as Nigeria, this can lead to widespread human rights abuses and political repression[10].

Furthermore, the rise of populism and authoritarianism in politics has raised concerns about the erosion of democratic values and the rule of law. Leaders who espouse populist rhetoric may exploit social divisions and stoke fear to consolidate power, undermining the foundations of democracy and sowing discord within society. The recent global surge in authoritarianism, accompanied by attacks on the media and civil society, highlights the fragility of democratic norms and the need for greater vigilance in defending democratic principles[11].

3.2 Political Debates in Nigeria

Political debates in Nigeria play a crucial role in shaping public opinion, informing voters, and providing a platform for candidates to articulate their positions on key issues. These debates are essential components of the democratic process, serving as fora for dialogue, engagement, and accountability among political actors. However, political debates in Nigeria are not without their challenges and controversies, as they often reflect the broader issues of corruption, ethnic and religious divisions, and lack of transparency that characterize the country's political landscape[12]. Nwokeocha points that media debate is undoubtedly one of the potent ways of providing political education for the masses[1]. He adds that TV debates became popularized in Nigeria in 1993 during the electioneering campaigns. It was between MKO Abiola and Bashir Today. The debates educated Nigerians on the capabilities of those two politicians and enabled them to make informed decision on whom to vote as president.

One of the key challenges in political debates in Nigeria is the tendency for discussions to devolve into personal attacks, mudslinging, and sensationalism, rather than substantive exchanges on policy issues. Politicians often resort to tactics of grandstanding, deflection, and emotional appeals in order to appeal to their base and score political points, rather than engaging in constructive dialogue that leads to meaningful outcomes. This creates a dynamic where debates become more about rhetoric and showmanship than about thoughtful discourse and informed decision-making.

Furthermore, the influence of money and power in political debates in Nigeria can skew the narrative, limit diversity of perspectives, and impede transparency in the electoral process. Wealthy candidates and political parties may use financial resources to control the agenda, manipulate media coverage, and silence dissenting voices, leading to an uneven playing field where certain voices are amplified while others are marginalized. This not only undermines the integrity of debates but also erodes public trust in the electoral system and contributes to a cycle of corruption and cronyism in Nigerian politics [13].

Moreover, the role of the media in shaping political debates in Nigeria is also a subject of scrutiny, as biased reporting, sensationalism, and lack of fact-checking can distort the discourse and mislead the public. The media's influence on political debates can either enhance transparency, accountability, and civic engagement, or exacerbate polarization, disinformation, and manipulation, depending on the quality and independence of the media outlets involved. Therefore, it is essential for the media to uphold ethical standards, provide accurate information, and promote informed public discourse in the context of political debates in Nigeria[14].

To address the challenges and enhance the effectiveness of political debates in Nigeria, it is imperative to promote inclusivity, transparency, and accountability in the process. All candidates, regardless of party affiliation or financial resources, should be given equal opportunities to participate and present their views to the electorate. A strong and independent electoral commission should oversee debate formats and ensure fair and impartial moderation. Moreover, civil society organizations, media watchdogs, and citizens themselves should actively engage in fact-checking, monitoring, and holding debaters accountable for their statements and promises, fostering a culture of integrity, openness, and citizen empowerment in Nigerian politics.

3.3 Elections in Nigeria

Elections in Nigeria are a critical component of the country's democratic process, providing citizens with the opportunity to choose their leaders and shape the direction of governance. However, elections in Nigeria have been marred by issues of fraud, violence, and corruption, raising concerns about the integrity and credibility of the electoral process. The conduct and outcome of elections in Nigeria have significant implications for the country's political stability, social cohesion, and economic development[15].

One of the key issues with elections in Nigeria is the prevalence of electoral malpractice, including vote rigging, ballot stuffing, and voter intimidation. These practices undermine the legitimacy of election results and erode public trust in the electoral process, leading to disenchantment and disillusionment among voters. The use of violence and coercion by politicians and their supporters further compounds these challenges, creating a hostile environment that inhibits free and fair participation in elections[16].

Furthermore, the influence of money and power in elections in Nigeria undermines the principle of equality and fairness in the electoral process. Wealthy candidates often use their financial resources to gain an unfair advantage, buying votes, manipulating media coverage, and engaging in corrupt practices to secure victory. This perpetuates a cycle of corruption and impunity that weakens democratic institutions and hampers the prospects of genuine representation and accountability in government[17].

The role of the electoral management body, the Independent National Electoral Commission (INEC), in overseeing elections in Nigeria is also a point of contention. While INEC is tasked with conducting free and fair elections, the commission has faced allegations of bias, incompetence, and political interference, casting doubt on its ability to uphold the integrity of the electoral process. The lack of transparency and accountability in the electoral management system further exacerbates doubts about the credibility and fairness of elections in Nigeria.

The recent elections conducted in the country cast serious doubt as to the credibility of INEC. Nigerians have continued to cry foul over the obvious subjectivity and apparent corruption of INEC. The rulling All Progressives Party (APC) seems to be using the electoral umpire to do its bidding leaving Nigerians to only complain and go to court. Ironically, the judiciary is another weapon fashioned against democracy and democrat ideals in Nigeria. The courts in Nigeria are currently manned by corrupt judges who collect bribes and give favourable judgement to the highest bidders. Often basing their judgements on technicalities (like they did in *Peter Obi Vs Bola Tinubu* 2023) shows that Nigeria's judiciary cannot be trusted the way it is currently constituted.

3.4 Electoral Outcomes and Crisis in Nigeria

The electoral outcomes in Nigeria have been a subject of controversy and scrutiny, with allegations of rigging, fraud, and manipulation marring the democratic process. This has had significant implications for the country's political landscape, governance, and overall stability, leading to concerns about the credibility and legitimacy of election results. One of the persistent challenges facing electoral outcomes in Nigeria is the prevalence of electoral malpractice, including voter intimidation, vote rigging, and manipulation of results. The 2019 general elections in Nigeria, which saw the re-election of President Muhammadu Buhari, were marred by allegations of irregularities, violence, and voter suppression. These issues raised doubts about the fairness and transparency of the electoral process and undermined public trust in the democratic system[18].

Furthermore, the lack of accountability and transparency in the electoral system has been a recurring issue in Nigeria, with reports of political interference, bribery, and corruption compromising the integrity of election results. The inability to conduct free, fair, and credible elections has had far-reaching implications for the country's political stability and democratic legitimacy, fueling social unrest, protests, and calls for electoral reforms[8]. The role of international observers and civil society organizations in monitoring election processes and ensuring the integrity of electoral outcomes has been crucial in highlighting irregularities and raising awareness about the need for electoral reforms. Organizations such as the Economic Community of West African States (ECOWAS) and the African Union (AU) have played a key role in assessing the credibility of elections in Nigeria and providing recommendations for improvement[19].

Despite these challenges, there have been instances of progress and positive developments in Nigeria's electoral landscape. The 2015 presidential election, which saw the peaceful transfer of power from the incumbent president to the opposition candidate, marked a significant milestone in the country's democratic history and demonstrated the potential for credible and transparent elections in Nigeria.

The escalation of violence did not merely commence on the day of the election; rather, its ominous presence was already palpable prior to the much-anticipated electoral event. The seeds of hostility had been sown and nourished in the days leading up to the election, causing an atmosphere fraught with tension and volatility. Even before voters flocked to the polling stations, there were disturbing signs that the impending democratic exercise would be marred by acts of aggression and conflict. Rival political factions, driven by deep-seated animosities and competing ideologies, engaged in a series of heated confrontations. These clashes unfolded in various forms, ranging from verbal altercations and incendiary speeches to physical skirmishes and targeted acts of intimidation.

Media platforms became battlegrounds for fierce rhetoric, amplifying the divisions and fanning the flames of hostility. The vitriolic discourse and smear campaigns spread like wildfire, exacerbating the already simmering tensions within the populace. Pervasive rumors and misinformation further fueled the growing animosity, with each side manipulating narratives to suit their agendas and stoking fear and anger among their respective supporters. As election day drew nearer, the atmosphere became increasingly charged. Political rallies, initially intended to energize and mobilize voters, devolved into chaotic spectacles marked by clashes between opposing factions. The streets, once symbols of unity and shared public spaces, transformed into zones of contention and potential danger.

The incidents of pre-election violence, whether orchestrated or spontaneous, served as ominous harbingers of the turmoil to come. The sense of apprehension and foreboding hung heavy in the air as people braced themselves for the storm that was about to descend upon their communities. It is essential to recognize that the violence that plagued the election was not an isolated event confined to a single day; rather, it was a culmination of mounting tensions and grievances that had been festering for an extended period. The prelude to the election was characterized by a distressing climate of hostility, division, and polarization that ultimately set the stage for the tragic events that unfolded on the day of the election itself.

Precisely, SMB reported that on February 23[20], the Imo Commissioner for Trade and Investment and two APC leaders were ambushed by gunmen in Umuawuchi village. On the same day, the Managing Director of Imo State Waste Management Agency and a representative from Okigwe South had a near-death encounter in a remote village near Okata Community. On February 25, ballot boxes and voting materials were snatched by political thugs at a polling unit in Oredo, Edo State. Disturbances were also recorded in Yenagoa, Bayelsa State, due to a ballot paper shortage. The INEC office in Takai LGA, Kano State, was burned by suspected thugs. Additionally, incidents of violence occurred in Idanre, Ondo State, where a person was shot dead, and in Etim Ekpo LGA, Akwa Ibom State, where two persons were shot dead. More violence was reported on February 25 as a female voter was stabbed by political thugs in Edo State. In Okene LGA, Kogi State, a PDP agent was killed by thugs suspected to be APC members. In Kano, at least two people were burned to death, and a campaign office was burned down. In Rivers State, a pregnant woman and a vigilante service member were killed, and houses were burned in Ubimini Community. Hoodlums also caused unrest in various polling units in Lagos State, including Awoyaya, Ibeju Lekki, and Oshodi. On February 27, the traditional ruler of Umuezeokaoha Community in Ebonyi State was shot and killed by political thugs. Thugs also disrupted the result collation process at the Plateau North Senatorial District's collation center. On February 28, there were reports of hoodlums attacking Igbo traders in Lagos, although the police denied the news. Additionally, a hoodlum shot a lady to death in Agege LGA while celebrating a political party's victory[21].

The impact of election violence on Nigeria's democracy is nothing short of catastrophic. When acts of violence and intimidation are used to suppress opposition voices and stifle free and fair debate, the very essence of the democratic process is undermined and weakened. This erosion of democratic principles has far-reaching consequences that extend

beyond the immediate aftermath of an election. One of the most significant consequences of election violence is the erosion of public trust in the electoral process. When citizens witness or experience violence during elections, they lose faith in the ability of the electoral system to accurately represent their voices and choices. This loss of trust can lead to disillusionment and apathy among the populace as they begin to question the legitimacy and integrity of the electoral process. When people no longer have confidence in the system, voter turnout declines, further weakening the democratic process. Furthermore, the legitimacy of elected officials and democratic institutions is severely compromised when election violence occurs. If individuals are elected through a process marred by violence, coercion, or fraud, their legitimacy to govern is called into question. When this foundation is torn down by election violence, elected officials and institutions lose their credibility and the ability to effectively govern[22].

Moreover, election violence hampers the development of a vibrant and inclusive political environment. In a democracy, healthy and robust debates are essential for shaping public opinion, formulating policy, and holding elected officials accountable. When violence is employed to silence opposition voices, the space for open discourse and the exchange of ideas is stifled. This lack of diverse perspectives weakens the quality of decision-making, hindering progress and inhibiting the development of a truly representative democracy. The consequences of election violence are not limited to the immediate aftermath of an election but can have long-lasting effects on the political, social, and economic fabric of a nation. The damage caused by election violence seeps into the very core of society, sowing seeds of division[20].

3.5 Influence of Political Debates on Electoral Outcomes in Nigeria

In liberal democracies, political debates play a crucial role in shaping public opinion and influencing electoral outcomes. This cannot be said concerning Nigeria. Political debates are yet to be given the prominence and importance it deserves in Nigeria as it is done in countries where democracy is appreciated and respected. Until political debates form part of our electoral laws, and institutionalized, our democracy will not make any progress and we will keep getting it wrong in our electoral journey. Debates provide a platform for candidates to present their policies, address key issues, and engage with voters, ultimately shaping their perceptions and decisions at the polls. However, the influence of political debates during elections in Nigeria is not without its challenges and controversies, raising concerns about their impact on the democratic process.

One of the key issues with political debate influence during elections in Nigeria is the lack of impartiality and fairness in the organization and moderation of debates. Oftentimes, debates are organized and controlled by major media houses or political parties, raising questions about bias and manipulation in favor of certain candidates. This can distort the narrative, limit the diversity of perspectives, and undermine the credibility of debates as a tool for informed decision-making among voters[21].

Furthermore, the influence of money, power, and vested interests in political debates can skew the discourse and shape the agenda in ways that prioritize the interests of the elite over those of the general populace. Candidates with financial resources often use their wealth to control the narrative, silence dissenting voices, and promote their own agendas, leading to a distortion of information and a lack of accountability in the electoral process. This can limit the impact of political debates in fostering transparency, accountability, and citizen engagement in Nigeria.

Moreover, the role of the media in shaping political debate influence during elections in Nigeria is also a cause for concern. Biased reporting, sensationalist coverage, and misinformation can distort the public discourse, manipulate public opinion, and contribute to the spread of fake news and disinformation. This can further polarize society, undermine trust in institutions, and erode the foundations of democracy, making it difficult for voters to make informed decisions based on accurate and reliable information[11].

In order to enhance the positive influence of political debates during elections in Nigeria, it is crucial to promote transparency, accountability, and inclusivity in the process. Debates should be organized by neutral and independent bodies, with clear rules and guidelines in place to ensure fairness and impartiality. Candidates should be held accountable for their statements and promises, and the media should play a watchdog role in fact-checking and providing accurate information to voters[22].

In support of the above assertion, Nwokeocha avers that the election campaign that saw Barack Obama voted in as the President of the United States of America (USA) in 2008 was characterized by the use of new media (Facebook, Twitter etc.) to attract the electorate[23]; commonly known as the friends of Obama, with the Slogan "Change is Possible". Political strategies and analysts have dubbed Barack Obama's 2008 presidential victory as the "Twitter election" "a triumph of new media in politics" and "the election decided by Facebook" cited in Nwokeocha[23]. Following the same trend, President Goodluck Jonathan adopted the use of Facebook in his presidential election campaigns and actually became the first in Nigeria to adopt such strategy that has increasingly made an inroad into our electoral process and in the overall political environment cited in Nwokeocha[23]. The 2023 presidential election in Nigeria saw a significant influence of social media in campaigning, monitoring results, and predicting winner. Many voters were mobilized on the social media and through it. Some candidates such as Peter Gregory Obi was tagged "a social media president." by the opposition, who undoubtedly were threatened by Obi's popularity in the build up to the general elections.

Overall, political debate influence during elections in Nigeria can be a powerful tool for promoting citizen engagement, shaping public opinion, and holding politicians accountable. However, without addressing issues of bias, manipulation, and misinformation, debates run the risk of being reduced to mere spectacles that do little to empower voters and strengthen democracy in Nigeria.

4 THEORETICAL FRAMEWORK

The following theories provided theoretical underpinning for the study.

4.1 Agenda Setting Theory

Agenda-setting theory is a prominent concept in the field of communication and political science that explores the influence of media in shaping public opinion and setting the political agenda. First proposed by Maxwell McCombs and Donald Shaw in the 1960s, agenda-setting theory posits that the media play a crucial role in determining not only what issues are discussed but also how these issues are framed and prioritized in the public consciousness. While media may not dictate what people think, they can significantly influence what people think about[24].

At the core of agenda-setting theory is the idea that the media have the power to frame public discourse by selecting specific topics and providing context and interpretation for those topics. Through news coverage, editorials, and commentary, media outlets can highlight certain issues, events, or individuals, while downplaying or ignoring others. This selective attention and emphasis on particular issues can shape public perceptions, influencing the salience and importance people attach to different topics.

One of the key contributions of agenda-setting theory is its recognition of the media's role as a gatekeeper of information and a mediator of public conversations. By controlling the flow of news and shaping narratives, the media can influence public attitudes, policy priorities, and political outcomes. Studies have shown that the topics and perspectives presented in the media can have a significant impact on what people consider important, what issues they prioritize, and how they interpret events in the world around them. However, agenda-setting theory is not without its criticisms and limitations. Critics argue that the theory may oversimplify the relationship between media content and public opinion, overlooking other factors that influence people's beliefs and behaviors. Additionally, the theory raises concerns about media bias, commercial interests, and political influence, as media organizations may prioritize certain issues or perspectives based on their own agendas rather than the public interest[25].

The Agenda-Setting Theory is highly relevant to studying the influence of political debates on electoral outcomes in Nigeria. This theory posits that the media play a significant role in shaping public perceptions by determining which topics are discussed and highlighted, influencing what issues the public considers important and how they evaluate political candidates. In the context of political debates in Nigeria, the Agenda-Setting Theory can help analyze how media coverage of debates influences voter attitudes, perceptions, and ultimately electoral choices.

During political debates in Nigeria, media coverage can amplify certain issues, candidates' positions, and moments from the debates, influencing public opinion and shaping voters' perceptions. The media's selection of topics, framing of discussions, and emphasis on specific narratives can impact the salience of issues for voters, potentially shaping their priorities and decision-making during elections. By strategically highlighting certain aspects of the debates, the media can draw attention to particular candidates or issues, helping to set the agenda for public discourse and electoral considerations. Moreover, the Agenda-Setting Theory can also shed light on the role of media bias, commercial interests, and political influence in shaping the coverage of political debates in Nigeria. Media organizations may have their own agendas, affiliations, or biases that shape how they present debates to the public, influencing which perspectives are emphasized and which are marginalized. Understanding these dynamics through the lens of agenda-setting can provide insights into how media influence electoral outcomes by framing the discourse, constructing narratives, and influencing public perceptions of candidates and issues.

4.2 Constructivism Theory

Constructivism is a significant theoretical framework in international relations that challenges traditional perspectives on state behavior, conflict, and cooperation. This theory, first introduced by scholars such as Alexander Wendt and Nicholas Onuf in the late 20th century, emphasizes the role of ideas, norms, and identities in shaping political outcomes. Central to constructivism is the notion that international relations are socially constructed, with states and actors engaging in interactions that shape their perceptions, beliefs, and behavior[26]. One of the key tenets of constructivism is the emphasis on the role of shared understandings, norms, and identities in shaping state behavior. Constructivist scholars argue that states do not simply respond to objective material interests or power dynamics but are influenced by subjective factors such as culture, history, and ideology. By focusing on how actors interpret and make sense of their environment, constructivism offers insights into the ways in which ideas and beliefs shape political decisions, alliances, and conflicts in the international system[27].

Moreover, constructivism challenges the assumption of a rigid, anarchic international system governed solely by power relations and self-interest. Instead, it highlights the potential for cooperation, communication, and socialization among states through the production and diffusion of norms and values. By studying how states construct their identities, interests, and preferences through interaction with other actors, constructivism offers a more nuanced understanding of international relations that goes beyond material constraints and zero-sum calculations[28].

Despite its contributions to the field of international relations, constructivism has faced criticism and skepticism from proponents of realism and liberalism. Critics argue that constructivism may lack predictive power and empirical rigor, as it often relies on qualitative methods and case studies to explore ideational factors that are difficult to measure. Additionally, some scholars question the extent to which constructivism can offer prescriptive policy recommendations or practical solutions to complex international problems. Nevertheless, constructivism remains a valuable theoretical

perspective for understanding the role of ideas, norms, and identities in shaping international politics. By examining how states, institutions, and actors construct their reality through social interactions, constructivism offers a holistic approach to studying global affairs that considers the influence of culture, discourse, and belief systems on diplomatic relations, conflict resolution, and global governance.

Constructivism theory offers valuable insights into the study of the influence of political debates on electoral outcomes in Nigeria. This theoretical perspective focuses on how ideas, norms, and identities shape political behavior and decision-making, highlighting the importance of social interactions and shared understandings in the political process. In the context of political debates in Nigeria, constructivism theory can help illuminate how discourse, narratives, and public perceptions influence voter attitudes and electoral choices. Moreover, constructivism theory sheds light on the role of media, civil society, and other social actors in shaping public discourse and political engagement during electoral campaigns. The interactions between candidates, voters, and other stakeholders create a shared space for dialogue, deliberation, and negotiation, where ideas are contested, exchanged, and legitimized. By analyzing these social dynamics through a constructivist lens, researchers can explore how communication, language, and symbols influence voter perceptions and behavior, ultimately shaping electoral outcomes.

5 DISCUSSION

The influence of political debates on electoral outcomes in Nigeria is a critical and complex aspect of the country's democratic process. Political debates serve as platforms for candidates to articulate their policies, engage with voters, and shape public opinion, ultimately influencing electoral decisions. In a nutshell, however, the impact of political debates on electoral outcomes in Nigeria is shaped by a range of factors, including media coverage, candidate performance, voter engagement, and societal dynamics.

Media Coverage: The media play a significant role in shaping the reach and impact of political debates in Nigeria. The way debates are covered and reported by the media can influence how they are perceived by voters, amplifying certain messages or perspectives while downplaying others. Biased or sensationalist media coverage can distort the public discourse and impact voter perceptions, potentially influencing electoral outcomes.

Candidate Performance: The performance of candidates during political debates can have a direct impact on electoral outcomes. Candidates who present clear, coherent, and persuasive arguments are more likely to sway undecided voters and garner support. Conversely, candidates who struggle to articulate their positions or engage in negative campaigning may lose credibility and support among voters, affecting their electoral prospects.

Voter Engagement: Political debates have the potential to engage voters, inform their decisions, and increase voter turnout. By providing a platform for candidates to discuss key issues and policy proposals, debates can help voters better understand the choices at stake in an election. Voter engagement and participation are crucial factors in determining electoral outcomes in Nigeria, and political debates can play a key role in mobilizing voters and shaping electoral results.

Societal Dynamics: The broader societal context in Nigeria, including factors such as ethnic and religious divisions, economic disparities, and social inequalities, can influence the impact of political debates on electoral outcomes. In a deeply polarized society like Nigeria, political debates may exacerbate existing divisions or mobilize support along identity lines. The influence of political debates on electoral outcomes is thus shaped by the complex interplay of societal dynamics and political discourse.

6 CONCLUSION

The influence of political debates on electoral outcomes in Nigeria is significant and multifaceted, with debates serving as important forums for candidates to engage with voters, present their policy proposals, and shape public opinion. The impact of political debates on electoral outcomes in Nigeria is shaped by a range of factors, including media coverage, candidate performance, voter engagement, and societal dynamics. Media coverage plays a crucial role in shaping the reach and impact of political debates, with biased or sensationalist coverage potentially distorting public discourse and impacting voter perceptions. Candidate performance during debates is also key, as candidates who effectively articulate their positions and engage with voters are more likely to sway undecided voters and gain support. Additionally, voter engagement and participation are crucial in determining electoral outcomes, with political debates serving as platforms to inform and mobilize voters.

Societal dynamics, including factors such as ethnic and religious divisions, economic disparities, and social inequalities, also influence the impact of political debates on electoral outcomes in Nigeria. In a society as diverse and polarized as Nigeria, debates can either exacerbate existing divisions or mobilize support along identity lines. Understanding these societal dynamics is crucial for assessing the impact of political debates on electoral decisions and ensuring a more informed and participatory democratic process.

Moving forward, it is important for stakeholders in Nigeria to critically assess and enhance the role of political debates in shaping electoral outcomes. This include making it a compulsory requirement for all candidates standing election, enshrining it in the Electoral Act, establishing a body that will supervise or take charge of political debates, promoting transparent and inclusive debate formats, ensuring fair and impartial media coverage, and encouraging meaningful engagement between candidates and voters. By strengthening the quality and impact of political debates, Nigeria can

foster a more informed electorate, encourage voter participation, and ultimately contribute to more credible and democratic electoral outcomes.

7 RECOMMENDATIONS

The following were recommended for the study:
1. To improve the influence of political debates on electoral outcomes in Nigeria, it is essential to enhance media coverage and promote transparency. Media outlets should provide fair and unbiased coverage of debates, ensuring that all candidates have equal opportunities to present their views. Transparency in media reporting can help voters make informed decisions and hold candidates accountable for their statements and positions.
2. Increasing civic education and voter engagement is crucial for maximizing the impact of political debates on electoral outcomes in Nigeria. Educational campaigns can help citizens understand the importance of debates, their role in the electoral process, and how to critically evaluate candidate performances. Encouraging voter participation and engagement in debates can lead to more informed and empowered voters who are actively involved in the democratic process.
3. To enhance the influence of political debates on electoral outcomes, it is important to foster constructive dialogue and civil discourse among candidates and stakeholders. Debates should focus on substantive policy discussions, respectful exchanges of ideas, and solutions-oriented conversations. By promoting a culture of respectful and informed debate, candidates can better connect with voters, address key issues, and influence electoral decisions positively.
4. Political debates should form part of our electoral laws at all levels and should be made a compulsory requirement for candidates standing election.

COMPETING INTERESTS

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

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A STUDY OF THE IMAGE OF CHINA IN THE GOVERNANCE OF CHINA -- A CORPUS-BASED STUDY

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Abstract: This article employs the corpus research method, using The Governance of China as its source material. It begins with Fairclough's three-dimensional discourse analysis model and takes the Five-sphere Integrated Plan as its point of departure, analysing the keywords in the political, economic, social, cultural, and ecological civilisation sphere. Qualitative and quantitative analysis of the keywords in the political, economic, social, cultural, and ecological civilisation discourse in The Governance of China elucidates the image of China embedded in it. To a certain extent, the results of the study assist young people, society, and the global community in comprehending series of pivotal discourses on China's multifaceted developments and the three-dimensional, dynamic portrayal of China in the contemporary era. Furthermore, the dissemination of China's narratives and perspectives is facilitated. Furthermore, it is conducive to the promotion of a positive self-image of China, which is aligned with the country's developmental trajectory and contemporary needs, as opposed to the current situation where Western discourse on China is largely limited to a narrow set of preconceived notions.
Keywords: The governance of China; Five-sphere integrated plan; Portrait of China; Corpus

1 INTRODUCTION

The cross-cultural figurative view posits that the Western image of China represents a cultural construct informed by Western imagination and knowledge. This representation, as a construct of the West as the Other in terms of knowledge and power, may perpetuate a form of imaginative oppression of China's modernity[1].
As indicated by People's Daily (2022), the "Five-sphere Integrated Plan" was initially proposed at the 18th National Congress of the CPC. This plan specifically emphasises the comprehensive advancement of economic, political, cultural, social and ecological civilisation construction as a unified endeavour. Subsequent to the 18th National Congress, the CPC Central Committee has been advocating for the "Five-sphere Integrated Plan" and the coordinated promotion of the Four-pronged Comprehensive Strategy. Since the 18th National Congress, the CPC Central Committee, has been promoting the Five-sphere Integrated Plan and the Four-pronged Comprehensive Strategy in a coordinated manner. This has resulted in the country making historic achievements and changes, and significant progress in adhering to the development of the country.
In consideration of the aforementioned factors, we have elected to utilise the text *The Governance of China* as our primary source material. To this end, we have employed the corpus research method and constructed five sub-corporations, namely political discourse, economic discourse, social discourse, cultural discourse, and ecological civilisation discourse. This approach has been undertaken in accordance with the overall layout of the Five-sphere Integrated Plan. Concurrently, a three-dimensional discourse analysis model is employed, with Antconc utilized to extract keywords from the five sub-corporations. These keywords are then subjected to analysis, with a focus on their characteristics and directionality within the context of text, discourse practice, and social practice. This approach enables an investigation into the image of China as portrayed in *The Governance of China*.

2 LITERATURE REVIEW

The role of translation in the formation of national, the images has been a significant factor throughout the course of human development. As a distinctive symbol, translation is not only directly implicated in the formation of the aforementioned images but also serves to disseminate them[2].
In 2013, the leader proposed that foreign propaganda work should be conducted with care and innovation, with the objective of creating new concepts, categories and expressions that integrate China and foreign countries, and of disseminating information about China and its policies. Scholars based in China have initiated research into how the international community portrays China, examining a range of sources including foreign newspapers and media, literary works, and the film industry. For example, Zhao Xueying (2019) examines the construction of China's cultural image in Chinese and English documentaries from the perspective of multimodal discourse, while Ma Ruiqi (2022) analyses the image of China embodied in Biancheng from the perspective of figurativeness[3-4]. Wang Shanmei (2022) employs the lens of spatial narrative to examine the construction of China's image in new immigrants' literature[5]. Hu Yangzi (2022), for his part, applies the concept of aesthetic acceptance to investigate the portrayal of China in the context of the "Youthful Metamorphosis"[6].
A review of the extant literature reveals that Western countries, led by the United States, which enjoy the privilege of disseminating and interpreting global culture, have engaged in uninhibited vilification and distortion of China and

developing countries. Xiao Yefei (2022:24) highlighted in his research that Time Magazine characterises China as a political power with poor human rights, a rapidly ascendant economic power with no rules, a military power that persistently seeks to expand its territory, and a scientific and technological power that possesses considerable strength and ambition[7]. In the following year, Zhang Kun and Wang Zhen (2023:102) highlighted in their study of China's image in Oscar-winning films that the cultural influence of American cinema has effectively rewritten Chinese culture according to its own value system[8]. They further observed that the image of "sphericalised" China that has emerged from this process symbolises the collage and reorganization of Eastern culture by the West, and has brought the Chinese people a myth of identity that has simultaneously confused and challenged their own sense of self. The image of "ballistic" China symbolises the collage and restructuring of Eastern culture by the West, and also brings to the Chinese people the myth and reflection of their identity.

In light of the aforementioned studies, it becomes evident that there is a pressing need to construct a comprehensive image of China for the global audience and to secure the authority to speak on matters pertaining to China's image research. Furthermore, the integration of diverse theoretical perspectives has led to a burgeoning field of research on China's image from a multitude of vantage points. However, the majority of current research remains anchored in the domain of communication, predominantly relying on literary translations as its primary source material. In contrast, the exploration of official documents represents a relatively nascent area of inquiry. The majority of current studies are conducted from a communication studies perspective, with the majority based on literary translations. The study of China's self-image through official documents is a relatively new field of research.

In conclusion, we posit that there is a substantial corpus and operational basis for investigating China's self-image through a three-dimensional discourse analysis model.

3 RESEARCH DESIGN

3.1 Research Corpus

This study employs the four-volume of *The Governance of China* as its principal source of material.

The Governance of China contains the speeches, talks, speeches, addresses, instructions, congratulatory letters, and other documents from 15 November 2012 to 10 May 2022. These documents present a range of new ideas, views, and assertions that address significant theoretical and practical questions about the development of the country in the context of the new historical conditions. They also focus on the CPC's philosophy of governance and the strategies of the new central leadership. The philosophy of governance and ruling strategy of the new central leadership group. It can be argued that this collection of texts represents the most significant and comprehensive account of China's history and development, and plays a pivotal role in shaping the discourse on China on the global stage[9]. It can be stated that *The Governance of China* in various languages serve as a conduit for mutual understanding between China and the global community. They represent not only a means through which China can present itself to the world, but also a crucial avenue for individuals in disparate countries and regions, speaking a multitude of languages, to gain insight into the perspectives of Chinese leaders[10]. Therefore, the book represents a significant resource for the self-modelling of our country's image, offering a certain degree of authority and professionalism. The Governance of China, excluding the catalogue and annotation sections, comprises 536,420 tokens and 12,706 word classes. The corpus has been divided into five sub-corporations, each of which is characterised by a distinct content and thematic focus. These five sub-corporations are: political, economic, cultural, ecological and civilisational, and social.

3.2 Theoretical Frameworks

The objective reality of language is not reflected, but rather, it is shaped by the subjective stance of the sender and the social context. Fairclough posits that language and social practice are mutually influential and constructive. Fairclough incorporated and employed Halliday's Systemic Functional Linguistics approach to language, proposing a three-pronged conceptual framework comprising discourse, discursive practice and social practice[11].

The field of textual analysis encompasses the examination of language at the level of vocabulary, grammar, coherence, structure, and other linguistic elements. Discourse practice analysis, on the other hand, delves into the processes involved in the production and interpretation of texts. Social practice analysis, finally, is the analysis of the social attributes of discourse, which entails examining texts in relation to their social context, environment, and international situation, as well as the impact they have had on society.

This paper takes the general layout of the "Five-sphere Integrated Plan" as its framework. It adopts Fairclough's three-dimensional discourse analysis model and combines qualitative and quantitative research with the corpus to analyse the practices of keywords in the text and society in the five sub-corporations of *The Governance of China*. The keywords in the corpus are employed to analyse the practices of the five sub-categories of *The Governance of China*' in text, discourse and society. This enables an understanding of the disparate initiatives and attitudes of the state in the fields of economy, politics, culture, society and ecological civilisation from the five dimensions. Subsequently, the image of China shaped by the five dimensions is analysed.

3.3 Research Methodology and Procedures

China's diplomatic image is shaped at two levels: material and discursive. At the material level, the image is formed by the impression left on individuals or groups by the actions of the Chinese management in the diplomatic field. At the discursive level, the image is formed by the perception of China's diplomacy, which is shaped by the words and actions of the management itself and by the words of others about the management[12]. Consequently, an analysis of *The Governance of Chin*a facilitates a more precise comprehension of the ideas put forth in the book, thereby enabling the shaping of a national image that is consistent with these ideas.

The contents of the four volumes were classified into five sub-corporations according to the Five-sphere Integrated Plan. These sub-corpora were defined as follows: economy, politics, culture, society and ecological civilisation. Secondly, Antconc was employed to generate keyword lists for the five sub-corporations, with the British National Corpus serving as the reference database. The top 20 keywords were then extracted. In the context of textual analysis, a keyword is defined as a word that appears with greater frequency in a given text or corpus relative to a comparable reference text or corpus of sufficient volume[13]. The analysis of keywords enables the derivation of the general idea of the topic, the author's attitude and stance, and so forth, in a given text or corpus. Accordingly, this study employed a combination of quantitative and qualitative research methods to extract and examine the keywords of *The Governance of China* and analyse its portrayal of China across five dimensions: economy, politics, society, culture and ecological civilisation[14].

4 FINDINGS OF THE RESEARCH

4.1 Keyword Analysis and China's Image Research

4.1.1 Political profile analysis

The keywords of the political corpus of *The Governance of China* are analysed in Table 1, which can be roughly classified into three categories. The first category comprises nouns indicating specific issues, such as development, law, and governance. The high-frequency use of these keywords indicates that the issues of development, laws and regulations, style of work, and governance remain the main core issues in Chinese political governance.

The following section presents nouns pertinent to the subject matter, including terms such as "leadership" and "cooperation." The deployment of these key words illustrates that the political consultation system, guided by the CPC, constitutes a fundamental political system of the People's Republic of China. Furthermore, the CPC serves as the bedrock of the socialist cause with Chinese characteristics and represents a pivotal aspect of this distinctive form of socialism.

In conclusion, the high frequency of these three key terms has successfully shaped the image of the CPC as an "efficient and conscientious" governor, as well as a significant global actor that is willing to confront challenges head-on, resolve them, and pursue progress through democratic means.

Table 1 Keyword List of Political Corpus

Rank	Keyword	Frequency	Keyness
1	China	1415	9538.31
2	and	16400	9248.41
3	Chinese	1274	9107.31
4	we	4244	6885.57
5	governance	658	6824.33
6	CPC	601	6696.88
7	our	2416	6635.52
8	development	1451	5275.36
9	reform	873	5068.11
10	must	1716	4537.83
11	leadership	692	3998.83
12	people	1997	3951.38
13	political	1160	3853.78
14	should	1818	3666.26
15	cooperation	480	3563.12
16	law	1079	3531.06
17	socialism	494	3493.43
18	uphold	315	2809.17
19	strengthen	381	2738.90

20	central	789	2735.22

4.1.2 Economic profile analysis

A critical examination of the keyword list allows us to identify the key economic values that the leader has emphasised on major occasions. This analysis enables us to conclude which image of China has been shaped by these words. As can be seen from Table 2, the keywords "development" and "economy" are ranked first and third, respectively, which serves to highlight the importance that China attaches to economic development. This reflects the fact that China's current development is still centred on economic construction. Concurrently, the frequency of the terms "innovation", "reform" and "enterprises" is also noteworthy. This indicates that China has been advancing the development of a robust economic nation, dedicated to the implementation of supply-side structural reforms, and the transformation and modernization of small and micro-enterprises.

Furthermore, the terms "cooperation", "countries" and "global" are of significant importance, as they illustrate China's aspiration for collective action and mutual advancement among all nations. This serves to substantiate China's dedication to the advancement of economic globalisation and the formation of a global community. This presents China as a proactive, pragmatic, and peace-seeking economy with a focus on the greater good.

Table 2 Keyword List of Economic Corpus

Rank	Keyword	Frequency	Keyness
1	development	1109	5760.71
2	China	614	4509.35
3	economic	750	3739.14
4	and	5577	3134.90
5	we	1628	2964.54
6	cooperation	324	2877.43
7	economy	491	2859.83
8	innovation	258	2063.50
9	should	808	2005.94
10	growth	398	1986.81
11	reform	281	1625.36
12	global	241	1556.97
13	our	633	1453.43
14	improve	235	1271.98
15	market	378	1239.10
16	countries	301	1202.17
17	promote	174	1061.62
18	governance	92	925.67
19	enterprises	133	909.51
20	globalization	69	811.82

4.1.3 Social profile analysis

With regard to nouns, the terms "people", "we", "Chinese", "China" and "development" are among the 20 most critical, reflecting the significance that China ascribes to the advancement of the entire nation with the populace as the primary focus.

From the perspective of word collocation, poverty can be associated with alleviation and improvement. This suggests that the poverty level of Chinese residents has decreased, the pressure of survival has been alleviated, and the happiness index of life has increased. This also demonstrates that the Chinese management has been successful in achieving the historic breakthrough of building a moderately prosperous society in all aspects since the 18th National Congress of the CPC.

In conclusion, the aforementioned terms collectively illustrate the Chinese management's sustained endeavours in social development and its assurance in, and forward planning for, China's prospective growth and advancement. This image portrays China as a great nation that cares for its people and strives to enhance their access to and happiness in life.

Table 3 Keyword List of Social Corpus

Rank	Keyword	Frequency	Keyness
1	people	884	2638.15
2	poverty	308	2400.67
3	and	4142	2366.77
4	we	1188	2144.86
5	Chinese	266	1862.44
6	China	258	1623.10
7	development	404	1558.44
8	should	603	1511.28
9	our	558	1457.59
10	social	350	1076.21
11	CPC	75	923.18
12	improve	171	923.02
13	governance	84	883.91
14	alleviation	73	873.51
15	must	362	851.21
16	reform	150	776.28
17	security	190	765.18
18	strengthen	85	609.81
19	cooperation	83	576.90
20	efforts	117	569.06

4.1.4 Cultural profile analysis

The high criticality of development, culture, culture, and rejuvenation in the keyword list of the cultural dimension, analysed from the vocabulary point of view, indicates that the Chinese management places a significant emphasis on cultural development and cultural rejuvenation. The terms "socialism", "socialist" and "values" are indicative of China's efforts to establish itself as a cultural powerhouse, with the socialist core values serving as the foundation for its cultural development, which is characterised by a distinctive Chinese identity. Furthermore, the elevated criticality of the term "CPC" substantiates the preeminent role of Marxism in the domain of ideology and China's aspiration to establish a robust socialist ideological foundation with robust cohesion and leadership.

It is worth mentioning that the key words country and exchanges in the keyword list are also of high importance, which shows that China's emphasis on culture and development is oriented to the world and the future, to the nation and the public, and to science. At the same time, the Chinese management strengthens the building of international communication capacity, and promotes China's excellent traditional culture to go out of the country and to the world while learning from the excellent culture of other countries, so that more people can understand and feel the charm of Chinese culture. It has shaped the image of China as a cultural powerhouse that attaches importance to cultural development, cultural heritage and cultural dissemination.

Table 4 Keyword List of Cultural Corpus

Rank	Keyword	Frequency	Keyness
1	Chinese	817	6977.25
2	and	5737	3553.48
3	China	487	3381.34
4	our	803	2208.00
5	should	839	2167.16
6	we	1345	2073.87
7	people	855	2061.35
8	CPC	134	1655.39
9	cultural	292	1638.06

10	culture	291	1495.13
11	socialism	184	1370.86
12	nation	201	1135.36
13	socialist	163	945.33
14	development	308	870.98
15	must	410	849.75
16	rejuvenation	72	819.11
17	exchanges	107	776.21
18	values	169	740.29
19	strengthen	104	727.19
20	Marxism	93	699.62

4.1.5 Ecological civilisation profile analysis

From the perspective of the subject, the words "we", "China" and "our" are of significant analytical importance. This demonstrates China's commitment to a people-centred approach in the development of an ecological civilisation, as well as its recognition of the necessity to address the people's requirements for an enhanced environment.

Secondly, from a thematic perspective, the prominence of words related to the environment, such as "environmental", "environment", "protection" and "protection", suggests that China places significant emphasis on the protection of its natural resources.

Furthermore, the keyword list encompasses a multitude of domains pertaining to environmental protection, including "carbon", "green", "ecological", "ecosystems", "biosecurity" and "energy". This reflects the Chinese management's recognition of the pressing national and global ecological challenges and its measured approach to analysing and responding to issues across various sectors. This serves to confirm China's emphasis on integrating a number of different policy areas, including industrial restructuring, pollution control, ecological protection, synergising carbon reduction, pollution reduction, green expansion and growth, and the promotion of the concepts of ecological priority, conservation and intensification, green and low-carbon development.

It is the responsibility and obligation of countries all over the world to protect the environment. China not only respects, adapts to and protects nature as an intrinsic requirement of nation-building, but also plans its development from the perspective of a harmonious symbiosis between human beings and nature. China's stance and actions in the field of ecological protection have contributed to its portrayal as a major power that prioritises the advancement of green development, the promotion of harmonious coexistence between humans and nature, the fulfilment of its international obligations and the assumption of responsibility.

Table 5 Keyword List of Ecological Civilisation Corpus

Rank	Keyword	Frequency	Keyness
1	eco	213	2700.16
2	and	2239	1601.26
3	development	326	1581.95
4	environmental	229	1560.15
5	we	693	1478.23
6	carbon	149	1214.98
7	environment	191	1062.67
8	green	196	1057.27
9	China	141	925.37
10	ecological	91	877.70
11	protection	128	733.96
12	should	266	626.84
13	our	245	601.04
14	must	211	568.27
15	governance	50	555.00
16	improve	96	548.35

17	ecosystems	45	517.32
18	biosecurity	31	493.33
19	promote	75	488.77
20	energy	107	483.68

5 CONCLUSION

This study employs a corpus analysis of the English translation of the leader on *The governance of China* to examine China's initiatives, attitudes, and image-building efforts in five domains: economy, politics, culture, society, and ecological civilisation. It situates these within the theoretical framework of the "Five-sphere Integrated Plan" and the three-dimensional discourse analysis model. The study reveals that China presents itself as a great power that is assertive, pragmatic, open and tolerant, people-centred, and committed to cultural heritage and innovation, while also promoting green development in the realms of politics, the economy, society, culture and ecological civilisation. This study offers novel perspectives and methodologies for the study of China's self-image, while simultaneously providing substantial evidence to support a more nuanced understanding of China on the global stage. It is crucial to highlight that this study has solely focused on exploring China's self-image from the lens of the "Five-sphere Integrated Plan" and the lexical level of the translated text. Nonetheless, the image of China in the text or discourse can b delved into from the syntactic, discourse, and semantic standpoints. In light of the aforementioned considerations, future research on China's image, whether from the perspective of self-image or other-image, would be well-advised to commence with an investigation of the specific syntactic structures and narrative strategies employed in the English translation of the pertinent discourse texts.

COMPETING INTERESTS

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